



BAY AREA
AIR QUALITY
MANAGEMENT
DISTRICT

BOARD OF DIRECTORS
STATIONARY SOURCE COMMITTEE

COMMITTEE MEMBERS

JOHN GIOIA - CHAIR
JOHN AVALOS
SCOTT HAGGERTY
LIZ KNISS
ROD SINKS

JIM SPERING – VICE CHAIRPERSON
CAROLE GROOM
DAVID E. HUDSON
JAN PEPPER

WEDNESDAY
JUNE 1, 2016
9:30 A.M.

7th FLOOR BOARD ROOM
939 ELLIS STREET
SAN FRANCISCO, CA 94109

AGENDA

1. **CALL TO ORDER - ROLL CALL – PLEDGE OF ALLEGIANCE**

The Committee Chair shall call the meeting to order and the Clerk of the Boards shall take roll of the Committee members. The Committee Chair shall lead the Pledge of Allegiance.

2. **PUBLIC COMMENT PERIOD**

(Public Comment on Non-Agenda Items Pursuant to Government Code § 54954.3) Members of the public are afforded the opportunity to speak on any agenda item. All agendas for regular meetings are posted at District headquarters, 939 Ellis Street, San Francisco, CA, at least 72 hours in advance of a regular meeting. At the beginning of the regular meeting agenda, an opportunity is also provided for the public to speak on any subject within the Committee's subject matter jurisdiction. Speakers will be limited to three (3) minutes each.

This meeting will be webcast. To see the webcast, please visit <http://www.baaqmd.gov/The-Air-District/Board-of-Directors/Agendas-and-Minutes.aspx> at the time of the meeting.

Staff/Phone (415) 749-

3. **APPROVAL OF THE MINUTES OF APRIL 18, 2016**

Clerk of the Boards/5073

The Committee will consider approving the draft minutes of the Stationary Source Committee meeting of April 18, 2016.

4. **UPDATE ON REGULATION 12, RULE 16: EVALUATION OF OPTIONS FOR REDUCING COMBUSTION EMISSIONS FROM REFINERIES**

J. Broadbent/5052
jbroadbent@baaqmd.gov

Staff will provide the Committee with an update on Regulation 12, Rule 16: Evaluation of Options for Reducing Combustion Emissions from Refineries.

5. **COMMITTEE MEMBER COMMENTS**

Any member of the Board, or its staff, on his or her own initiative or in response to questions posed by the public, may: ask a question for clarification, make a brief announcement or report on his or her own activities, provide a reference to staff regarding factual information, request staff to report back at a subsequent meeting concerning any matter or take action to direct staff to place a matter of business on a future agenda. (Gov't Code § 54954.2)

6. **TIME AND PLACE OF NEXT MEETING**

Monday, July 18, 2016, Bay Area Air Quality Management District Office, 375 Beale Street, San Francisco, California 94105 at 10:30 a.m.

7. **ADJOURNMENT**

The Committee meeting shall be adjourned by the Committee Chair.

CONTACT:

MANAGER, EXECUTIVE OPERATIONS
375 BEALE STREET, SAN FRANCISCO, CA 94105
mmartinez@baaqmd.gov

(415) 749-5016
FAX: (415) 928-8560
BAAQMD homepage:
www.baaqmd.gov

- To submit written comments on an agenda item in advance of the meeting. Please note that all correspondence must be addressed to the “Members of the Mobile Source Committee” and received at least 24 hours prior, excluding weekends and holidays, in order to be presented at that Committee meeting. Any correspondence received after that time will be presented to the Committee at the following meeting.
- To request, in advance of the meeting, to be placed on the list to testify on an agenda item.
- **Accessibility and Title VI:** The Air District provides services and accommodations upon request to persons with disabilities and individuals who are limited-English proficient who wish to address Board matters. For accommodations or translations assistance, please call 415-749-5016 at least three days in advance of a meeting, so that arrangements can be made accordingly.

Accesibilidad y Título VI: El Distrito del Aire ofrece servicios y realiza las adaptaciones necesarias para las personas con discapacidades y para las personas con un dominio limitado del inglés siempre que estos servicios se soliciten y se deseen tratar asuntos relacionados con la Junta. Si necesita ayuda con algún tipo de adaptación o traducción, llame al 415-749-5016 como mínimo tres días antes de la reunión de manera que puedan realizarse las adaptaciones necesarias.

Magagamit na Tulong at Título VI: Nagbibigay ang Air District ng mga serbisyo at mga akomodasyon, kapag hiniling, sa mga taong may kapansanan at mga taong limitado ang kakayahan sa Ingles na gustong magpahayag tungkol sa mga usapin sa harap ng Lupon. Para sa mga tulong sa akomodasyon o sa pagsasalin, mangyaring tumawag sa 415-749-5016 nang tatlong araw man lamang na una pa sa miting, para makapaghandang ayon sa pangangailangan.

可及度及標題VI: 空氣管理局根據申請為殘障人士和英語熟練程度有限但卻希望參與董事會事宜的人員提供服務和住宿。關於住宿或者翻譯幫助，請至少在會議之前三天致電 415-749-5016，以便作出相應安排。

Tạo Khả Năng Truy Cập và Chương VI: Đặc Khu cung cấp dịch vụ và phương tiện đáp ứng, khi có yêu cầu, cho những người bị khuyết tật và cho những cá nhân không thông thạo Anh ngữ muốn được tham gia các vấn đề của Hội Đồng. Để được phương tiện đáp ứng hoặc trợ giúp phiên dịch, xin gọi số 415-749-5016 ít nhất ba ngày trước khi có hội thảo, để tiện bố trí các phương tiện

Any writing relating to an open session item on this Agenda that is distributed to all, or a majority of all, members of the body to which this Agenda relates shall be made available at the District’s offices at 939 Ellis Street, San Francisco, CA 94109, at the time such writing is made available to all, or a majority of all, members of that body

BAY AREA AIR QUALITY MANAGEMENT DISTRICT
939 ELLIS STREET, SAN FRANCISCO, CALIFORNIA 94109
FOR QUESTIONS PLEASE CALL (415) 749-5016 or (415) 749-4941

EXECUTIVE OFFICE:
MONTHLY CALENDAR OF AIR DISTRICT MEETINGS

JUNE 2016

<u>TYPE OF MEETING</u>	<u>DAY</u>	<u>DATE</u>	<u>TIME</u>	<u>ROOM</u>
Board of Directors Regular Meeting <i>(Meets on the 1st & 3rd Wednesday of each Month)</i> - CANCELLED	Wednesday	1	9:45 a.m.	Board Room
Board of Directors Stationary Source Committee <i>(Meets on the 3rd Monday of each Month)</i>	Wednesday	1	9:30 a.m.	Board Room

**BAY AREA AIR QUALITY MANAGEMENT DISTRICT
375 BEALE STREET, SAN FRANCISCO, CALIFORNIA 94105
FOR QUESTIONS PLEASE CALL (415) 749-5016 or (415) 749-4941**

**EXECUTIVE OFFICE:
MONTHLY CALENDAR OF AIR DISTRICT MEETINGS**

JUNE 2016

Board of Directors Special Meeting as the Sole Member of The Bay Area Clean Air Foundation	Wednesday	15	9:45 a.m.	1st Floor Boardroom
Board of Directors Regular Meeting <i>(Meets on the 1st & 3rd Wednesday of each Month)</i>	Wednesday	15	9:45 a.m.	1st Floor Board Room
Board of Directors Executive Committee <i>(Meets on the 3rd Monday of each Month)</i> - CANCELLED	Monday	20	9:30 a.m.	1st Floor Board Room
Board of Directors Stationary Source Committee <i>(Meets on the 3rd Monday of each Month)</i> - CANCELLED	Monday	20	10:30 a.m.	1st Floor Board Room
Board of Directors Budget & Finance Committee <i>(Meets on the 4th Wednesday of each Month)</i> - CANCELLED	Wednesday	22	9:30 a.m.	1st Floor Board Room
Board of Directors Mobile Source Committee <i>(Meets on the 4th Thursday of each Month)</i> - RESCHEDULED TO JUNE 30, 2016	Thursday	23	9:30 a.m.	1st Floor Board Room
Board of Directors Mobile Source Committee <i>(Meets on the 4th Thursday of each Month)</i>	Thursday	30	9:30 a.m.	1st Floor Board Room

JULY 2016

<u>TYPE OF MEETING</u>	<u>DAY</u>	<u>DATE</u>	<u>TIME</u>	<u>ROOM</u>
Board of Directors Regular Meeting <i>(Meets on the 1st & 3rd Wednesday of each Month)</i>	Wednesday	6	9:45 a.m.	1 st Floor Board Room
Board of Directors Executive Committee <i>(Meets on the 3rd Monday of each Month)</i>	Monday	18	9:30 a.m.	1 st Floor Board Room
Advisory Council Meeting <i>(Meets at the Call of the Chair)</i>	Monday	18	10:00 a.m.	1 st Floor Board Room
Board of Directors Stationary Source Committee <i>(Meets on the 3rd Monday of each Month)</i>	Monday	18	10:30 a.m.	1 st Floor Board Room
Board of Directors Regular Meeting <i>(Meets on the 1st & 3rd Wednesday of each Month)</i>	Wednesday	20	9:45 a.m.	1 st Floor Board Room
Board of Directors Climate Protection Committee <i>(Meets on the 3rd Thursday of every other Month)</i>	Thursday	21	9:30 a.m.	1 st Floor Board Room
Board of Directors Budget & Finance Committee <i>(Meets on the 4th Wednesday of each Month)</i>	Wednesday	27	9:30 a.m.	1 st Floor Board Room
Board of Directors Mobile Source Committee <i>(Meets on the 4th Thursday of each Month)</i>	Thursday	28	9:30 a.m.	1 st Floor Board Room
MM – 5/24/16 (9:44 a.m.)				G/Board/Executive Office/Moncal

BAY AREA AIR QUALITY MANAGEMENT DISTRICT
Memorandum

To: Chairperson John Gioia and Members
of the Stationary Source Committee

From: Jack P. Broadbent
Executive Officer/Air Pollution Control Officer

Date: May 18, 2016

Re: Approval of the Minutes of April 18, 2016

RECOMMENDED ACTION

Approve the attached draft minutes of the Stationary Source Committee (Committee) meeting of April 18, 2016.

