Public Workshop on Draft Amendments to Rule 6-5

Virtual Public Workshop
February 4, 2021
How to Use Zoom Video Conferencing

**Black menu bar at top or bottom of screen:**

- **Audio**
  - Please mute yourself when not speaking

- **Video**

- **Participants**
  - See Others
  - Rename Yourself (Name & Group/Agency Affiliation if applicable)
  - Raise Hand (remember to lower after)

- **Chat Feature**
  - Questions can be chatted at any time

- **View**
  - Gallery/Speaker View
  - View of videos and screen share can be changed in top right corner

*Note: The Air District will be recording this public workshop*
If you need technical assistance, please use the chat function and direct your question to “Jennifer – Tech Support”

You can also contact Jennifer via phone, text or email at:

- (650) 784-0107 or jelwell@baaqmd.gov
Welcome and Opening Remarks

Veronica Eady
Senior Deputy Executive Officer of Policy & Equity
Bay Area Air Quality Management District
Virtual Participation Principles

• **One** person speaks at a time.
• Be **respectful** of one another’s opinions.
• Please **mute** yourself when you’re not speaking.
• **Share video** so we can stay visually connected.
• Technology happens – please be **flexible and patient**.
• Remember this is just one meeting in a longer **process**.
Workshop Agenda

• Introductory poll
• Staff presentation
• Public input
  • Breakout session
  • Questions and comments
• Closing and next steps
We have received many questions, concerns and comments up to this point. Some of the most common sentiments are listed below. **Which one(s) do you identify with?**

- I support the most stringent wet gas scrubbing technology
- I am concerned about potential economic impacts
- I am not sure/I need more information
Bay Area Air Quality Management District

Staff Presentation on Draft Amendments to Rule 6-5

Virtual Public Workshop
February 4, 2021

David Joe, PE
Assistant Manager – Rule Development

Phil Martien, PhD
Director – Assessment, Inventory, & Modeling Division
Presentation Outline

• Background
• Draft Amendments
  • Control Scenario A
  • Control Scenario B
• Preliminary Estimates of Impacts
  • Emission reductions
  • Compliance costs
  • Socioeconomic impacts
  • Environmental impacts
  • Health impacts
• Next steps and process
Background

- Fluidized Catalytic Cracking Units (FCCUs) convert heavy components of crude oil into gasoline and high-octane products
- Large source of particulate matter (PM) emissions

<table>
<thead>
<tr>
<th>Refinery</th>
<th>FCCU PM$_{10}$ Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chevron Products Richmond</td>
<td>245 TPY</td>
</tr>
<tr>
<td>PBF Martinez Refinery</td>
<td>309 TPY</td>
</tr>
<tr>
<td>Marathon Martinez Refinery</td>
<td>190 TPY</td>
</tr>
<tr>
<td>Valero Benicia Refinery</td>
<td>83 TPY</td>
</tr>
</tbody>
</table>

TPY = tons per year
• Air District currently developing amendments to Rule 6-5
• Identified two potential control options to reduce PM from FCCUs
• Released workshop package with draft amendments for both control options and information on potential impacts
## Draft Amendments Summary

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Control Scenario A</th>
<th>Control Scenario B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia (NH₃)</td>
<td>10 ppm</td>
<td>10 ppm</td>
</tr>
<tr>
<td>Sulfur dioxide (SO₂)</td>
<td>25 ppm (365-day average)</td>
<td>25 ppm (365-day average)</td>
</tr>
<tr>
<td></td>
<td>50 ppm (7-day average)</td>
<td>50 ppm (7-day average)</td>
</tr>
<tr>
<td>Total PM₁₀</td>
<td>0.020 gr/dscf</td>
<td>0.010 gr/dscf</td>
</tr>
<tr>
<td>Effective date</td>
<td>January 1, 2023</td>
<td>January 1, 2026</td>
</tr>
</tbody>
</table>

ppm = parts per million  
gr/dscf = grains per dry standard cubic foot
## Affected Refineries

<table>
<thead>
<tr>
<th>Impact</th>
<th>Control Scenario A</th>
<th>Control Scenario B</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Affected refineries</strong></td>
<td><strong>Chevron Products Richmond</strong>&lt;br&gt;PBF Martinez Refinery</td>
<td><strong>Chevron Products Richmond</strong>&lt;br&gt;PBF Martinez Refinery&lt;br&gt;<em>Marathon Martinez Refinery</em></td>
</tr>
<tr>
<td><strong>Anticipated controls</strong></td>
<td>Improvement/expansion of existing controls: ESP, Feed&lt;br&gt;Hydrotreatment, Catalyst&lt;br&gt;Additives</td>
<td><strong>Installation of new WGS</strong></td>
</tr>
</tbody>
</table>

