GATEWAY CITIES COUNCIL OF GOVERNMENTS

Environmental Committee

AGENDA

Wednesday, April 17, 2013
6:00 - 8:30 p.m. Meeting

Gateway Cities Council of Governments
16401 Paramount Boulevard, 2nd Floor Conference Room
Paramount, California

STAFF REPORTS AND OTHER WRITTEN DOCUMENTS ARE AVAILABLE IN THE GATEWAY CITIES COUNCIL OF GOVERNMENTS OFFICES, 16401 PARAMOUNT BOULEVARD, PARAMOUNT, CALIFORNIA. ANY PERSON HAVING QUESTIONS CONCERNING ANY AGENDA ITEM MAY CALL THE COG STAFF AT (562) 663-6850.

FOR YOUR INFORMATION: The Environmental Committee will hear from the public on any item on the agenda or an item of interest that is not on the agenda. The Environmental Committee cannot take action on any item not scheduled on the agenda. These items may be referred for administrative action or scheduled on a future agenda. Comments are to be limited to three minutes for each speaker, unless extended by the Environmental Committee, and each speaker will only have one opportunity to speak on any one topic. You have the opportunity to address the Environmental Committee at the following times:

A. AGENDA ITEM: at this time the Environmental Committee considers the agenda item OR during Public Comments, and

B. NON-AGENDA ITEMS: during Public Comments, comments will be received for a maximum 20-minute period; any additional requests will be heard following the completion of the Environmental Committee agenda; and

C. PUBLIC HEARINGS: at the time for public hearings.

Please keep your comments brief and complete a speaker card for the Chair.

I. CALL TO ORDER

II. ROLL CALL – BY SELF INTRODUCTIONS
III. PLEDGE OF ALLEGIANCE

IV. AMENDMENTS TO THE AGENDA - This is the time and place to change the order of the agenda, delete or add any agenda item(s).

V. PUBLIC COMMENTS - Three minutes for each speaker.

VI. CONSENT CALENDAR

A. Minutes of the January 25, 2012 meeting of the Environmental Committee
B. Minutes of the January 30, 2013 meeting of the Environmental Committee

VII. REPORTS

5 Min. A. AQAP Status and Schedule Update - Oral Report by ICF

SUGGESTED ACTION: A MOTION TO HEAR REPORT, POSSIBLE ACTION AND/OR GIVE DIRECTION TO STAFF

5 Min. B. AQAP Participation Framework Committee Reports - Oral Report by Arellano Associates

SUGGESTED ACTION: A MOTION TO HEAR REPORT, POSSIBLE ACTION AND/OR GIVE DIRECTION TO STAFF


120 Min. SUGGESTED ACTION: ADJOURN MEETING TO CONVENE WORKSHOP WITH ROUNDTABLES

D. COG Engineer’s Report - Oral Report by Jerry Wood

10 Min. SUGGESTED ACTION: A MOTION TO HEAR REPORT, POSSIBLE ACTION AND/OR GIVE DIRECTION TO STAFF

VIII. MEETING SCHEDULE REVIEW

IX. COMMENTS FROM ENVIRONMENTAL COMMITTEE CHAIR AND MEMBERS

X. ADJOURNMENT

NOTICE: New items will not be considered after 8:30 p.m. unless the Environmental Committee votes to extend the time limit. Any items on the agenda that are not completed will be forwarded to the next regularly scheduled Environmental Committee meeting.
IN COMPLIANCE WITH THE AMERICAN WITH DISABILITIES ACT, IF YOU NEED SPECIAL ASSISTANCE TO PARTICIPATE IN THIS MEETING, PLEASE CONTACT THE COG OFFICE AT (562) 663-6850. NOTIFICATION 48 HOURS PRIOR TO THE MEETING WILL ENABLE THE COUNCIL OF GOVERNMENTS TO MAKE REASONABLE ARRANGEMENT TO ENSURE ACCESSIBILITY TO THIS MEETING.
CONSENT CALENDAR

ITEM A

APPROVAL OF MINUTES
I. CALL TO ORDER
Chairman Bill DeWitt called the meeting to order at 7:07 PM.

II. ROLL CALL – BY SELF INTRODUCTIONS
Roll call was taken by self-introduction.

COMMITTEE MEMBERS PRESENT: Chairman Bill DeWitt – City of South Gate; Steve Lefever – Planning Directors Committee Representative (City of South Gate); Elizabeth Warren – FuturePorts; Michael Jordan and Nelson Kerr – representing Ron Arias, City of Long Beach Health and Human Services Department; Adrian Martinez – Natural Resources Defense Council; TL Garrett – Pacific Marine Shipping Association; Angelo Logan – AQAP Advisory Roundtable Liaison (East Yard Communities for Environmental Justice); Luis Cabrales – AQAP Advisory Roundtable Liaison (Coalition for Clean Air); David Libatique - Port of Los Angeles Commissioner; Daniel Ojeda – AQAP Technical Roundtable Liaison (City of Lynwood).

COMMITTEE MEMBERS ABSENT
Jorge Rifa – City Managers Committee Liaison (City of Commerce); Ruben Arceo – I-5 JPA Representative (City of La Mirada); Angie Castro – representing Supervisor Gloria Molina; and Karly Katona, Representing Supervisor Mark Ridley-Thomas; Steve Forster (City of La Mirada; Judith Mitchell – South Coast Air Quality Management District Board; Douglas Drummond and Thomas Fields – Port of Long Beach Commissioners.

OTHERS PRESENT: Joan Greenwood – AQAP Advisory Roundtable Representative (West Long Beach Neighborhood Representative); Harold Tseklenis – AQAP Advisory Roundtable Representative (Downey Community Representative); Jessica Tovar – AQAP Advisory Roundtable Representative (Long Beach Alliance for Children with Asthma); Jill Griffiths – AQAP Technical Roundtable Representative (City of Long Beach); Jerry Wood – GCCOG
III. PLEDGE OF ALLEGIANCE

Steve Lefever led the Pledge of Allegiance.

IV. AMENDMENTS TO THE AGENDA

There were no amendments to the agenda.

V. PUBLIC COMMENTS

There were no public comments.

VI. CONSENT CALENDAR

There were no additions to the meeting minutes of the October 26, 2011 meeting of the Environmental Committee. Member Daniel Ojeda made a motion to receive and file the report. Member TL Garrett seconded the motion to no objection.