DISCUSSION

Attached for your review and approval are the draft minutes of the Committee meeting of April 18, 2016.

Respectfully submitted,

Jack P. Broadbent
Executive Officer/APCO

Prepared by: Heidi Kettler
Reviewed by: Maricela Martinez

Attachment: Draft Minutes of the Committee Meeting of April 18, 2016

AGENDA: 3 – ATTACHMENT

Draft Minutes – Stationary Source Committee Meeting of April 18, 2016

Bay Area Air Quality Management District
939 Ellis Street
San Francisco, California 94109
(415) 749-5073

DRAFT MINUTES

Summary of Board of Directors
Stationary Source Committee Meeting
Monday, April 18, 2016

1. CALL TO ORDER – ROLL CALL

Stationary Source Committee (Committee) Chairperson John Gioia called the meeting to order at 10:33 a.m.

Present: Committee Chairperson John Gioia; Vice-Chairperson James Spering; and Directors John Avalos, Scott Haggerty, David Hudson, Liz Kniss, and Rod Sinks.

Absent: Director Carole Groom and Jan Pepper.

Also Present: Board Chairperson Eric Mar.

2. PUBLIC COMMENT ON NON-AGENDA MATTERS

Robert Reed, Chevron, urged the Committee to consider the job security of current and future refinery employees, as well as potential financial impacts that the general public may face, resulting from regulations made at the Air District. The Committee and staff discussed concerns that misinformation is being circulated regarding Rule 12-15, and claims that the “Air District is shutting down refineries.” Staff clarified that the Air District is attempting to promote further transparency and disclosure about refinery emissions through this rule.

Greg Karras, Communities for a Better Environment, addressed the Committee regarding bringing rule-ready language, including an option for Board consideration for refinery emission caps, to the Committee by May 2016. Mr. Karras distributed a draft Resolution to Propose Emission Limit “Caps” on Refinery-Wide Climate and Particulate Air Pollution via Rule 12-16, and urged staff to bring this to the Committee, and then Board, for adoption.

3. APPROVAL OF THE MINUTES OF FEBRUARY 25, 2016

Committee Comments:

None.

Public Comments:

No requests received.

Committee Action:

Director Kniss made a motion, seconded by Director Hudson, to approve the Minutes of February 25, 2016; and the motion carried by the following vote of the Committee:

AYES: Avalos, Gioia, Haggerty, Hudson, Kniss, Sinks, Spering, and Mar.
NOES: None.
ABSTAIN: None.
ABSENT: Groom and Pepper.

4. UPCOMING CHANGES TO REGULATION 9, RULE 13: CEMENT KILNS

Jack Broadbent, Executive Officer/Air Pollution Control Officer, introduced Robert Cave, Senior Air Quality Specialist, who gave the staff presentation, *Upcoming Changes to Regulation 9, Rule 13: Cement Kilns*, including background and purpose; comparison of standards; results of rule adoption; continuing issues of concern; technical issues with the Ammonia standard; the staff's proposed solution to the Ammonia issue; and next steps.

Public Comment:

Cupertino resident, Gary Latshaw, addressed the Committee, stating that many cement plants are located in rural areas, while the Lehigh Southwest Cement Company directly impacts a metropolitan area in Santa Clara County. Mr. Latshaw acknowledged that cement plant's emissions levels have been improving, and said that he hopes for an improved, bottoms-up health risk assessment.

Bill Almon, addressed the Committee regarding Lehigh's full compliance with Regulation 9, Rule 13, despite the Ammonia emission standard not being met.

Committee Comments:

The Committee and Staff discussed the difficulty of correcting the Ammonia emissions standard, due to variable feed stock-generated Ammonia; fugitive dust mitigation and the associated health risks of the workers inside the plant; the Committee's appreciation of staff's ongoing outreach and listening to key stakeholders; the anticipated timeframe for addressing the correction of the Ammonia emissions standard, as well as the anticipated timeframe for the incorporation of new Office of Environmental Health Hazard Assessment guidelines; particulate matter and SO₂ production rates; and Lehigh's compliance with dust mitigation measures.

Committee Action:

None; receive and file.

5. AIR QUALITY IMPACTS OF CALIFORNIA’S ORGANIC WASTE DIVERSION REQUIREMENTS

Jeff McKay, Deputy Air Pollution Control Officer, introduced Wayne Kino, Director of Compliance and Enforcement, who gave staff presentation *Air Quality Impacts of California’s Organic Waste Diversion Requirements*, including background; solid waste facilities overview; California’s organic waste diversion priorities; solid waste industry overview; air emissions; the Air District’s role in solid waste emissions control; and summary.

Public Comment:

No requests received.

Committee comments:

The Committee and Staff discussed the difference between regulation on solid waste and composting facilities; indoor versus outdoor facilities and the Air District’s permitting authority over such facilities; new models for processing food waste; criteria to assess locations to mitigate odor impacts to communities from these facilities; clarifying for the public what items may be recycled; and the Committee’s acknowledgement of staff’s initiative in regulating this industry.

6. PERMIT APPLICATION PUBLIC PARTICIPATION ENHANCEMENTS

Damien Breen, Deputy Air Pollution Control Officer, introduced Jaime Williams, Director of Engineering, who gave the staff presentation *Permit Application Public Participation Enhancements*, including improvements to public participation in the permit application process; permit application look up table; implementation roadmap; and next steps.

Public Comment:

Azibuike Akaba, Bay Area Environmental Health Collaborative (BAEHC), addressed the Committee regarding a desire for a more extensive break-down of the Air District’s technical information for the public. Mr. Akaba also said that he believes that this permit process needs to be applied to Air District permit renewals.

Committee Comments:

The Committee and staff discussed the ten-day period during which applications are subjected to public inquiries and comments after they are submitted; further enhancements to the website that may be needed; the difference between “Discretionary” permits and “Ministerial” permits; the permit renewal process; and whether or not permit violations will be listed on the website.

7. COMMITTEE MEMBER COMMENTS

Director Hudson requested clarification on the location of the June 1, 2016 Stationary Source Committee meeting.

8. TIME AND PLACE OF NEXT MEETING

Wednesday, June 1, 2016, Bay Area Air Quality Management District Headquarters, 939 Ellis Street, San Francisco, CA 94109 at 9:30 a.m.

9. ADJOURNMENT: The meeting adjourned at 12:00 p.m.

Marcy Hiratzka
Clerk of the Boards

BAY AREA AIR QUALITY MANAGEMENT DISTRICT

Memorandum

To: Chairperson John Gioia and Members
of the Stationary Source Committee

From: Jack P. Broadbent
Executive Officer/APCO

Date: May 18, 2016

Re: Update on Regulation 12, Rule 16: Evaluation of Options for Reducing Combustion
Emissions from Refineries

RECOMMENDED ACTION

None; receive and file.

BACKGROUND

On October 15, 2014, the Board of Directors approved Resolution Number 2014-07 directing staff to develop strategies to reduce emissions from petroleum refineries. Specifically, the resolution directed staff to continue development of Regulation 12, Rule 15: Petroleum Refining Emissions Tracking (“Rule 12-15”) to track and monitor refinery emissions; to develop Regulation 12, Rule 16 (“Rule 12-16”) to set emissions thresholds and mitigate potential emissions increases; and to develop additional rules to reduce emissions from refineries by 20% by 2020, or as much as feasible.

Staff worked with interested stakeholders and released proposed regulatory language and staff reports for four refinery emission reduction rules, Rule 12-15 and Rule 12-16 in October of 2015. In December of 2015, the Board of Directors adopted three refinery emission reduction rules/rule amendments (Regulation 6, Rule 5: Fluid Catalytic Cracking Units; Regulation 8, Rule 18: Equipment Leaks; and Regulation 11, Rule 10: Cooling Towers). Regulation 12, Rule 15 along with an additional refinery emission reduction measure, Regulation 9, Rule 14, Coke Calcining were adopted by the Board on April 20, 2016. Together, these rules are estimated to reduce criteria pollutants by more than 15%. Staff received a significant number of comments on proposed Rule 12-16, and determined that a different approach was necessary in order to address the concerns of stakeholders, including affected industry and interested community groups. In addition to these efforts, staff continues to work on other rules that will affect refineries dealing with permitting requirements and with reducing health risks from toxic air contaminants.