ESP = electrostatic precipitator  
WGS = wet gas scrubber
Preliminary Estimates of Impacts

- **Emission reductions**: Reductions in pollutant emissions
- **Compliance costs**: Costs for installing and operating controls
- **Cost effectiveness**: Costs per ton of reduction
- **Socioeconomic impacts**: Economic impacts, job losses, consumer impacts
- **Environmental impacts**: Impacts from installation or use of controls
- **Health impacts**: Health benefits associated with reduced pollution
## Emissions and Cost Impacts

### Control Scenario A

<table>
<thead>
<tr>
<th>Refinery</th>
<th>PM$_{10}$ Reductions</th>
<th>Capital Cost</th>
<th>Total Annualized Cost</th>
<th>Cost Effectiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chevron Richmond</td>
<td>80 TPY</td>
<td>$30 MM</td>
<td>$4.4 MM/year</td>
<td>$55,300/ton</td>
</tr>
<tr>
<td>PBF Martinez</td>
<td>170 TPY</td>
<td>$80 MM</td>
<td>$14 MM/year</td>
<td>$84,900/ton</td>
</tr>
<tr>
<td>Marathon Martinez</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

TPY = tons per year  
MM = million  

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## Emissions and Cost Impacts

**Control Scenario B**

<table>
<thead>
<tr>
<th>Refinery</th>
<th>PM$_{10}$ Reductions</th>
<th>Capital Cost</th>
<th>Total Annualized Cost</th>
<th>Cost Effectiveness</th>
<th>Incremental Cost Effectiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chevron Richmond</td>
<td>160 TPY</td>
<td>$241 MM</td>
<td>$39 MM/year</td>
<td>$239,600/ton</td>
<td>$423,400/ton</td>
</tr>
<tr>
<td>PBF Martinez</td>
<td>240 TPY</td>
<td>$255 MM</td>
<td>$40 MM/year</td>
<td>$165,000/ton</td>
<td>$359,400/ton</td>
</tr>
<tr>
<td>Marathon Martinez</td>
<td>93 TPY</td>
<td>$235 MM</td>
<td>$38 MM/year</td>
<td>$406,400/ton</td>
<td>–</td>
</tr>
</tbody>
</table>

TPY = tons per year  
MM = million
Emissions and Cost Impacts

Estimated PM$_{10}$ Reductions

- Control Scenario A: 80 tons per year
- Control Scenario B: 160 tons per year

Total Annualized Cost ($MM)

- Control Scenario A: $14 MM
- Control Scenario B: $40 MM

Estimated Annualized Costs

- Control Scenario A: $4.4 MM
- Control Scenario B: $39 MM

Estimated Cost Effectiveness

- Control Scenario A: $-450,000
- Control Scenario B: $-450,000

- Overall Cost Effectiveness
- Chevron Products Richmond
- PBF Martinez Refinery
- Marathon Martinez Refinery

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### Socioeconomic Impacts

- Significant impacts expected when costs exceed 10% of net income
- Potential labor reductions or increased fuel pricing

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Compliance Cost (% of Income)</td>
<td>Potential Labor Impacts</td>
</tr>
<tr>
<td>Chevron Richmond</td>
<td>$282.8 MM</td>
<td>1.6%</td>
<td>N/A</td>
</tr>
<tr>
<td>PBF Martinez</td>
<td>$177.7 MM</td>
<td>8.1%</td>
<td>N/A</td>
</tr>
<tr>
<td>Marathon Martinez</td>
<td>$146.5 MM</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

MM = million

- Significant impacts expected when costs exceed 10% of net income
- Potential labor reductions or increased fuel pricing
Environmental Impacts

• Substantial water usage for wet gas scrubbing

• Approximately 400,000 gallons per day for each system

• Technologies and designs available to reduce water impacts, but with increased costs and complexity
Information on:

- Localized PM$_{2.5}$ impacts from Chevron and PBF
- Equity, health, and Rule 6-5 benefits
Contours correspond to modeled contributions of +1.0, +0.9, ... +0.1 µg/m³

Study area is the region inside the outermost contour

**Context:** measured total ambient PM$_{2.5}$ is 8–10 µg/m³

* Total ambient (not just from refineries)
** 8–13 µg/m³ if including 2017–18 wildfires
Study area is the region inside the outermost contour

Contours correspond to modeled contributions of +1.0, +0.9, ... +0.1 µg/m³

Study area population (2020) is about 1 million residents
PM$_{2.5}$ Exposure Per Capita by Source and Scenario

Disparities in Exposure

- African-American / Black and Hispanic / Latino residents are exposed to more PM$_{2.5}$ from Chevron in all scenarios.