VII. REPORTS

A. AQAP Status and Schedule Update – Oral Report by ICF

Overall Status, Schedule and 101 Handout Review
Scott Broten presented a Status and Schedule Update on the AQAP. He reviewed the components of the AQAP and identified those that are part of the I-710 EIR/EIS and those that are part of the GCCOG AQAP process. He presented an assessment of the work completed to date on each task and the scheduled completion dates for the tasks still in process. He also discussed the development of the Toolkit that will be a product of the various tasks that are part of the AQAP including the completion of the Compendium Update and Early Actions. The Toolkit will be a set of measures, policies, projects that can be implemented to improve air quality in the Gateway Cities COG subregion. He also presented the AQAP meeting schedule for 2012 and noted the topics that each of those public meetings and webinars would be covering. Scott briefly mentioned that the list of Early Actions has been completed and will be released in early February.


Susan DeSantis presented an overview of the Participation Framework and updated the Committee on its current status. She reported on the HIA Technical Working Group and Roundtable meetings that took place between October and November 2011, which focused on reviewing the draft findings and recommendations of the I-710 Health Impact Assessment (HIA) work product. She also reported that the Transportation Committee (TC) and the Gateway Cities Council of Governments (GCCOG) Board approved the Environmental Committee’s recommendation for a Peer Review of the HIA document. The
 GCCOB Board also requested staff to provide an update to the TC at their January 2012 meeting on how to proceed with the peer review. She reviewed some of the comments, suggestions and concerns that were raised by the Working Groups and Roundtables and noted that there was universal support for the Peer Review. She then indicated that per the TC’s action all comments received during the various meetings on the HIA, meeting summaries and any documents used during the HIA process would be provided to the Peer Review Panel. The TC also agreed that at the conclusion of the Peer Review, the final HIA work product document and the Peer Review Report would be submitted directly to Caltrans. She paused to allow for questions

Member TL Garret requested clarification on what documentation and in what format those documents were provided to the I-710 Project Work Group? Additionally, he asked what documentation will be provided to the Peer Review Committee as the Peer Review Process moves forward. J. Wood responded that both the I-710 Project Work Group has been provided with a variety of reports including Roadway Modeling, Construction Staging, final HIA Work Product, comment letters, etc. He further noted that all reports and documents provided to the I-710 Project Work Group will be made available for the Peer Review.

Next Susan DeSantis requested that Mr. Wood provide a brief update on the status of the I-710 EIR/EIS release for public comment, and how the proposed Peer Review schedule would fit within that overall schedule. Mr. Wood indicated that the EIR/EIS report will be released on April 1 and that the current review period is for 60 days. Caltrans is still considering whether or not to extend the review period beyond the 60 days; they will make that determination within one month.

Member Angelo Logan expressed concern that the peer review will not be completed in time to be submitted to Caltrans. He further noted that if the HIA is not included as part of the EIR/EIS, then the public can’t comment during the comment period. Mr. Wood recognized the challenges with the schedule and noted that the HIA could still be included as a comment to the EIR/EIS and thus would be part of the final EIR/EIS. Member Karen Heit also added that it is important to keep in mind that the I-710 Project Committee can only make recommendations to Caltrans on what to include in the EIR/EIS, but it cannot force the lead agency do anything. Thus far Caltrans has been open to reviewing the HIA Work Produce, but has not made any decision on whether or not to include any of the HIA in the EIR/EIS. Member Angelo Logan requested that the EC come back to the schedule/timing discussion following the Peer Review Presentation. Ms. DeSantis noted that current discussion with the National Research Council (NRC) staff suggest that a preliminary Peer Review document may be available before the comment period closes. She also indicated that per NRC staff, the current schedule is ambitious and while it may be possible to tighten it in certain areas the most time consuming task is convening of the Peer Review Panel, which is a task that is time-consuming, and cannot be expedited.

Member Adrian Martinez requested clarification on the action taken by the I-710 Project Committee. It is his understanding that the I-710 Project Committee approved the inclusion of the HIA in the EIR/EIS, not the Peer Review Report. He also expressed concern over the Peer Review Process delaying consideration of the inclusion of the HIA in the draft EIR/EIS and argued that the best place for the document to be included is in the draft stage. Ms. DeSantis noted that the recommendation to move forward with a Peer Review was made by the Environmental Committee and subsequently approved by the Transportation Committee that the HIA was not adequate for inclusion without a Peer Review.
Member TL Garret requested clarification on whether the COG Board would take action on the HIA at the conclusion of the Peer Review Process. Ms. DeSantis stated that there would be no Board action at that time. She noted that the TC and GCCOG Board approved motions in November 2011 stating that at the conclusion of the Peer Review Process, the HIA, Peer Review Report and all Comments received during the participation process were to be submitted directly to Caltrans. This action modified the language approved by this EC Committee at its November meeting. Ms. Heit read the exact language in the November 2nd TC meeting.


Ms. DeSantis called the Environmental Committee Member’s attention to the Peer Review Process handouts. She pointed out that the currently the HIA Peer Review is in the “study definition” stage, which focuses on the questions that will guide the Peer Review Process. She also indicated that the presentation would include the nine study questions approved by the NAS Governing Board and noted that input from the Environmental Committee on these questions is welcomed. Ms. DeSantis also indicated that the selection of the Peer Review Panel is a key step in the Peer Review Process. She highlighted the importance of selecting a panel that does not result in any conflicts of interest, that is balanced and has the expertise needed to evaluate the HIA document. Ms. DeSantis then reviewed the preliminary schedule based on initiating the Peer Review in February. She did note that the funds for the Peer Review have not been secured.

Next, Ms. DeSantis began review of the nine questions approved by the NAS Governing Board that would guide the Peer Review Process. Member Angelo Logan requested clarification on what documentation would be available to the Peer Review Panel. Ms. DeSantis responded that all documents generated by all of the HIA TWG, Roundtables, Environmental Committee, as well as any formal and informal comments submitted would be made available to the panel. Member Logan also wanted to ensure that NAS was provided with the purpose and need of the HIA.

Member Nelson Kerr asked if the Peer Review Panel has been selected and if they have experience in HIA’s. Ms. DeSantis indicated that we do not know who the panel members will be at this time; however she reviewed the qualifications of the NAS staff that would be assigned to the Peer Review.

Member Luis Cabrales requested clarification on whether or not the Environmental Committee can change the questions. Ms. DeSantis clarified that the EC can make recommendations to revise the language, however the nine questions were approved by the NAS Governing Board and they are under no obligation to change the questions.