As a result of these rule development processes, criteria pollutants are being significantly reduced and health risks from toxic air contaminants will be significantly reduced in a proposed regulation expected to be brought to the Board for consideration in early 2017. These actions will build upon well-established Air District regulations and programs that improve public

health. However, further action is needed to address refinery GHG emissions and further reduce emissions of criteria pollutants and toxic air contaminants.

The Air District is concerned about the environmental and public health impacts of combustion emissions from refinery sources. Combustion emissions contribute significantly to carbon dioxide (CO₂) emissions (the primary driver of anthropogenic climate change), criteria pollutants emissions, including nitrogen oxides (NO_x), sulfur dioxide (SO₂), and particulate matter (PM) emissions and can exacerbate community health risks. While refineries are expected to contribute to the reduction of GHG emissions as part of California's Cap-and-Trade program that was developed in response to AB 32, Global Warming Solutions Act of 2006, the Cap-and-Trade program does not require individual facilities to reduce their emissions. In the Bay Area, refineries are some of the largest industrial combustion sources and contributors to climate, criteria and toxic pollutants.

DISCUSSION

The Air District has been regulating criteria and toxic pollutants from stationary sources for decades. Consequently, there are fewer opportunities for significant reductions in pollutants such as nitrogen oxides (NO_x) and fine particulate matter (PM_{2.5}). In order to continue to achieve reductions of criteria and toxic pollutants, and better incorporate greenhouse gas reductions opportunities into rule making, the Air District is focusing on fuel-burning (combustion) systems as a multiple pollutant emissions reduction approach.

Most modern combustion systems produce low concentrations of criteria and toxic pollutants at individual emission points while emitting large volumes of air and the end-products of combustion (CO₂ and water). This makes traditional "end-of-pipe" air pollution controls very expensive due to the relatively small mass of NO_x or PM_{2.5} when compared to the large mass of air, water and CO₂. While the concentrations may be low at each emission point, the high volume and large number of sources can add up to significant criteria pollution, and to a lesser extent toxic air contaminants, in the atmosphere. Any reduction of fuel use will result in emission reductions of these compounds. Therefore, by increasing efficiency and reducing fuel consumption, all of the air pollution by-products of fuel burning are also reduced: criteria, climate and toxic pollutants. Since this approach results in fuel cost savings, the changes should pay for themselves over time. Reducing combustion emissions would help the Air District attain and maintain compliance with state and federal air quality standards, reduce local contributions to anthropogenic climate change, and minimize emissions of many toxic pollutants.

A strategy to reduce combustion emissions would be cost-effective and would reduce criteria, climate and toxic pollution in the Bay Area. Since petroleum refineries are among the largest stationary sources of combustion emissions and also among the largest sources of climate, criteria and toxic air pollutants, this approach is beginning with these sources.

Staff has been meeting with stakeholders from community groups and industry, as well as ARB staff to discuss and evaluate three options that could potentially reduce combustion emissions from refineries, as well as an option to reduce methane emissions. These options include the following:

1. Refinery-Wide Combustion Emissions Reductions

Under this option, refineries would have a choice between –

- a) meeting an efficiency-target (such as a limit on GHG emissions per barrel of product)
- or,
- b) meeting a facility-wide mass emissions reduction target.

2. Combustion Emissions BARCT on Refinery Processes

Under this option, refinery processes would be evaluated for combustion emissions and energy efficiency in order to identify cost-effective and technically feasible improvements that would lead to reductions in fuel use and, therefore, combustion emissions.

3. Enforceable Numeric Caps

Several community and environmental organizations have suggested the Air District adopt a refinery-wide (and associated facilities) enforceable emissions cap set at recent levels of actual emissions.

4. Focus on Methane

Under this approach, the Air District would focus its the regulatory action on methane instead of combustion systems. Methane is a potent climate forcer that is 20 to 80 times more potent than CO₂ and is second to CO₂ in contributing to anthropogenic climate change. In addition, methane usually is stored with other organic compounds, many of which can be toxic. By reducing methane emissions, there will be both toxic and climate pollutant emission reductions.

The attached draft evaluation report includes information on these potential options for reducing combustion emissions from Bay Area refineries, the evaluation criteria used to compare them and a summary of staff's evaluation. Staff's preliminary recommendation is to pursue a hybrid approach that uses both Options 1 and 2. This approach provides the benefits of limiting refinery-wide combustion emissions included in Option 1 with the continued improvements over time provided in Option 2. Staff proposes to refine this approach through further discussions with the Committee, stakeholders and ARB.

BUDGET CONSIDERATIONS/FINANCIAL IMPACT

None at this time.

Respectfully submitted,

Jack P. Broadbent
Executive Officer/APCO

Prepared by: Victor Douglas/Greg Nudd/Eric Stevenson

Reviewed by: Jean Roggenkamp

Attachment: Draft Options for Reducing Refinery Combustion Emissions Evaluation Report



BAY AREA
AIR QUALITY
MANAGEMENT
DISTRICT

DRAFT
**Options for Reducing Refinery
Combustion Emissions
Evaluation Report**

Prepared by the staff of the
Bay Area Air Quality Management District

May 2016

This page intentionally left blank

Table of Contents

INTRODUCTION	1
BACKGROUND	1
Regulatory Context	1
Climate Pollutant Emissions Reduction Goals	3
Refinery Emissions and Emission Reduction	4
<i>Climate Pollutants: AB 32—Cap & Trade</i>	5
<i>Existing Criteria Pollutants</i>	5
<i>Toxic Pollutants and Community Risk</i>	6
Petroleum Refining Processes	6
OPTIONS UNDER EVALUATION	7
Refinery-Wide Combustion Emissions Reductions	7
Combustion Emissions BARCT on Refinery Processes	8
<i>Refinery Energy Efficiency Analysis</i>	8
<i>Carbon Capture and Sequestration</i>	9
Enforceable Numeric Caps	9
Focus on Methane	10
CRITERIA FOR COMPARING OPTIONS	12
Leveraging GHG Reduction Goals	12
<i>AB 32 / Cap-and-Trade</i>	12
<i>Air District GHG Reduction Goal</i>	12
<i>Net Reduction of GHGs</i>	12
Simultaneous Reduction of Other Pollutants	12
<i>Reduction of Criteria Pollutants Emissions</i>	12
<i>Reduction of Toxic Pollutants Emissions</i>	13
<i>Reduction of Health Impacts on Neighboring Communities (Including PM_{2.5})</i>	13
Within Air District Authority	13
<i>Air District Authority to Control Climate Pollutants</i>	13
<i>Health and Safety Code Compliance</i>	13
<i>Emissions Reductions and Economic Considerations</i>	14
CEQA Implications / Impacts	14
Process Transparency	14
Implementation Speed/Complexity	14
Technology Benefits / Innovation	15

EVALUATION OF OPTIONS	15
Refinery-wide Combustion Emission Reductions	16
BARCT Approach	17
Enforceable Numeric Caps	18
Focus on Methane	20
REFERENCES	22

INTRODUCTION

The Air District is a non-attainment area for State and federal fine particulate matter (PM_{2.5}) and ozone ambient air quality standards (AAQS). The Air District has been regulating criteria and toxic pollutants from stationary sources for decades. Consequently, there are fewer opportunities for significant reductions in pollutants such as nitrogen oxides (NO_x) and PM_{2.5}. In order to continue to achieve reductions of criteria and toxic pollutants, and better incorporate greenhouse gas reductions opportunities into rule making, the Air District is focusing on fuel-burning (combustion) systems as a multiple pollutant emissions reduction approach.

Most modern combustion systems produce low concentrations of criteria and toxic pollutants at individual emission points while emitting large volumes of air and the end-products of combustion (carbon dioxide (CO₂) and water). This makes traditional “end-of-pipe” air pollution controls very expensive due the relatively small mass of NO_x or PM_{2.5} when compared to the large mass of air, water and CO₂. While the concentrations may be low at each emission point, the high volume and large number of sources can add up to significant criteria pollution, and to a lesser extent toxic air contaminants, in the atmosphere. Any reduction of fuel use will result in emission reductions of these compounds. Therefore, by increasing efficiency and reducing fuel consumption, all of the air pollution by-products of fuel burning are also reduced: criteria, climate and toxic pollutants. Since this approach results in fuel cost savings, the changes should pay for themselves over time. Reducing combustion emissions would help the Air District attain and maintain compliance with state and federal air quality standards, reduce local contributions to anthropogenic climate change, and minimize emissions of many toxic pollutants.

A strategy to reduce combustion emissions would be cost-effective and would reduce criteria, climate and toxic pollution in the Bay Area. Bay Area petroleum refineries are some of the largest industrial sources of toxic, PM_{2.5}, and other criteria pollutants. They are also the largest industrial sources of climate pollutants in the region. Refineries emissions of PM and toxic compounds may disparately impact local communities. Further, changes in crude (or product) slates could change the emissions profiles of refinery sources due to increases in combustion needed to process different crude slates to finished products, possibly resulting in increasing toxic, criteria and climate pollutant emissions. Therefore, refineries are a top priority for reducing all pollutants to help the region achieve the AAQS and Air District goals for healthy air and climate protection.