Sources other than FCCU

- Drive these disparities.
- Remain significant across all modeled scenarios.

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### Health Impacts and Valuations (Chevron)

<table>
<thead>
<tr>
<th>Estimated Baseline Health Impact from Modeled Sources (Annual)</th>
<th>Valuation(^1) (Annual)</th>
<th>Scenario A</th>
<th>Scenario B</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cardiovascular</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.5–4.3 heart attacks</td>
<td>$63k–600k</td>
<td>-13%</td>
<td>-22%</td>
</tr>
<tr>
<td>1.0 hospital admissions</td>
<td>$47k</td>
<td>-13%</td>
<td>-22%</td>
</tr>
<tr>
<td><strong>Restricted Activity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4,800 days</td>
<td>$360k</td>
<td>-12%</td>
<td>-21%</td>
</tr>
<tr>
<td><strong>Lost Work</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>820 days</td>
<td>$190k</td>
<td>-12%</td>
<td>-21%</td>
</tr>
<tr>
<td><strong>Asthma</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>200 exacerbations(^3)</td>
<td>$12k</td>
<td>-12%</td>
<td>-21%</td>
</tr>
<tr>
<td>4 emergency room visits</td>
<td>$2k</td>
<td>-12%</td>
<td>-21%</td>
</tr>
<tr>
<td>0.1 hospital admissions</td>
<td>$1k</td>
<td>-12%</td>
<td>-20%</td>
</tr>
<tr>
<td><strong>Respiratory Illness(^2)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>140 upper tract(^3)</td>
<td>$5k</td>
<td>-12%</td>
<td>-20%</td>
</tr>
<tr>
<td>100 lower tract(^3)</td>
<td>$2k</td>
<td>-12%</td>
<td>-20%</td>
</tr>
<tr>
<td>8 bronchitis(^3)</td>
<td>$4k</td>
<td>-12%</td>
<td>-20%</td>
</tr>
<tr>
<td>0.2 chronic lung disease</td>
<td>$5k</td>
<td>-12%</td>
<td>-21%</td>
</tr>
<tr>
<td><strong>Mortality</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.1–11.6 deaths(^4)</td>
<td>$52.5M–118M</td>
<td>-13%</td>
<td>-23%</td>
</tr>
</tbody>
</table>

\(^1\) Conventional EPA valuations, in 2015 US dollars
\(^2\) Other than asthma
\(^3\) Subset of pediatric (≤18 years)
\(^4\) Including infant mortality

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Bay Area Air Quality Management District
## Health Impacts and Valuations (PBF)

<table>
<thead>
<tr>
<th>Estimated Baseline Health Impact from Modeled Sources (Annual)</th>
<th>Valuation(^1) (Annual)</th>
<th>Scenario A</th>
<th>Scenario B</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cardiovascular</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.3–2.4 heart attacks</td>
<td>$37k–350k</td>
<td>-35%</td>
<td>-50%</td>
</tr>
<tr>
<td>0.6 hospital admissions</td>
<td>$26k</td>
<td>-35%</td>
<td>-50%</td>
</tr>
<tr>
<td><strong>Restricted Activity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2,700 days</td>
<td>$200k</td>
<td>-35%</td>
<td>-50%</td>
</tr>
<tr>
<td><strong>Lost Work</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>460 days</td>
<td>$100k</td>
<td>-35%</td>
<td>-50%</td>
</tr>
<tr>
<td><strong>Asthma</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>110 exacerbations(^3)</td>
<td>$7k</td>
<td>-35%</td>
<td>-50%</td>
</tr>
<tr>
<td>2 emergency room visits</td>
<td>$1k</td>
<td>-35%</td>
<td>-50%</td>
</tr>
<tr>
<td>&lt;0.1 hospital admissions</td>
<td>$1k</td>
<td>-35%</td>
<td>-50%</td>
</tr>
<tr>
<td><strong>Respiratory Illness(^2)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>80 upper tract(^3)</td>
<td>$3k</td>
<td>-35%</td>
<td>-50%</td>
</tr>
<tr>
<td>50 lower tract(^3)</td>
<td>$1k</td>
<td>-35%</td>
<td>-50%</td>
</tr>
<tr>
<td>4 bronchitis(^3)</td>
<td>$2k</td>
<td>-35%</td>
<td>-50%</td>
</tr>
<tr>
<td>0.1 chronic lung disease</td>
<td>$3k</td>
<td>-35%</td>
<td>-50%</td>
</tr>
<tr>
<td><strong>Mortality</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.8–6.3 deaths(^4)</td>
<td>$28.8M–64.9M</td>
<td>-35%</td>
<td>-50%</td>
</tr>
</tbody>
</table>