Member Angelo Logan requested clarification on the source of the nine questions. Ms. DeSantis indicated the nine questions were crafted and approved by the NAS Staff. She also indicated that NAS staff were provided with the questions drafted by the Gateway Cities staff and reviewed by the Environmental Committee, and then subsequently by the Transportation Committee prior to submission to NAS.
Member Adrian Martinez indicated that Question 2 needed to be more specific. He thought it was too broad as currently stated.

Member T.L Garrett made a general comment on all nine questions. He indicated that the questions should be used within the scope of the I-710 project and the effects of the project. This is important because some of the recommendations were made for items that went beyond the I-710 project.

Next, Ms. DeSantis reviewed questions six to nine and paused for questions and comments. No questions or comments were made by Environmental Committee Members. Chairman DeWitt asked if there were any comments on the process.

Member Adrian Martinez asked the cost of the Peer Review process. Ms. Heit indicated that a contract has not been secured with NAS; therefore she is not at liberty to discuss cost details. As soon as a contract is secured the cost will be made public record.

Member Angelo Logan asked to revisit the Peer Review timing issue that he raised during the previous presentation. He recommended that the issue of the Peer Review timing be brought up to the TC and to the I-710 Project Committee as it relates to the timing of the I-710 EIS/EIR. Mr. Wood indicated that Caltrans has not made a decision on the length of the comment period.

Member Nelson Kerr requested clarification on the source of funds for the Peer Review. He also noted that if the funding is not secured soon the Peer Review schedule will likely be impacted. Ms. DeSantis responded that staff is currently looking at funding sources, including foundations.

Member T.L. Garrett noted an opportunity with the release of the I-710 EIR/EIS overlapping with the Peer Review and wanted to know if it is useful to have the EIR/EIS inform the Peer Review process – the HIA’s value added. Ms. Heit responded that NAS indicated that in order to make the value judgment they would have to review the EIR/EIS and that process could be very timely but cost prohibitive.

Chairman DeWitt asked for Public Comments. Jill Griffiths, City of Long Beach noted that the Environmental Committee Members seem to have different levels of familiarity with the preparation of the Draft EIR. She noted that the decision to include the HIA or any other document in the EIR is not an arbitrary decision, the crating and preparation of the EIR is very specific and only supporting technical studies should be included that are used in the preparation of the text and conclusions in the Draft EIR. She also noted that if the HIA is not quoted or used in the EIR to make decisions then it should not be included. Mr. Wood responded that Human Impact Partners (HIP) had access to technical studies and Caltrans is currently reviewing the HIA to see if it should be included.

Finally, Ms. DeSantis reviewed the Peer Review Committee required expertise and invited EC members to make recommendations on potential members.

Angelo Logan noted that jobs and the economics was one of the big questions that came up and asked where that topic fits in the expertise required. M. DeSantis agreed and suggested making a recommendation to add this area of expertise.
Member Luis Cabrales asked if the experts were going to be selected nation-wide. Ms. DeSantis indicated that they would be selected based on a nation-wide search.

D. COG Engineer’s Report– Oral Report by Jerry Wood

This item will be discussed at the next meeting

VIII. MEETING SCHEDULE REVIEW

Chairman DeWitt confirmed that the next meeting of the Environmental Committee will be determined at a later date.

IX. COMMENTS FROM ENVIRONMENTAL COMMITTEE CHAIR OR MEMBERS

X. ADJOURNMENT

The meeting adjourned at 8:30 PM.
AQAP Workshop
Analysis of New Measures to Improve Air Quality

April 17, 2013
Today’s Agenda

• Presentation
  • AQAP Status Update
  • Review of New Measures Selection Process
  • Results of New Measures Analysis

• Questions and Discussion

• Next Steps
Today’s Agenda

• Presentation
  • AQAP Status Update
  • Review of New Measure Selection Process
  • Results of New Measures Analysis
• Questions and Discussion
• Next Steps
Overview of the Air Quality Modeling Process

- Modeling Protocol
- Emission Inventory Development
- Air Quality Modeling and Evaluation
- Health Risk Assessment
- Additional Measures

Final AQAP Report will summarize all these activities.
Workshop Process

1. Refresher on the measure development process and selected measures

2. Review individual measures in terms of
   - Are these the right implementation steps? (challenges, supporters, opponents)
   - Is the measure a long- or short-term priority?
   - What is the priority (High, Med, Low)?
Today’s Agenda

• Presentation
  • AQAP Status Update
  • Review of New Measure Selection Process
  • Individual Review of New Measures

• Questions and Discussion

• Next Steps
Purpose of New Measures

Primary goal:
Identify and analyze new measures that will continue to improve air quality and health within the Gateway Cities by 2035.

Considerations:
• Strategies could be implemented by any party.
  o Local cities, regional agencies, private industry, etc.
• Strategies should be evaluated based on local (Gateway Cities) AQ benefits.
• Strategies could apply to all sources – mobile, point, area, etc.
Role of the Gateway Cities

Gateway Cities has a supporting role in new measures:

- Seek funding for mitigation projects
- Facilitate and coordinate projects throughout the sub-region
- Educate member cities, stakeholders, and community members
- Regulate emission sources under local control
- Encourage local cities to implement early action projects
- Advocate with air quality organizations (AQMD, ARB, EPA)
- Continue to monitor air quality improvements
- Advocate for additional air quality monitoring stations.

Most measures implemented by third parties.

- Regional, state, and federal agencies
- Private industry
- Other stakeholders (e.g., ports)

Many measures require new technology and funding.
Goals of New Measures

1) Further reduce PM2.5
2) Further reduce DPM
3) Further reduce NOx
4) Further reduce other cancer-causing pollutants
New Measures Development Process

1. Review 2035 air quality and HRA results
2. Identify largest contributors to 2035 air pollution and health risk
3. Identify potential new measures that target these large contributors (53) (AQMP reviewed to help with this step)
4. Workshop to obtain feedback on potential new measures, identify others
5. Screen potential new measures based on emission source size (kg/day), emission control effectiveness, and ease of implementation
6. 18 New Measures selected for quantification
7. TODAY: Workshop re: Implementation and Prioritization
8. Incorporate into AQAP Toolkit
## Primary PM2.5 Emissions in GCCOG