BACKGROUND

Regulatory Context

The Air District has primary authority to regulate pollutants from stationary sources and has a long history of developing and enforcing rules and regulations that reduce criteria and toxic pollutants from Bay Area industries, including petroleum refineries. Currently, over two dozen Air District rules and regulations are aimed at reducing the emissions of criteria and toxic pollutants at refineries with a recently adopted regulations that further

reduce emissions from Bay Area petroleum refineries. This strategy stems from a Board of Directors' resolution (2014-17) adopted on October 15, 2014 directing staff to develop strategies to reduce emissions from petroleum refineries. Specifically, the resolution directed staff to continue development of Regulation 12, Rule 15: Petroleum Refining Emissions Tracking ("Rule 12-15") to track and monitor refinery emissions; to develop Regulation 12, Rule 16 ("Rule 12-16") to set emissions thresholds and mitigate potential emissions increases; and to develop additional rules to reduce emissions from refineries by 20 percent by 2020, or as much as feasible.

Staff worked with interested stakeholders and released proposed regulatory language and staff reports for four refinery emission reduction rules, Rule 12-15 and Rule 12-16 in October of 2015. In December of 2015, the Board of Directors adopted three refinery emission reduction rules/rule amendments (Regulation 6, Rule 5: Fluid Catalytic Cracking Units; Regulation 8, Rule 18: Equipment Leaks; and Regulation 11, Rule 10: Cooling Towers). Regulation 12, Rule 15 along with an additional refinery emission reduction measure, Regulation 9, Rule 14, Coke Calcining were adopted by the Board on April 20, 2016. Together, these rules are estimated to reduce criteria pollutants by more than 15 percent. Staff received a significant number of comments on proposed Rule 12-16, and determined that a different approach was necessary in order to address the concerns of stakeholders, including affected industry and interested community groups. In addition to these efforts, staff continues to work on developing other rules, such as those addressing requirements and with reducing health risks from toxic air contaminants that will affect refineries along with other source categories.

As a result of these rule development processes, criteria pollutants are being significantly reduced and health risks from toxic air contaminants will be significantly reduced in a proposed regulation expected to be brought to the Board for consideration in early 2017. These actions will build upon well-established Air District regulations and programs that improve public health. However, further action is needed to address refinery GHG emissions and further reduce emissions of criteria pollutants and toxic air contaminants.

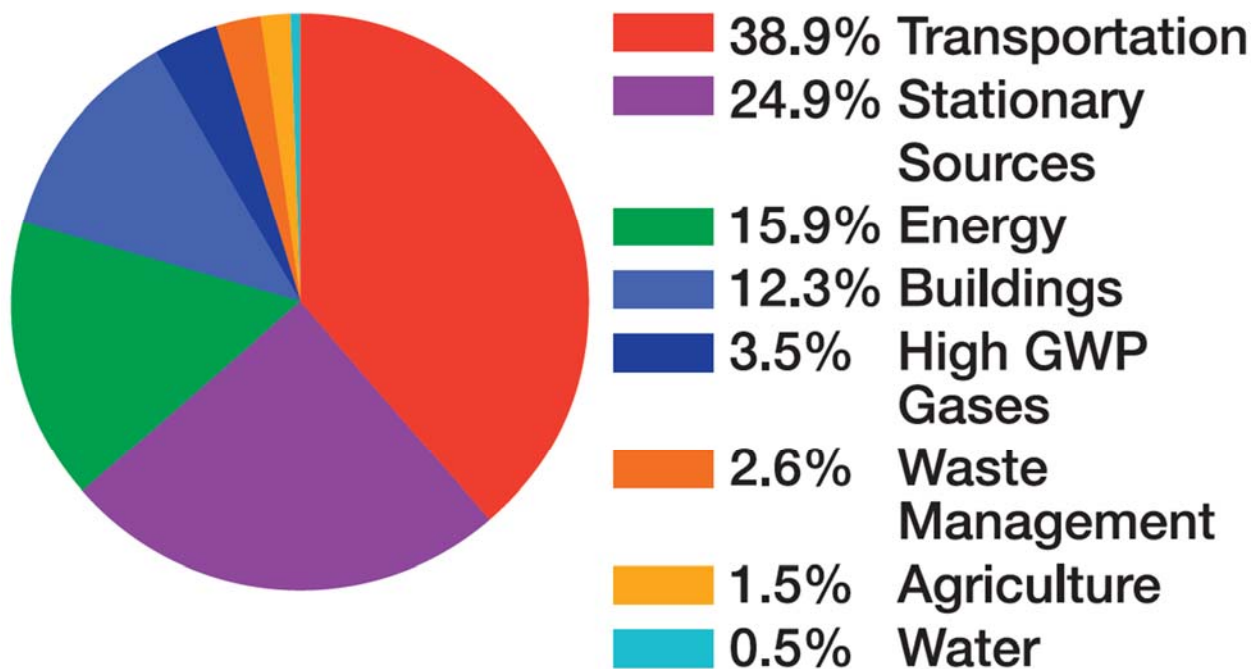
The Air District is concerned about the environmental and public health impacts of combustion emissions from refinery sources. Combustion emissions contribute significantly to CO₂ emissions (the primary driver of anthropogenic climate change), criteria pollutants emissions, including NO_x, sulfur dioxide (SO₂), and particulate matter (PM) emissions and can exacerbate community health risks. While refineries are expected to contribute to the reduction of GHG emissions as part of California's Cap-and-Trade program that was developed in response to AB 32, Global Warming Solutions Act of 2006, the Cap-and-Trade program does not require individual facilities to reduce their emissions. In the Bay Area, refineries are some of the largest industrial combustion sources and contributors to climate, criteria and toxic pollutants. By limiting combustion system emissions, the Air District will be able to simultaneously reduce climate and criteria and pollutants and, to a less extent, toxic air contaminants.

A brief description of the Air District’s goals and recent regulatory activities dealing with climate pollutants, criteria pollutants, toxic air contaminants and how potential crude slate change might affect combustion system emissions is presented below.

Climate Pollutant Emissions Reduction Goals

The Air District has established near-term, mid-term, and long-term climate protection goals. This began in the 2010 Clean Air Plan, where the Air District set performance objectives to reduce emissions of greenhouse gases by specific targets by 2020, 2035 and 2050. In 2013, the Board of Directors adopted resolution 2013-11, which set “...a goal for the Bay Area region of reducing GHG emissions to 80 percent below 1990 levels by 2050, and developing specific performance objectives to track progress in achieving that goal.” In the upcoming draft 2016 Clean Air Plan/Regional Climate Protection Strategy, the Air District intends to update its climate protection goals to align with Governor Brown’s Executive Order B-30-15 which sets a GHG reduction goal of 20 percent below 1990 levels by 2020, 40 percent below 1990 levels by 2030 and 80 percent below 1990 levels by 2050. In addition, staff has identified economic sectors that collectively emit over 80.3 million metric tons of climate pollutants in 2015: transportation; stationary sources; energy; buildings; high global warming potential (GWP) gases (methane, black carbon, hydrofluorocarbons); waste management; agriculture; and water. Figure 1 illustrates the relative contribution of each sector to the regions climate pollutant inventory.

Figure 1
2015 Bay Area GHG Emissions by Economic Sector



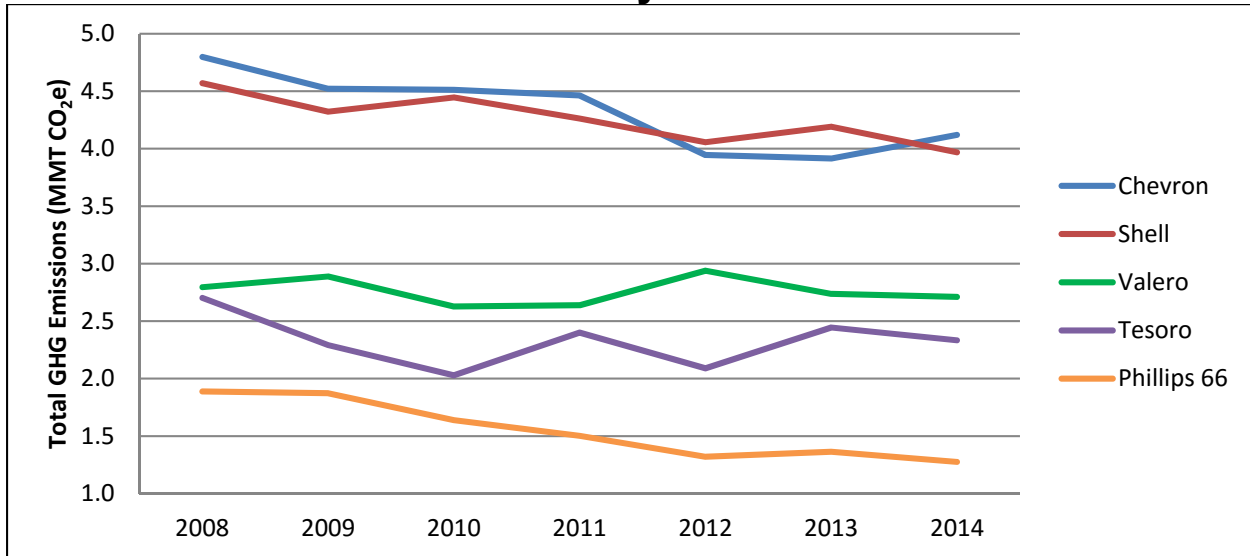
Although these sectors are targeted for reductions in climate pollutants, specific emission reduction goals for each of these sectors have not been identified. While the transportation sector is by far the largest contributor to climate pollutants – with a contribution of 38.9 percent – the Air District does not have authority to regulate emissions from these sources; this authority lies with the California Air Resources Board (ARB) and federal agencies. The Air District uses non-regulatory means to reduce GHGs from this sector. The stationary source sector is the second largest contributor and includes petroleum refining facilities. The Air District uses rulemaking as well as other strategies to reduce criteria pollutants (including particulate matter), toxic air contaminants, and climate pollutants from stationary sources in the Region, including refineries and other industrial sources. Bay Area petroleum refineries are some of the largest industrial sources of toxic air contaminants, PM_{2.5}, and other criteria pollutants. They are also the largest industrial sources of climate pollutants in the region. For these reasons, refineries are a top priority for reducing emissions of air pollutants, including climate pollutants.