\(1\) Conventional EPA valuations, in 2015 US dollars  
\(2\) Other than asthma  
\(3\) Subset of pediatric (≤18 years)  
\(4\) Including infant mortality  

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# Cost-Benefit Comparisons

<table>
<thead>
<tr>
<th>Facility</th>
<th>Scenario</th>
<th>Proposed Limit</th>
<th>Projected Costs</th>
<th>Modeled Benefits¹,²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chevron</td>
<td>A</td>
<td>0.020 gr/dscf</td>
<td>$4.4M/yr</td>
<td>$6.8M to $15M/yr</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>0.010 gr/dscf</td>
<td>$39M/yr</td>
<td>$12M to $27M/yr</td>
</tr>
<tr>
<td>PBF</td>
<td>A</td>
<td>0.020 gr/dscf</td>
<td>$14M/yr</td>
<td>$10M to $23M/yr</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>0.010 gr/dscf</td>
<td>$40M/yr</td>
<td>$14M to $32M/yr</td>
</tr>
</tbody>
</table>

¹ Based on conventional US EPA valuations of selected health impacts.
² Valuations are in 2015 US dollars, calculated using the US EPA BenMAP system.
Rule Development Process

• Draft amendments are available for public review and comment

• Consider and evaluate comments and input received

• Staff may solicit further comments and input on additional materials or drafts

• Final proposed amendments
  • Public comment period
  • Considered for adoption by the Air District Board of Directors at a Public Hearing
Further Comments and Questions

Comments and Questions
• Comments accepted through March 1, 2021
• Comments received will be posted to website
• Staff available to discuss or answer questions

David Joe, PE
Rule Development
djoe@baaqmd.gov

Phil Martien, PhD
Assessment, Inventory, & Modeling Division
pmartien@baaqmd.gov

Materials and Information
https://www.baaqmd.gov/reg6rule5
Small Group Discussions

Take a few moments to think about which you feel would be the most appropriate option to bring to the Air District Board of Directors.

1. Control Scenario A (PM$_{10}$ limit of 0.020 gr/dscf, achievable through ESP controls)
2. Control Scenario B (PM$_{10}$ limit of 0.010 gr/dscf, achievable through WGS controls)
3. Another option not presented or undecided

Note: The Air District will be recording this public workshop
Technical Assistance

• In just a moment you will receive an invitation to join a breakout room
• Click join to enter the breakout room and wait for your facilitators
• For technical support contact: Jennifer Elwell at:
• (650) 784-0107 or jelwell@baaqmd.gov
Breakout Session Report Out
Question & Answer Session

• Please mute yourself when you’re not speaking
• Please raise your hand if you wish to speak and wait for the facilitator to let you know when you can unmute yourself and speak
• One person speaks at a time
• Be respectful of one another
Closing and Next Steps

Comments and Questions
• Materials available at: https://www.baaqmd.gov/reg6rule5
• Comments accepted through March 1, 2021
• Comments received will be posted to website
• Staff available to discuss or answer questions

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Rule Development
djoe@baaqmd.gov

Phil Martien, PhD
Assessment, Inventory, & Modeling Division
pmartien@baaqmd.gov

Next Steps
• Consider and evaluate comments
• Solicit further comments and feedback as needed
• Proposed amendments and public comment opportunity
• Public Hearing for consideration by Board of Directors
Workshop Evaluation

_The Air District Wants Your Feedback!_

Help us improve our workshops and rule development process by completing this short survey in the link below.

https://www.surveymonkey.com/r/HYWFCG8