<table>
<thead>
<tr>
<th>Source Category</th>
<th>Emissions (kg/day)</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area Sources</td>
<td>15,864</td>
<td>57.7%</td>
</tr>
<tr>
<td>Entrained Road Dust</td>
<td>3,394</td>
<td>12.3%</td>
</tr>
<tr>
<td>On-road Vehicles</td>
<td>3,176</td>
<td>11.6%</td>
</tr>
<tr>
<td>Watercraft</td>
<td>1,831</td>
<td>6.7%</td>
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<tr>
<td>Point Sources</td>
<td>1,715</td>
<td>6.2%</td>
</tr>
<tr>
<td>Off-Road Other</td>
<td>925</td>
<td>3.4%</td>
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<tr>
<td>Aircraft</td>
<td>348</td>
<td>1.3%</td>
</tr>
<tr>
<td>Rail Lines</td>
<td>203</td>
<td>0.7%</td>
</tr>
<tr>
<td>Airport GSE</td>
<td>14</td>
<td>0.05%</td>
</tr>
<tr>
<td>Railyards</td>
<td>12</td>
<td>0.04%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>27,482</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

### Area Source component
- Cooking - commercial charbroiling: 52%
- Residential wood combustion: 12%
- Building construction and demolition: 11%
- Other: 24%

### Mobile Source component
- Light-Duty Vehicles: 39%
- Watercraft: 28%
- Off-Road Other: 14%
- Heavy-Duty Trucks: 10%
- Aircraft: 5%
- Rail Lines: 3%

### Potential measures
- Measure 1
- Measure 2, 3
- Measure 4
- Measure 5, 6, 7
- Measure 8, 9, 10
- Measure 11

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**New Measure Identification - example**
<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Primary Pollutant Targeted</th>
<th>No.</th>
<th>Description</th>
<th>Primary Pollutant Targeted</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Reduce emissions from char-broiling</td>
<td>PM2.5</td>
<td>10</td>
<td>Alternative fuel infrastructure for trucks</td>
<td>DPM</td>
</tr>
<tr>
<td>2</td>
<td>Reduce emissions from wood combustion</td>
<td>PM2.5</td>
<td>11</td>
<td>Heavy-duty truck inspection and maintenance program</td>
<td>DPM</td>
</tr>
<tr>
<td>3</td>
<td>Reduce emissions from building construction and demolition</td>
<td>PM2.5</td>
<td>12</td>
<td>Low-emission equipment for public construction contracts</td>
<td>DPM</td>
</tr>
<tr>
<td>4</td>
<td>Accelerate zero and near-zero emission vehicle adoption</td>
<td>PM2.5</td>
<td>13</td>
<td>Alternative fuels for port cargo handling equipment</td>
<td>DPM</td>
</tr>
<tr>
<td>5</td>
<td>Expand street sweeping</td>
<td>PM2.5</td>
<td>14</td>
<td>Control of at berth ship emissions</td>
<td>DPM</td>
</tr>
<tr>
<td>6</td>
<td>Reducing entrained road dust</td>
<td>PM2.5</td>
<td>15</td>
<td>Install clean ship engine technologies</td>
<td>NOx</td>
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<tr>
<td>7</td>
<td>Emission controls for pleasure boats</td>
<td>PM2.5</td>
<td>16</td>
<td>Low/zero emission transportation refrigeration units</td>
<td>NOx</td>
</tr>
<tr>
<td>8</td>
<td>Zero emission port trucks</td>
<td>DPM</td>
<td>17</td>
<td>Advocate for zero and near-zero emission on-road vehicles</td>
<td>NOx</td>
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<td>9</td>
<td>Low emission trucks in Gateway Cities communities</td>
<td>DPM</td>
<td>18</td>
<td>Reduce arsenic emissions from glass manufacturing</td>
<td>Arsenic</td>
</tr>
</tbody>
</table>
Today’s Agenda

• Presentation
  • AQAP Status Update
  • Review of New Measure Selection Process
  • Individual Review of New Measures
• Questions and Discussion
• Next Steps
New Measures For Quantification

1. Area Source Measures
   a. Reduce Emissions from Charbroiling
   b. Reduce Emissions from Residential Wood Combustion
   c. Reduce Emissions from Building Construction and Demolition
   d. Reduce Road Dust from Construction Sites
   e. Expand Street Sweeping
   f. Reduce Emissions from Glass Manufacturing

2. On-Road Vehicle Measures
   a. Accelerate Zero and Near-Zero Emission Vehicle Adoption (light duty)
   b. Zero Emission Port Trucks
   c. Low Emission Trucks in Gateway Cities Communities
   d. Alternative Fuel Infrastructure for Trucks
   e. Heavy-duty Truck Inspection and Maintenance Program
New Measures For Quantification – cont.

3. Off-Road Mobile Source Measures
   a. Advanced Technology for Port Cargo Handling Equipment
   b. Control of At-Berth Ship Emissions
   c. Install Clean Ship Engine Technologies
   d. Emission Controls for Pleasure Boats
   e. Low/Zero Emission TRUs
   f. Low-emission Equipment for Public Construction Contracts
1a - Reduce Emissions from Charbroiling

Summary

- Under-fired charbroilers: 23% of all primary PM 2.5 emissions in Gateway Cities in 2035
- Several control technologies available; wet scrubbers appear most effective
- AQMD proposed amendment to Rule 1138
  - Would require 85% effective control equipment
  - Would affect 7% of restaurants using under-fired charbroilers; responsible for 22% of charbroiling emissions

Costs

- $32,350 per unit
- $1,300 to $5,500 for installation
- $3,300 annual O&M costs
Area Sources

1a - Reduce Emissions from Charbroiling

Benefits and Costs

<table>
<thead>
<tr>
<th>PM2.5 Emissions from Under-fired Charbroiling</th>
<th>Percent of Emission Sources Affected by Measure</th>
<th>Control Technology Effectiveness</th>
<th>2035 Emissions Reductions of PM2.5</th>
<th>Cost Effectiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td>6,455 kg/day</td>
<td>22 %</td>
<td>85%</td>
<td>1,207 kg/day</td>
<td>$7,850 – $8,400 per ton</td>
</tr>
</tbody>
</table>

Implementation steps

- AQMD lead through adoption of amended Rule 1138
- Gateway Cities role: advocacy and education
**Summary**

- Fireplaces and woodstoves: 12% of primary PM2.5 in 2035
- EPA-certified low emission wood stoves and fireplace inserts reduce emissions 70%
- AQMD Rule 445 requires new construction to use EPA certified wood stoves
- AQMD could expand rule to require that existing homes install EPA certified equipment when sold – ~80% homes by 2035