Air District staff anticipates working closely with the refiners and other interested stakeholders to determine the most appropriate GHG emissions reduction targets for this industrial sector to help achieve the near-term, mid-term, and long-term climate protection goals. Focusing on combustion emissions is an appropriate strategy since almost all climate pollution from refineries is due to combustion.

Refinery Emissions and Emission Reduction

Bay Area refineries are the largest industrial sources of climate pollutants. In 2011, refineries were responsible for over 45 percent of the Industrial / Commercial Sector GHG emissions in the Bay Area.ⁱ Over the past several years individual refinery GHG emissions have varied and all refineries have had some degree of GHG reductions, as shown in Figure 2.

Figure 2
ARB Data: Refinery GHG Emissions



Furthermore, refinery GHG emissions in total have generally trended downward. In 2008, refinery emissions total 17.6 MMT CO₂e and in 2014 that total was 14.4 MMT.

Climate Pollutants: AB 32—Cap & Trade

Under AB 32, Global Warming Solutions Act of 2006, ARB developed its market-based Cap-and-Trade program which, along with other programs and regulations, aims to reduce climate pollutants to 1990 levels by the year 2020 from several economic sectors, including petroleum refining. However, the Cap-and-Trade program does not require individual facilities to reduce their emissions. ARB is in the process of developing amendments to the regulations to chart post-2020 implementation of the Cap-and-Trade program.

Existing Criteria Pollutants

Refinery emissions of criteria (including PM_{2.5}) and toxic pollutants have traditionally been addressed through permitting and rule development approaches, including new source review (for both criteria and toxic pollutants) for new and modified sources and Best Available Retrofit Control Technology (BARCT) rules for specific refinery sources. Air District staff conducts BARCT analyses to identify emission reduction opportunities and then initiates rule development efforts. Such analyses and rule development have achieved a consistent lowering of emissions over time. Recent rule making will result in estimated reductions of over 15 percent at refineries. However, new criteria pollution emission reduction opportunities are increasingly more difficult to achieve, and by using a combustion emission reduction approach, emissions of criteria pollutants will be reduced throughout the Bay Area by increasing efficiency and minimizing fuel consumption.

Toxic Pollutants and Community Risk

Toxic pollutants are addressed by one of three mechanisms: 1) Toxic New Source Review (NSR) for new and modified sources, 2) AB 2588 Toxic “Hot Spots” Program for existing sources, and 3) Airborne Toxic Control Measures (ATCMs) developed by the Air District and/or ARB.¹ The Air District is currently in the process of updating the toxics NSR program by incorporating new health risk values and protocols adopted by the California Office of Environmental Health Hazard Assessment (OEHHA). These more protective health risk values and protocols may result in a two- to five-fold increase in health risks for the same amount of toxic emissions due to the use of more conservative methods and assumptions.

The Air District is currently investigating the most effective way to reduce facility-wide emissions of toxic pollutants and their associated risk. Action is expected in 2017. Additional reductions can also be achieved by reducing combustion of fuels.

Petroleum Refining Processes

A petroleum refinery is a highly complex industrial facility that processes crude oil into a variety of products such as gasoline, aviation fuel, diesel and other fuel oils, lubricating oils, asphalt base, heating oil, kerosene, liquefied petroleum gas (LPG), and feedstocks for the petrochemical industry. Oil refineries are typically large industrial complexes that are composed of process units that use large amounts of fuel to heat and process crude oil with extensive piping throughout the facility. The process units are highly integrated, with materials passing through and among the various units as the materials are processed. In addition, heat and process by-products are recovered and re-used throughout the refinery in an attempt to utilize “waste” heat and by-products to improve efficiency.

No two refineries are identical in design or operation. Each refinery is designed to efficiently process a specific range of crude oil feedstock (i.e., crude slate). The crude slate options available to a given refinery are further limited by the chemical compatibilities among the crude oils (which affects the propensity for fouling during the refining process) and the compatibility of the crude oils with the metals composition of the refinery equipment and the reactor catalysts. The composition and properties of the crude slate processed by each refinery are dictated both by the desired product slate and by the available processing units at the refinery. As a result, significant changes in crude or product slates can result in significant changes in combustion needs, as process units must produce more or less output in response to the change in crude slate or desired products.

These primary process units and auxiliary equipment (boilers, turbines, heat exchangers, etc.), use heat from combustion to process crude oil into a variety of fuels and other products, emitting a variety of criteria pollutants, toxic air contaminants, and greenhouse gases. Other sources of emissions include truck, rail and ship loading

¹ The Air District has the authority to adopt ATCMs independent of the ARB pursuant to H&SC Sections 39013 and 39659.

activities, waste water treatment, storage tanks for feedstocks and products, leaking equipment, pressure release devices, which are collectively subject to at least ten different Air District regulations.

OPTIONS UNDER EVALUATION

- Refinery-Wide Combustion Emission Reductions
- Combustion Emissions BARCT Rule Development for Specific Refinery Processes
- Enforceable Numeric Caps
- Focus on Methane

Refinery-Wide Combustion Emissions Reductions

Under this option, refineries would have a choice between meeting an efficiency target (carbon intensity or energy) that minimizes the amount of CO₂ emitted per-unit of production (such as a limit on GHG emissions per barrel of product) or meet a facility-wide mass emissions reduction target. Reductions of CO₂ emitted translates into a reduction of fuel burned with a similar reduction of criteria and toxic pollutants generated.

This approach was taken by the State of Washington in their rule - Chapter 173-485 WAC, Petroleum Refinery Greenhouse Gas Emission Requirements. This rule required Washington refineries to either improve energy efficiency or directly reduce GHGs. By October 1, 2025, Washington State Refinery GHG Rule requires refineries to either:

- Meet energy efficiency requirements - Meet an energy efficiency standard established as the Solomon Associates Energy Intensity Index (EII) representing the 50th percentile (median level) for similar refineries; or
- Achieve GHG reductions - Achieve annual GHG emissions reductions that total ten percent of the facility's baseline GHG emissions (either 2010 or 2011 GHG emissions reported to the EPA).

An Air District rule along these lines would not necessarily need to be based on the proprietary Solomon Energy Intensity Index. A comparable index could be developed, but it would likely have some confidential component, because of the need to take annual production rates into account. Similarly, an Air District rule would not need to set 10 percent as the emission reduction target, a different target could be selected. The core of this concept is that the refineries would have a choice between meeting the efficiency target or the mass emission reductions with a likely reduction in fuel usage and the emissions associated with combustion. The efficiency approach could be structured to require that less efficient facilities provide more GHG emissions reductions than more efficient facilities, leveling the playing field for all refineries. Should a refinery not be able to achieve the efficiency targets, it could reduce overall GHG emissions directly by a given percentage. The overall reductions realized by this approach would be dependent on the method used to determine efficiency, the baseline chosen as the efficiency target, and the percentage required for GHG and associated criteria and toxic pollutant emissions reduction.

Combustion Emissions BARCT on Refinery Processes

Under this option refinery processes would be evaluated for emissions and efficiency in order to identify cost-effective and technically feasible improvements that would lead to reductions in fuel use and, therefore, GHG and other combustion emissions. These improvements would be implemented through new rules on a source-type by source-type basis. This is the Air District's traditional rulemaking approach for criteria pollutants. The implementation timeframe should consider planned refinery maintenance schedules to avoid forcing shutdowns that could result in increased pollution. General areas that may be considered for BARCT rulemaking include:

- Energy Efficiency Optimization – near-term approach,
- Carbon Capture and Sequestration – long-term approach.

Near-term approaches are those for which the technology or methodology is readily available, can be implemented now or relatively quickly, and does not require additional development except for implementation. These approaches could potentially be used to help work towards reaching the near-term goal of 1990 GHG emissions levels by the year 2020 as well as reductions in criteria and climate pollutants.

Long-term approaches are those that would rely on nascent or as-of-yet undeveloped technologies and processes that could be leveraged to further reduce emissions of GHGs to help achieve the Air District's mid-term and long-term climate protection goals.

Refinery Energy Efficiency Analysis

Continuous improvement in energy efficiency is an ongoing endeavor at all refineries. Increased energy efficiency results in less fuel being burned and a decrease in GHG, criteria and toxic emissions. There is a complimentary business purpose related to improved energy efficiency, which is to improve the economic performance of refinery operations by realizing a capital return from the implementation of energy efficiency measures. Not all energy efficiency measures are pursued by refineries for business purposes, because some do not generate sufficient return on capital in the timeframes industry may desire. However, efficiencies gains will result in some cost savings over time.

For complex industrial process plants such as oil refineries, there are four general categories for energy efficiency improvement:

- Improved operating practices, including process control and variability reduction
- Equipment upgrade
- Process integration
- Process modification

Air District staff, through literature research and consultation with experts in energy efficiency, has identified the following areas that could offer the best improvements in energy efficiency:

- Steam System Optimization,
- Heat Exchanger Train Optimization,
- Monitoring and Process Control Improvements,
- Furnace Efficiency Improvements,
- Combined Heat and Power,
- Fuel Gas System Optimization,
- Lighting System Efficiency Improvements.

Carbon Capture and Sequestration

There are several emerging post-combustion technologies designed to reduce CO₂ emissions from a number of different processes and exhaust stacks. The consideration of CO₂ capture and control at a refinery would be limited to large CO₂ sources, such as the FCCU, the fluid coking unit, the hydrogen plant, and large boilers or process heaters.ⁱⁱ

One carbon capture technology of interest is oxy-combustion. Which is the process of burning a fuel in the presence of pure or nearly pure oxygen instead of air. Fuel requirements are reduced because there is no nitrogen component to be heated, and the resulting flue gas volumes are significantly reduced. The process uses an air separation unit to remove the nitrogen component from air. The oxygen-rich stream is then fed to the combustion unit so the resulting exhaust gas contains a higher concentration of CO₂, which can reach as high as 80 percent. A portion of the exhaust stream is discharged to a CO₂ separation, purification, and compression facility. The higher concentration of CO₂ in the flue gas directly impacts size of the adsorber (or other separation technique), and the power requirements for CO₂ compression. This technology is still in the research stage.

The Petroleum Environmental Research Forum (PERF) is focusing on potentially applying this technique to large refinery combustion sources, particularly the FCCU and crude oil process heaters. Because this process greatly reduces the nitrogen concentration during the combustion process, the formation of NO_x and secondary formation of fine PM will also be reduced.ⁱⁱⁱ

Enforceable Numeric Caps

Several community and environmental organizations have suggested the Air District adopt a refinery-wide (and associated facilities) enforceable emissions cap using an emissions baseline year (2011–2013) and a buffer to account for normal variations in year to year emissions. This suggestion is presented below in an excerpt from a September 2015 comment letter on the originally proposed Rule 12-16 from Communities for a Better Environment:

DESCRIPTION OF THE PROPOSED LIMITS

The proposed limits are shown in Table 1. A numeric limit on the annual mass emission rate of each air pollutant specified is applied to each facility specified in the table. The limit is equal to the maximum-year actual emissions reported in 2011–2013 *plus* the additional numeric allowance calculated previously by Air District Staff. (These additional allowances, or ‘threshold factors,’ are +10,000 metric tons for GHG, +7% for PM, and +7% for each of the PM precursors, NOx and SO₂.)

Table 1. The enforceable numeric limits on refinery-wide emissions proposed^a

Facility	GHG (metric tons/yr)	PM (tons/yr)	NOx (tons/yr)	SO ₂ (tons/yr)
Chevron Refinery, Plt. A-0010	4,473,000	529	974	400
Shell Refinery, Plt. A-0011	4,272,000	569	1,040	1,340
Phillips 66 Refinery, Plt. A-0016	1,512,000	56.0	275	433
Tesoro Refinery, Plt. B-2758/2759	2,456,000	180	1,080	707
Valero Refinery, Plt. B-2626	2,950,000	134	1,410	138
Martinez Cogen LP, ^b Plt. A-1820	431,000	18.8	119	2.30
Air Liquide H ₂ Plant, ^b Plt. B-7419	855,000	17.3	12.9	2.48
Air Products H ₂ Plant, ^b Plt. B-0295	281,000	10.4	3.40	2.31

^a Annual facility-wide emission limits. GHG: greenhouse gas emissions (CO_{2e}) as reported under Air Resources Board Mandatory Reporting; PM: filterable and condensable particulate matter; NOx: oxides of nitrogen; SO₂: sulfur dioxide. PM, NOx and SO₂ as reported in the Facility’s annual emission inventory.

^b The Martinez Cogen and Air Products facilities support Tesoro; Air Liquide supports Phillips 66.

These limits are thus specific, numeric, transparent, and enforceable upon adoption.

These organizations assert that a cap such as this is necessary to ensure refinery emissions do not increase as refineries move to different crude oil compositions. It has been asserted that lower quality crude slates require greater processing, which could lead to greater emissions of all pollutants, including climate pollutants. If a refinery annual emissions inventory indicated that the refinery’s annual emissions exceeded the cap and the buffer allowance, the refinery would be in violation of the emissions limit requirement and subject to enforcement, including appropriate penalties, based on the year the emissions inventory covered.

Focus on Methane

Under this approach, the Air District would focus its the regulatory action on methane instead of CO₂ and would apply this to all regulated sources. Methane is a potent climate forcer that is 20 to 80 times more potent than CO₂ and is second to CO₂ in contributing to anthropogenic climate change. In focusing on methane, the Air District would rely upon other climate protection strategies, such as AB 32, to ultimately

address emissions of CO₂. To-date, Air District efforts to control organic compounds have excluded methane, because it does not lead to ozone formation. As a result, methane is under-controlled in many stationary sources. Under this option, the Air District's focus would be on identifying cost-effective and technically feasible regulations for methane and/or other non-CO₂ GHG compound reductions. By addressing emissions of methane, there will likely be a decrease in organic compounds – many of which may be toxic - that are stored or associated with methane.

While refineries are one of several significant sources of methane under Air District regulatory authority there are a number of similar sources in other industries. Historically, sources of methane emissions can be classified under three general categories: 1) fugitive; 2) vented; and 3) combusted. Some examples of methane control rules that might impact these sources are discussed below.

Fugitive emissions sources of methane include various components, such as valves, flanges, pump or compressors seals. Regulation 11, Rule 10: Cooling Towers was recently amended to address the potential of hydrocarbons, including methane, leaking into the cooling water system and then released to the atmosphere from leaks in heat exchangers. Particular to refineries, fuel gas system generally contains significant concentrations of methane; certain process units may either generate methane or use methane and other light ends as part of the process operations (e.g., steam methane reforming [SMR] hydrogen production). Regulation 8, Rule 18: Equipment Leaks currently addresses fugitive emissions from these sources and could be tailored to include a greater focus on the equipment more likely to emit methane.

Vented emissions are releases by design or operational practice. These include emissions from continuous process vents, such as dehydrator reboiler vents; maintenance practices, such as blowdowns; and small individual sources, such as gas-operated pneumatic device vents and pressure release devices (PRD), and waste water treatment operations.^{iv} Under Regulation 8, Rule 2: Miscellaneous Operations, the definition of "Total Carbon" could be amended in to include methane. This would result in methane being included in the 15-pound limit for total carbon. Further, Regulation 8, Rule 28: Episodic Releases from Pressure Relief Devices at Petroleum Refineries and Chemical Plants, which currently addresses non-methane emissions of organic compounds, could be amended to account for methane under the definition of a "Release Event."

Combustion emissions are exhaust emissions of unburned methane fuel from combustion sources such as compressor engines, burners, and flares. Incomplete combustion of methane fuel in compressor engine exhaust is the only significant source of methane in this category. Regulation 12, Rule 12: Flares at Petroleum Refineries could be amended to include a minimum combustion efficiency component or best practices to ensure maximum flare combustion efficiency. According to engineering estimates, combustion efficiency for flares typically can range between 70 and 99 percent, with some combustion efficiencies being as low as 20 percent, depending on various combustion conditions.^v

Given the historical focus on organic pollutants that lead to ozone formation, it is possible that methane emissions from stationary sources may be underestimated. A systematic effort to update methane emissions estimates could be helpful in identifying cost-effective opportunities for methane control. This effort could include additional aerial surveillance, onsite optical imaging for fugitive and vented organic emissions and more refined analyses of process and refinery fuel gas streams to better understand their methane content.

CRITERIA FOR COMPARING OPTIONS

The criteria for comparing the various options are presented below. It is important to recognize that since the options have not been fully developed, the criteria are based on some assumptions and a limited level of specific detail. As a result, there are not yet specific emission reduction numbers associated with any given option.

Leveraging GHG Reduction Goals

AB 32 / Cap-and-Trade

AB 32 requires the ARB to develop regulations and market mechanisms to reduce California's GHG emissions to 1990 levels by the year of 2020. This is the equivalent of approximately a 30 percent reduction in GHGs from 2006 levels. This criterion evaluates whether a given approach would likely provide additional GHG emissions reductions to Cap-and-Trade.