**Costs**

- Average woodstove cost: $1,900
- For catalytic stove, cost of catalyst replacement every 6 years: $150
- Average fireplace insert cost: $2,500
- Installation and piping cost: $1,200
1b - Reduce Emissions from Residential Wood Combustion

**Benefits and Costs**

<table>
<thead>
<tr>
<th>PM2.5 Emissions from Residential Wood Burning</th>
<th>Percent of Emission Source Affected by Measure</th>
<th>Control Technology Effectiveness</th>
<th>2035 Emission Reduction of PM2.5</th>
<th>Cost Effectiveness</th>
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</thead>
<tbody>
<tr>
<td>1,875 kg/day</td>
<td>80%</td>
<td>70%</td>
<td>1,050 kg/day</td>
<td>$6,100 per ton</td>
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</tbody>
</table>

**Implementation steps**

- AQMD would amend Rule 445
- Gateway Cities role: provide education and outreach to residents; advocacy for Rule change and enforcement
1c - Reduce Emissions from Building Construction and Demolition

Summary

• Fugitive dust from building construction and demolition: 11% of 2035 primary PM2.5 emissions

• Rule 403 requires record keeping and inspection
  o Implementation of dust control techniques (pre-watering unpaved areas, stabilizing soils, etc.)

• AQMD could requiring more sources to maintain records and additional inspections to expand the reach of the rule

Costs

• Includes salary and benefits for additional inspector
1c - Reduce Emissions from Building Construction and Demolition

Benefits and Costs

<table>
<thead>
<tr>
<th>PM2.5 Emissions from Building Construction and Demolition</th>
<th>Percent of Emission Source Affected by Measure</th>
<th>Control Technology Effectiveness</th>
<th>2035 Emission Reduction of PM2.5</th>
<th>Cost Effectiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,768 kg/day</td>
<td>20%</td>
<td>50%</td>
<td>177 kg/day</td>
<td>$1,610 per ton</td>
</tr>
</tbody>
</table>

Implementation steps

- AQMD lead by amending Rule 403
- Gateway Cities role: provide education and outreach to contractors; advocacy for rule change and enforcement
1d - Reduce Road Dust from Construction Sites

Summary

• Road dust from construction: 1% of primary PM2.5 in 2035
• Rule 403 requires the use of best management practices to reduce dust track-out from construction sites
• Best management practices such as pipe-grid track-out control systems and wheel washers are more effective than others such as gravel beds
• Rule 403 could be amended to require the most effective practices
  o Reduce emissions 24% - 34%
  o Could reach 80% of sites

Costs

• Annual site cost: $1,800 - $5,000
Area Sources

1d - Reduce Road Dust from Construction Sites

Benefits and Costs

<table>
<thead>
<tr>
<th>Track-out Control Technology</th>
<th>PM2.5 Emissions from Road Dust from Demolition and Construction</th>
<th>Percent of Emission Source Affected by the Strategy</th>
<th>Control Technology Effectiveness</th>
<th>2035 Emission Reduction of PM2.5</th>
<th>Annual Technology Unit Cost</th>
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</thead>
<tbody>
<tr>
<td>Gravel Bed</td>
<td>109 kg/day</td>
<td>80%</td>
<td>46%</td>
<td>Assumed Baseline</td>
<td>$1,360</td>
</tr>
<tr>
<td>Pipe-grid Track-Control Device</td>
<td>109 kg/day</td>
<td>80%</td>
<td>80%</td>
<td>30 kg/day</td>
<td>$1,820</td>
</tr>
<tr>
<td>Wheel Washers</td>
<td>109 kg/day</td>
<td>80%</td>
<td>70%</td>
<td>21 kg/day</td>
<td>$5,000</td>
</tr>
</tbody>
</table>

Implementation steps

- AQMD lead by changing Rule 403
- Gateway Cities role: provide education and outreach to contractors; advocacy for rule change and enforcement
Area Sources

1e – Expand Street Sweeping

Summary

• Approximately 12% of primary PM2.5 emissions from entrained road dust (all roadway types)
• Measure analyzed: street sweeping programs doubled on 20% of roadway segments that are the dustiest
• Vacuum sweepers can reduce dust by 86%

Costs

• $1,260 per curb mile for weekly sweeping
• Annual $1.6 million for GCCOG region
Area Sources

1e – Expand Street Sweeping

Benefits and Costs

<table>
<thead>
<tr>
<th>PM2.5 Emissions from Entrained Road Dust</th>
<th>Percent of Emission Source Affected by the Strategy</th>
<th>Control Technology Effectiveness</th>
<th>2035 Emission Reduction of PM2.5</th>
<th>Cost Effectiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td>3,394 kg/day</td>
<td>20%</td>
<td>86%</td>
<td>584 kg/day</td>
<td>$6,700 per ton</td>
</tr>
</tbody>
</table>

Implementation steps

- Municipalities lead through increasing the frequency of street sweeping
Area Sources

1f - Reduce Emissions from Glass Manufacturing

Summary

• Arsenic: most significant contributor to non-cancer health risk
  o Developmental effects (e.g., decreased intellectual function in children
• Glass manufacturing operations responsible for nearly all arsenic emissions
• Add-on emissions control strategy to enhance existing controls
  o High-energy Venturi scrubbers
  o Electrostatic precipitators
  o Baghouses
  o Combined with a collection hood to increase the efficiency of particulate collection
Area Sources

1f - Reduce Emissions from Glass Manufacturing

Benefits and Costs

<table>
<thead>
<tr>
<th>Arsenic Emissions from Glass Manufacturers</th>
<th>Percent of Emission Sources Affected by Rule</th>
<th>Control Technology Effectiveness</th>
<th>2035 Emissions Reductions of Arsenic</th>
<th>Cost Effectiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.97 kg/day</td>
<td>100 %</td>
<td>72%</td>
<td>4.3 kg/day</td>
<td>$971,000 per ton</td>
</tr>
</tbody>
</table>

Implementation steps

- AQMD lead by promulgating a new rule
- Gateway Cities role: advocate for rule adoption and enforcement
On-Road Vehicle Measures

2a. Accelerate Zero and Near-Zero Emission Vehicle Adoption (light duty)
2b. Zero Emission Port Trucks
2c. Low Emission Trucks in Gateway Cities Communities
2d. Alternative Fuel Infrastructure for Trucks
2e. Heavy-duty Truck Inspection and Maintenance Program
2a - Accelerate Zero and Near-Zero Emission Vehicle Adoption (light duty)

**Summary**

- Under Advanced Clean Cars Program, about 17% of GCCOG LDVs will be ZEVs by 2035
- Measure analyzed: double number of ZEVs by 2035
- Emissions benefits per vehicle in 2035
  - PM2.5: 9.1 kg/vehicle/year
  - NOx+ROG: 0.33 kg/vehicle/year

**Costs**

- Incremental vehicle costs
  - PHEV: $11,000 currently, dropping 30% by 2035
  - BEV: $15,000 currently, dropping 60% by 2035
  - FCV: $45,000 currently, dropping 50% by 2035
- Infrastructure costs
2a - Accelerate Zero and Near-Zero Emission Vehicle Adoption (light duty)

Emissions impacts

<table>
<thead>
<tr>
<th></th>
<th>PM2.5 (kg/day)</th>
<th>DPM (kg/day)</th>
<th>NOx + ROG (kg/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2035 Baseline</td>
<td>2,313</td>
<td>-</td>
<td>15,096</td>
</tr>
<tr>
<td>2035 with Strategy</td>
<td>2,304</td>
<td>-</td>
<td>15,068</td>
</tr>
<tr>
<td>Reduction</td>
<td>9</td>
<td>-</td>
<td>27</td>
</tr>
<tr>
<td>% reduction</td>
<td>0.4%</td>
<td>-</td>
<td>0.2%</td>
</tr>
</tbody>
</table>

Poor cost effectiveness

- Total cost: $6 billion
- Cost effectiveness: more than $10M per ton

Implementation steps

- New state and/or AQMD incentives for zero emission vehicles
- New state and/or AQMD incentives for charging infrastructure
- Gateway Cities role: advocacy; siting and permitting for EVSE
2b – Zero Emission Port Trucks

Summary

• Port trucks in 2035 responsible for:
  o 15% of DPM in GCCOG
  o 5% of NOx

• Further emission reductions will require advanced technology

• Battery electric trucks
  o Eliminates NOx, DPM
  o 80% reduction in PM2.5

<table>
<thead>
<tr>
<th></th>
<th>PM2.5 (kg/day)</th>
<th>DPM (kg/day)</th>
<th>NOx (kg/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline emissions</td>
<td>302</td>
<td>219</td>
<td>6,445</td>
</tr>
<tr>
<td>Emission reduction</td>
<td>261</td>
<td>219</td>
<td>6,445</td>
</tr>
<tr>
<td>(maximum)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
On-Road Vehicle Measures

2b – Zero Emission Port Trucks

Benefits and Costs

- Estimated incremental cost of battery electric port drayage truck

<table>
<thead>
<tr>
<th></th>
<th>PM2.5</th>
<th>DPM</th>
<th>NOₓ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost Effectiveness (low)</td>
<td>$457,600</td>
<td>$504,800</td>
<td>$17,200</td>
</tr>
<tr>
<td>Cost Effectiveness (high)</td>
<td>$686,400</td>
<td>$757,200</td>
<td>$25,800</td>
</tr>
</tbody>
</table>

Cost effectiveness ($/ton of emission reduction)

Implementation steps

- State and/or AQMD incentives, grant funding
- Use demo projects, access restrictions (ports, I-710) to advance technology
- GCCOOG Strategic Transportation Plan will include a zero-emission trucks commercialization study
2c – Low Emission Trucks in Gateway Cities Communities

Summary

• Non-port trucks in 2035 responsible for:
  o 31% of DPM in GCCOG
  o 8% of NOx

• Further emission reductions will require advanced technologies

• Emissions benefits depend on weight class and technology

<table>
<thead>
<tr>
<th>Weight Class</th>
<th>Reference Fuel</th>
<th>Technology</th>
<th>Emissions Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>PM2.5</td>
</tr>
<tr>
<td>Light Heavy-Duty</td>
<td>Gasoline</td>
<td>Advanced NGVs</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hybrid-Electric Trucks</td>
<td>21-31%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Plug-In Hybrid Electric</td>
<td>43-58%</td>
</tr>
<tr>
<td>Medium Heavy-Duty</td>
<td>Diesel</td>
<td>Advanced NGVs</td>
<td>10-30%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hybrid-Electric Trucks</td>
<td>9-29%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Plug-In Hybrid Electric</td>
<td>26-66%</td>
</tr>
<tr>
<td>Heavy Heavy-Duty</td>
<td>Diesel</td>
<td>Advanced NGVs</td>
<td>10-30%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hybrid-Electric Trucks</td>
<td>4-24%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Plug-In Hybrid Electric</td>
<td>9-33%</td>
</tr>
</tbody>
</table>
2c – Low Emission Trucks in Gateway Cities Communities

Costs

- Projected incremental purchase cost for new trucks

<table>
<thead>
<tr>
<th>Technology</th>
<th>Weight Class</th>
<th>Today</th>
<th>2023</th>
<th>2035</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced NGVs</td>
<td>Light Heavy-Duty</td>
<td>$15-20k</td>
<td>$13-18k</td>
<td>$10-14k</td>
</tr>
<tr>
<td></td>
<td>Medium Heavy-Duty</td>
<td>$25-35k</td>
<td>$23-32k</td>
<td>$20-28k</td>
</tr>
<tr>
<td></td>
<td>Heavy Heavy-Duty</td>
<td>$35-45k</td>
<td>$32-40k</td>
<td>$28-36k</td>
</tr>
<tr>
<td>Hybrid-Electric Trucks</td>
<td>Light Heavy-Duty</td>
<td>$10-15k</td>
<td>$8-12k</td>
<td>$6-10k</td>
</tr>
<tr>
<td></td>
<td>Medium Heavy-Duty</td>
<td>$35-40k</td>
<td>$20-30k</td>
<td>$15-20k</td>
</tr>
<tr>
<td></td>
<td>Heavy Heavy-Duty</td>
<td>$55-60k</td>
<td>$40-50k</td>
<td>$25-35k</td>
</tr>
<tr>
<td>Plug-In Hybrid Electric</td>
<td>Light Heavy-Duty</td>
<td>$20-30k</td>
<td>$15-25k</td>
<td>$10-20k</td>
</tr>
<tr>
<td>Trucks</td>
<td>Medium Heavy-Duty</td>
<td>$30-50k</td>
<td>$25-40k</td>
<td>$20-30k</td>
</tr>
<tr>
<td></td>
<td>Heavy Heavy-Duty</td>
<td>$70-100k</td>
<td>$50-80k</td>
<td>$35-55k</td>
</tr>
</tbody>
</table>