Air District GHG Reduction Goal

The upcoming draft of the 2016 Clean Air Plan/Regional Climate Protection Strategy will include GHG reduction goals of 20% of 1990 levels by 2020, 40% of 1990 levels by 2030 and 80% of 1990 levels by 2050. This criterion evaluates how effective an approach is likely to be toward helping to reach these goals.

Net Reduction of GHGs

This criterion compares the relative ability of each approach to likely reduce GHGs. It also considers whether an approach is likely to result in a net overall reduction of GHG emissions in excess of all of the systems in place to address GHGs in California, including the statewide Cap-and-Trade program and other climate protection regulations adopted by the ARB.

Simultaneous Reduction of Other Pollutants

Reduction of Criteria Pollutants Emissions

“Criteria pollutants” are pollutants for which either California or federal air quality standards have been established. These also include precursors for criteria pollutants. Since the Bay Area does not meet current standards for ozone or PM_{2.5}, this criterion focuses particularly on how well a given approach will also likely reduce emissions of the following pollutants: particulate matter (PM) including PM_{2.5}, oxides of nitrogen (NO_x), reactive organic gases (ROG), and oxides of sulfur (SO_x).

Reduction of Toxic Pollutants Emissions

Toxic air contaminants can impact health for people exposed to them. For this criterion, staff will consider how likely the given approach would reduce the total health risk from emissions of toxic air contaminants from the refineries.

Reduction of Health Impacts on Neighboring Communities (Including PM_{2.5})

Certain air pollutants can have disproportionate impacts to the health of communities near the source of where they are emitted. This includes toxic air contaminants, but also PM emissions, which cause both acute and chronic health affects including mortality and respiratory illnesses, like asthma. This criterion will be used to evaluate each approach for its potential to reduce both toxic and criteria pollutants that may impact neighboring communities.

Within Air District Authority

Air District Authority to Control Climate Pollutants

The California Health and Safety Code (H&SC) provides air districts authority to regulate GHGs as air pollutants. H&SC Section 40000 states that air districts “have the primary responsibility for control air pollution from all sources, other than emissions from motor vehicles.” H&SC §39013 defines “air pollutants” to include, among other things, “carbon” and “gases”; thereby including greenhouse gases. H&SC §39002 expressly allows air districts to adopt measures more stringent than the State. AB 32 specifically included a provision preserving the Air Districts’ preexisting authority over GHGs; H&SC §38594 which states “Nothing in [The California Global Warming Solutions Act of 2006] shall limit or expand the existing authority of any [air] district...” This criterion will be used to evaluate each approach to determine how well it likely aligns with Air District authority to regulate climate pollutants.

Health and Safety Code Compliance

The H&SC requires the Air District to make “...findings of necessity, authority, clarity, consistency, non-duplication and reference” before adopting, amending, or repealing a rule (H&SC §40727). “Consistency” is defined to mean:

“The regulation is in harmony with, and not in conflict with or contradictory to, existing statutes, court decisions, or state or federal regulations.”

Consistency, as defined, is particularly important in light of AB 32 and the Cap-and-Trade Program. The stated goal of the Cap-and-Trade program is the reduce economy-wide GHGs emissions by explicit amounts by 2020. This does not necessarily equate to GHG emissions reductions from individual facilities underneath the cap. In fact, individual facilities could potentially increase GHG emissions and meet their Cap-and-Trade targets through offsets or credits. However, an Air District rule that caps or reduces GHG emissions from a specific facility or sector has the potential to be considered in conflict with the existing Cap-and-Trade program.

Emissions Reductions and Economic Considerations

The H&SC Section 40728.5 requires the Board of Directors to consider socioeconomic impacts of a proposed regulatory action (adoption, amendment, or repeal of a rule or regulation). The socioeconomic impacts that must be considered include:

1. The type of industries or business, including small business, affected by the rule or regulation.
2. The impact of the rule or regulation on employment and the economy of the region affected by the adoption of the rule or regulation.
3. The range of probable costs, including costs to industry or business, including small business, of the rule or regulation.
4. The availability and cost-effectiveness of alternatives to the rule or regulation being proposed or amended.
5. The emission reduction potential of the rule or regulation.

The Board of Directors must weigh each of the listed items against the environmental benefits of adoption of any proposed regulatory action.

CEQA Implications / Impacts

All regulatory actions by the Air District must comply with the California Environmental Quality Act (CEQA). It is possible that requiring reductions of combustion emissions, including GHGs, would lead to some undesirable environmental impacts. Some control options are easier to assess because the environmental impacts are easier to predict. These options are less likely to be successfully challenged.

This criterion will be used to evaluate the potential CEQA implications and impacts of each options and rank those results with the other options being considered.

Approaches that have lower environmental impacts or have impacts that are easier to predict would be ranked higher under this criterion.

Process Transparency

Transparent regulatory development and rules ensure all stakeholders, including the affected industry and the impacted community, are aware of what to expect during the rule development process and the implementation of the final rule. Transparency means rules are written in a manner that is easily understood, especially by the affected industry and by those impacted by its implementation and their advocates. It also means that when the rules are implemented, stakeholders can determine if they are working as expected. A transparent process provides regulatory certainty for industry and ensures emission reductions for the impacted communities. This criterion will be used to assess how transparent a given option is likely to be.

Implementation Speed/Complexity

It is important that rules are implemented in an expeditious manner such that the benefits can be achieved sooner, rather than later. This criterion considers how quickly an option can likely be implemented. Additionally, approaches that would require many more Air District staff to implement will not score as well as those that do not require additional staff.

Technology Benefits / Innovation

Although this is not required under the H&SC, this criterion will evaluate the potential approaches for their likely ability to encourage innovation in reducing both emissions and the cost associated with the emission reductions. For example, by promoting research into new emission control technologies the rules may not only benefit the Bay Area, but also create new technologies or approaches that could be replicated elsewhere and hasten the reduction of GHG emissions globally.

EVALUATION OF OPTIONS

This evaluation of options is based on the likelihood that a given approach will result in a specific outcome. Since these options are at the beginning of the rule development process, staff has estimated how a given approach might be rated using the above metrics.

Criteria	Refinery-Wide Combustion Emissions Reductions	BARCT Approach	Emissions Cap	Focus on Methane
Leveraging GHG reduction goals	High	High	Low	Low
Simultaneous reduction of other pollutants	High	Medium	Low	Medium
Within Air District authority	Medium	High	Medium	High
CEQA Implications / Impacts	Medium	Medium	Medium	Medium
Process Transparency	Low	High	High	High
Implementation Speed / Complexity	Medium	Low	High	Medium
Technology Benefits / Innovation	Medium	High	Low	Medium

Refinery-wide Combustion Emission Reductions

Criteria	Rating	Discussion
Leveraging GHG reduction goals	High	As discussed previously, the Air District has adopted near-term, mid-term, and long-term GHG performance objectives. Since this approach has the flexibility to set specific combustion emission reduction targets, a target could be set to reach a particular goal. For this reason, this approach has been rated as high.
Simultaneous reduction of other pollutants	High	The methods that would be used to meet the requirements of this option would most-likely reduce fuel consumption through reducing energy demand in refinery processes. Reducing fuel consumption reduces combustion exhaust products, such as NOx and PM. While there is the potential for refiners to implement other measures that have not been identified by this initial assessment, staff believes that any additional efficiency improvement would not likely result in adverse impacts.
Within Air District authority	Medium	In the State of Washington, the rule fit clearly into the GHG strategy set by the legislature of that state. In California, AB 32, provided the ARB direct authority to regulate GHGs, through an economy-wide Cap-and-Trade program. An Air District program that sets targets for efficiency or emissions for a particular sector or facility could be more stringent than the statewide program. Determining the cost-effectiveness of this option may prove difficult because the Air District would not know which measures refiners would choose to improve efficiency or reduce combustion emissions. Since requiring a reduction in fuel usage is likely to result in an overall cost reduction over time, it is assumed that this option would result in cost effective measures being taken. Since there are positive air quality benefits to this option that would result in attaining and/or maintaining compliance with applicable standards, this option is likely to fit within the Air District authority.
CEQA Implications / Impacts	Medium	This proposal contains a list of efficiency measures that could potentially be implemented to improve the energy intensity at refineries. The potential adverse environmental impacts associated with these measure are believed to be both low and easily determined. The majority of the measures would likely reduce fuel consumption, the need for combustion, and reduce the emissions of other pollutants, such as NOx and PM.
Process Transparency	Low	Staff expects that most of the refineries would opt for an efficiency-based standard to ensure production flexibility. This efficiency-based standard would almost certainly require submission of confidential business information in order for the Air District to confirm compliance.
Implementation Speed / Complexity	Medium	Since significant changes to the refineries may be needed to meet efficiency targets, those changes would likely be made as part of planned turn-arounds, to minimize the need for process shut-downs. Otherwise, significant emissions could result from forcing system shut-downs in order to install new equipment. As a result, it is likely that this option would take 5-10 years to meet target efficiency levels.

Criteria	Rating	Discussion
Technology Benefits / Innovation	Medium	Depending on how aggressive the efficiency goals are, there may not be much need to develop new technologies that could be used elsewhere. The technologies necessary to achieve the goals of the Washington State Rule or the Air District's potential near-term goals are currently available and could readily be implemented at Bay Area refineries. However, this regulatory approach could be a model for other jurisdictions.

BARCT Approach

Criteria	Rating	Discussion
Leveraging GHG reduction goals	High	Development of a suite of BARCT rules that would reduce combustion emissions of CO ₂ and associated criteria and toxic pollutants aligns very well with the Air Districts goals. The Air District would first leverage the most cost-effective and technologically feasible retrofit control technologies. Each BARCT measure would be analyzed for expected emissions reductions and those reductions summed against the needed emissions reductions that would be necessary to meet the overall emissions reduction goals.
Simultaneous reduction of other pollutants	Medium	BARCT rules historically target specific pollutants. This approach would focus on reducing all emissions associated with combustion, resulting in a much more holistic approach to emissions reduction. Approaches like improved efficiency would also likely result in reductions in combustion pollutants like NO _x and therefore ozone and PM.
Within Air District authority	High	This approach is the most consistent with the traditional Air District approach to regulation, which has been upheld as a legitimate exercise of legislative authority. The BARCT approach is readily evaluated within the traditional H&SC requirements of necessity, non-duplication, and cost-effectiveness. Since this approach focuses on pieces of individual equipment, cost-effectiveness varies with BARCT measures for the various pieces of equipment. Near-term and mid-term BARCT measures would most likely rely on readily available efficiency measures, which likely be cost effective. Since this approach will require continued improvement of combustion efficiency over time, long-term BARCT measure would likely rely upon emergent technologies that may require large capital expenditures and operating cost, resulting in large cost-effectiveness values. However, the cost of reducing GHG emissions, in particular, is anticipated to increase in general as the "low-hanging fruit" of current technology is exhausted and more innovative and potentially expensive means of reduction become a necessity to achieve adopted goals. The cost-effectiveness of these emerging technologies would be determined as rule development relying upon their utilization moves forward.

Criteria	Rating	Discussion
CEQA Implications / Impacts	Medium	Each BARCT approach would require a CEQA analysis. The environmental impacts of each approach would vary; some may have the potential for adverse environmental impacts. This determination cannot be made until the potential control approaches are determined and analyzed for their impacts. However, because the BARCT approach relies on the evaluation of specific reductions technologies and measures, the ability to determine the environmental impacts of the candidate measures would be highly likely.
Process Transparency	High	The BARCT approach is the Air District's traditional approach to regulating criteria pollutants. This relies on a transparent process, in which emissions and compliance would be a matter of public record and interested stakeholders made aware of emission limits. Interested parties could easily determine where the refineries are in terms of those limits.
Implementation Speed / Complexity	Low	This approach would follow the Air District normal process of rulemaking of individual sources of pollutants. This would entail analyses of emissions, control technologies and opportunities, and economic and environmental impacts for each rule development effort. Further, each rule would have its own unique implementation schedule and compliance program likely resulting in emissions reductions over a longer period.
Technology Benefits / Innovation	High	This approach will require continued improvement of combustion emissions over time. As the Air District investigates how to meet mid-term and long-term combustion emissions reduction goals, the BARCT approach would likely need to begin relying on nascent technology and set limits that would force the development of, and rely on, emerging technology to meet those limits. Currently, there are no technologies that are demonstrated to allow refineries to reduce emissions to levels consistent with mid-term and long-term GHG goals of 40 and 80 percent reduction over 1990 without reductions in productions. Hence, to maintain current production levels, technologies would need to be developed to accomplish these emissions reduction goals.

Enforceable Numeric Caps

Criteria	Rating	Discussion
Leveraging GHG reduction goals	Low	A GHG emissions cap would not provide any means of actually reducing GHG and associated emissions from Bay Area refineries. The cap would merely set a maximum on the amount of GHG emissions a refinery would be allowed, but not achieve any emission reductions.
Simultaneous reduction of other pollutants	Low	Because a cap would not result in emissions reduction, there is likely no opportunity for the approach to reduce the emissions of other pollutants.

Criteria	Rating	Discussion
Within Air District authority	Medium	<p>The record supporting caps on GHG and other pollutants will need to demonstrate quantitatively why the level at which the caps are set is rationally related to alleviating a problem. The support record will also have to demonstrate how setting GHG caps is consistent with, and not contradictory to, the State Cap-and-Trade system.</p> <p>Looking only at cost-effectiveness as a criterion, if a refinery were to increase production while complying with the emissions cap, additional controls would likely be required. Any evaluation of these potential controls would need to include emission reductions and associated economic impacts, including cost effectiveness, although this option does not mandate any specific emissions reductions.</p>
CEQA Implications / Impacts	Medium	<p>An emissions cap does not necessarily require the installation of any specific control technology. However, a cap could impact a refinery's ability to meet market demands which could result in that demand being met elsewhere in the state, resulting in the emissions of pollutants or other environmental impacts occurring in other locations. This is also known as "leakage". The impacts of this potential leakage would be difficult to assess because it would be virtually impossible to determine which refineries would meet this shifted demand and how that may impact emissions elsewhere.</p>
Process Transparency	High	<p>This approach is highly transparent. Emissions inventories, which are readily available to the public, are published by the Air District annually. As a result, anyone would easily be able to determine if a refinery was in compliance with the cap.</p>
Implementation Speed / Complexity	High	<p>This option could be easily implemented and could become effective upon adoption or initiated with the next calendar year inventory – as a result, implementation would likely take up to two years. Because the option relies upon a simple comparison of a refinery's GHG emissions inventory against the cap value, it is very straight forward.</p>
Technology Benefits / Innovation	Low	<p>The opportunity for this option to promote technological benefits and foster innovation is likely to be extremely low. Refiners attempts to increase production without exceeding their cap may result in the implementation of efficiency measures; however, it is unlikely new technology would develop as a result.</p>

Focus on Methane

Criteria	Rating	Discussion
Leveraging GHG reduction goals	Low	The opportunity for this measure [alone] to contribute significantly to the Air District goals for climate protection is likely relatively low. This is largely because the methane component is a small portion of the overall GHG inventory – about 3 percent. ¹ The refinery-specific sources are primarily waste water treatment and fugitive emissions from refinery fuel gas and possibly coking operations.
Simultaneous reduction of other pollutants	Medium	In the case of refineries, reducing methane from waste water treatment, fugitive leaks, and coking operations, etc. would have the added benefit of reducing the emission of other pollutants such as VOCs, toxic pollutants, and odorous compounds. There are similar examples for other industries. However, because these pollutants are already being addressed, typically, by the very means that could be used to reduce methane, the opportunity for this option to deliver substantial emission reductions is likely to be less than some of the other options presented.
Within Air District authority	High	This option is in line with the Air District authority. Any measure developed to address methane emissions would utilize a regulatory framework and technologies already employed for the control of the emissions of other pollutants, such as criteria and toxic emissions. This regulatory framework includes the traditional H&SC requirements of necessity, non-duplication, and cost effectiveness. Since this approach focuses on pieces of individual equipment, cost-effectiveness varies with BARCT measures for the various pieces of equipment. Near-term and mid-term BARCT measures would most likely rely on readily available efficiency measures, which would provide a basis for evaluating cost-effectiveness.
CEQA Implications / Impacts	Medium	As mentioned above, the measures that would be employed to reduce methane emissions are the ones that are currently employed to reduce emissions of other related pollutants. Because these measure have been vetted in a regulatory development process, their environmental impacts are understood and, if adverse, easily addressed.
Process Transparency	High	This option would likely rely on the Air District's traditional approach to regulating criteria pollutants. This relies on a transparent process, in which emissions and compliance would be a matter of public record and all interested stakeholders made aware of emission limits. Interested parties could easily determine where industries are in terms of those limits.
Implementation Speed / Complexity	Medium	Methane emissions are not typically reported separately from VOCs and estimation methods will likely need to be refined to better quantify these emissions. Further, many of the measures that could be used to reduce methane emission may already be employed. This could lead to large incremental costs to control methane over the methane emissions that are mitigated as a result of other regulatory measures such as VOC control. In addition, there are other regulatory agencies involved in regulation of methane sources (e.g. the California Public Utilities Commission and the natural gas distribution network) that would likely increase complexity and timelines as agencies determine regulatory responsibilities.

Criteria	Rating	Discussion
Technology Benefits / Innovation	Medium	The means for reducing methane leaks are well understood and have been used to reduce other organic pollutants for many years. It is unlikely that an innovative technology for methane control would be developed. However, there is much to be learned in improving the methane inventory. That knowledge would likely be easily reused in other jurisdictions.

REFERENCES

- i “Bay Area Emissions Inventory Summary Report: Greenhouse Gases Base Year 2011,” Updated 2015, Bay Area Air Quality Management District, 2015.
- ii “Available and Emerging Technologies for Reducing Greenhouse Gas Emissions from the Petroleum Refining Industry,” US EPA, October 2010.
- iii “CO₂ Capture Technologies Oxy Combustion with CO₂ Capture,” Global CCS Institute, January 2012.
- iv “Methane Emissions from the U.S. Petroleum Industry, Final Report” Radian International LLC, February 1999, EPA-600 / R-99-010. <https://www3.epa.gov/climatechange/pdfs/radian-petroleum-1999.pdf>
- v TCEQ 2010 Flare Study Final Report, Texas Commission on Environmental Quality, PGA No. 582-8-862-45-FY09-04, August 1, 2011.