Implementation steps

- State and/or AQMD incentives, grant funding
- Use demo projects and access restrictions (ports, I-710) to advance technology
- GCCCOG Strategic Transportation Plan will include a zero-emission trucks commercialization study
On-Road Vehicle Measures

2d – Alternative Fuel Infrastructure for Trucks

Summary

• Growth in alternative fuel fleets will require:
  o More natural gas fueling stations (CNG, LNG)
  o More EV charging stations (including fast charging for trucks)
2d – Alternative Fuel Infrastructure for Trucks

Benefits and Costs

- Emissions benefits
  - Not possible to quantify – enabling strategy
- CNG station costs
  - $500,000 to $5 million
  - Likely private investment
- EV charging costs
  - Level 2: $2,000 - $8,000
  - DC Fast Charge: $70,000

Implementation steps

- Local governments work with private NG fueling developers
- Secure grant funding
- Business model for EV truck charging not yet clear
On-Road Vehicle Measures

2e – Heavy-duty Truck Inspection and Maintenance Program

Summary

• Wear and deterioration of engine parts and emission control equipment can cause truck emission rates to increase
• Trucks going longer between engine re-build (750K+ miles)
• I&M program can reduce emissions increase attributable to malmaintenance
• EMFAC assumptions for deterioration:

<table>
<thead>
<tr>
<th>Truck mileage accumulation</th>
<th>Type</th>
<th>NOx (g/mile)</th>
<th>PM (g/mile)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (new vehicle)</td>
<td></td>
<td>1.14</td>
<td>0.035</td>
</tr>
<tr>
<td>100,000</td>
<td>2010+</td>
<td>1.55</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td>2010+/OBD</td>
<td>1.46</td>
<td>0.04</td>
</tr>
<tr>
<td>500,000</td>
<td>2010+</td>
<td>3.19</td>
<td>0.09</td>
</tr>
<tr>
<td></td>
<td>2010+/OBD</td>
<td>2.74</td>
<td>0.07</td>
</tr>
</tbody>
</table>

NOx: 2.4 times higher than new truck
PM: 2 times higher than a new truck
2e – Heavy-duty Truck Inspection and Maintenance Program

Benefits and Costs

• Emissions benefit
  o Little information on long-term deterioration of trucks meeting MY2010 standards
  o Little information on extent of malmaintenance
  o Insufficient information to quantify benefits

Implementation steps

• Would require state action
• Build on new Gateway Cities truck inspection initiative
Off-Road Mobile Source Measures

3a. Advanced Technology for Port Cargo Handling Equipment
3b. Control of At-Berth Ship Emissions
3c. Install Clean Ship Engine Technologies
3d. Emission Controls for Pleasure Boats
3e. Low/Zero Emission TRUs
3f. Low-emission Equipment for Public Construction Contracts
Off-Road Mobile Source Measures

3a – Advanced Technology for Port Cargo Handling Equipment

Summary

• Yard tractors
  o Currently contributes 50% of CHE DPM at ports
  o In 2035, will account for 0.5% of GCCOG DPM
  o Options: Hybrid Electric, Hydraulic Hybrid, Battery Electric

• Rubber tire gantry (RTG) cranes
  o Currently contributes 8% of CHE DPM at ports
  o In 2035, will account for 0.2% of GCCOG DPM
  o Options: Energy storage systems (ESS), Electric RTG (e-RTG)
3a – Advanced Technology for Port Cargo Handling Equipment

Benefits and Costs

- Emissions benefits

<table>
<thead>
<tr>
<th>Technology</th>
<th>PM2.5 (kg/day)</th>
<th>DPM (kg/day)</th>
<th>NOx (kg/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yard Hostlers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline Emissions</td>
<td>6.83</td>
<td>6.83</td>
<td>184.4</td>
</tr>
<tr>
<td>Reduction - Hybrid</td>
<td>1.37</td>
<td>1.37</td>
<td>36.9</td>
</tr>
<tr>
<td>Reduction - Hydraulic Hybrid</td>
<td>2.05</td>
<td>2.05</td>
<td>55.3</td>
</tr>
<tr>
<td>Reduction - Battery Electric</td>
<td>6.83</td>
<td>6.83</td>
<td>184.4</td>
</tr>
<tr>
<td>RTG Cranes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline Emissions</td>
<td>2.46</td>
<td>2.46</td>
<td>66.3</td>
</tr>
<tr>
<td>Reduction - ESS</td>
<td>0.61</td>
<td>0.61</td>
<td>16.6</td>
</tr>
<tr>
<td>Reduction - eRTG</td>
<td>2.46</td>
<td>2.46</td>
<td>66.3</td>
</tr>
</tbody>
</table>

- Cost effectiveness – Yard hostler
  - Most cost effective is battery electric, $2.6M/ton DPM; $95,000/ton NOx
- Cost effectiveness – RTG cranes
  - Most cost effective is e-RTG, $2.3M per ton DPM; $86,000 per ton NOx

Implementation steps

- Ports would lead through terminal lease agreements, investments
3b – Control of At-Berth Ship Emissions

Summary

• OGV At-Berth emissions
  o ARB rule requires shore power for most container, cruise, and reefer vessels by 2020

• OGV At-Berth Operations in 2035 will be responsible for:
  o 3% of GCCOG DPM (47 kg/day)
  o 10% of GCCOG NOx (13,600 kg/day)

• Further control measures to focus on:
  o Other ship types
  o Infrequent callers

• Technology options
  o Expansion of shore power
  o Exhaust bonnet system
3b – Control of At-Berth Ship Emissions

Benefits and Costs

- Maximum emission reduction potential

<table>
<thead>
<tr>
<th></th>
<th>PM2.5</th>
<th>DPM</th>
<th>NOₓ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline emissions</td>
<td>47.4</td>
<td>47.4</td>
<td>13,586</td>
</tr>
<tr>
<td>Reduction potential</td>
<td>95%</td>
<td>95%</td>
<td>95%</td>
</tr>
<tr>
<td>Emissions reduction</td>
<td>45.0</td>
<td>45.0</td>
<td>12,907</td>
</tr>
</tbody>
</table>

- Costs
  - Total: about $1.1 billion over 30 years

- Cost effectiveness ($ per ton)

<table>
<thead>
<tr>
<th>Technology</th>
<th>PM2.5</th>
<th>DPM</th>
<th>NOₓ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shore Power</td>
<td>$2,100,000</td>
<td>$2,100,000</td>
<td>$7,300</td>
</tr>
<tr>
<td>Bonnet System</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
</tbody>
</table>

Implementation steps

- Ports would lead development of shore-side infrastructure.
- Major barrier is cost.
3c – Install Clean Ship Engine Technologies

Summary

• Other OGV regulations
  o Marine sulfur rule reduces PM
  o IMO standards reduce NOx
  o EPA Tier 3 standards (US-flagged vessels only)

• OGVs in 2035 will be responsible for:
  o 15% of GCCOG DPM
  o 21% of GCCOG NOx

• Possible technology options for further reductions
  o Selective catalytic reduction (SCR)
  o Seawater scrubbers
Off-Road Mobile Source Measures

3c – Install Clean Ship Engine Technologies

Benefits and Costs

• Maximum emission reduction potential

<table>
<thead>
<tr>
<th>Technology</th>
<th>PM2.5</th>
<th>DPM</th>
<th>NOₓ</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SCR</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline emissions (kg/day)</td>
<td>215</td>
<td>215</td>
<td>27,552</td>
</tr>
<tr>
<td>Control effectiveness</td>
<td>45%</td>
<td>45%</td>
<td>85%</td>
</tr>
<tr>
<td>Emissions reduction (kg/day)</td>
<td>82</td>
<td>82</td>
<td>19,906</td>
</tr>
<tr>
<td><strong>Seawater Scrubbing</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline emissions (kg/day)</td>
<td>215</td>
<td>215</td>
<td>27,552</td>
</tr>
<tr>
<td>Control effectiveness</td>
<td>80%</td>
<td>80%</td>
<td>20%</td>
</tr>
<tr>
<td>Emissions reduction (kg/day)</td>
<td>172</td>
<td>172</td>
<td>5,510</td>
</tr>
</tbody>
</table>

• Cost effectiveness is relatively poor
  o SCR: $68M per ton DPM, $281K per ton NOₓ
  o Seawater scrubbers: $16M per ton DPM, $487K per ton NOₓ

Implementation steps

• Ports could require or incentivize clean ship technologies
• Barrier is technology development, cost
3d – Emission Controls for Pleasure Boats

Summary

• Emission inventory suggests recreational boats will be responsible for 73% of watercraft PM2.5 in 2035

• Measure focuses on spark ignition outboard and personal watercraft (PWC) engines
  o Assumed to all be 2-stroke
  o Other boats will have catalytic after-treatment

• Measure: require fuel injected, 4-stroke engines with a 3-way catalyst
3d – Emission Controls for Pleasure Boats

Benefits and Costs

- Emissions benefits

<table>
<thead>
<tr>
<th>Baseline emissions (all 2-stroke outboard and PWC)</th>
<th>PM2.5 (kg/day)</th>
<th>DPM (kg/day)</th>
<th>NOx (kg/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control effectiveness</td>
<td>2.5</td>
<td>-</td>
<td>151</td>
</tr>
<tr>
<td>Emissions reduction</td>
<td>1.8</td>
<td>-</td>
<td>123</td>
</tr>
</tbody>
</table>

Costs

- Incremental cost: $760 per engine
- Cost effectiveness ($/ton)

<table>
<thead>
<tr>
<th>Technology</th>
<th>PM2.5</th>
<th>DPM</th>
<th>NOx</th>
</tr>
</thead>
<tbody>
<tr>
<td>Convert to 4-Stroke with TWC</td>
<td>$2,439,000</td>
<td>-</td>
<td>$32,000</td>
</tr>
</tbody>
</table>

Implementation steps

- Mandatory or voluntary program established by ARB or AQMD
- Gateway Cities role: advocacy and education
Off-Road Mobile Source Measures

3e – Low/Zero Emission TRUs

Summary

• Transport Refrigeration Units (TRUs) in 2035 will be responsible for:
  o 5.7% of all Gateway Cities NOx emissions (7,154 kg/day)
  o 1.4% of all Gateway Cities DPM emissions (21 kg/day)

• Under EPA and ARB rules, all TRUs will meet Tier 4 standards by 2020

• Advanced technology options
  o Electric standby units – can plug into the grid
  o Cryogenic temperature control systems – use liquid CO2 for cooling

• Assume measure targets large, private, regionally based fleets
  o 23% of TRUs operating in GCCOG
Off-Road Mobile Source Measures

3e – Low/Zero Emission TRUs

Emissions benefits

<table>
<thead>
<tr>
<th>Technology</th>
<th>PM2.5</th>
<th>DPM</th>
<th>NOx</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>29.8</td>
<td>21.1</td>
<td>7,454</td>
</tr>
<tr>
<td>Emissions subject to control</td>
<td>6.9</td>
<td>4.9</td>
<td>1,714</td>
</tr>
<tr>
<td>Cryogenic liquid CO₂</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Emission Reduction</td>
<td>6.9</td>
<td>4.9</td>
<td>1,714</td>
</tr>
<tr>
<td>Electric standby</td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>Emission Reduction</td>
<td>3.4</td>
<td>2.4</td>
<td>857</td>
</tr>
</tbody>
</table>

Incremental cost

- $2,000 for cryogenic TRU; $3,000 for electric standby TRU

Cost effectiveness

- $34,000 – $103,000 per ton DPM
- $100 – $300 per ton of NOx

Implementation steps

- Voluntary incentive-based program, set up by ARB or AQMD
- Challenging to get private sector to adopt new technologies
3f – Low-emission Equipment for Public Construction Contracts

- In 2035, off-road construction will account for:
  - 8% of DPM emissions in GCCOG
  - 4% of NOX emissions
- Due to EPA standards, ARB’s Off-Road Rule, and fleet turnover, nearly all construction equipment expected to meet Tier 4 standards by 2035
- Metro’s Green Construction Policy
  - Benefits over period 2012-2030; fully realized by 2035
- Limited information on advanced technology construction equipment. Costs and emissions reductions not quantified

Implementation steps
- Local governments include clean construction requirements in bid specs
## Summary – Emission Reduction Potential

<table>
<thead>
<tr>
<th>Measure</th>
<th>PM2.5</th>
<th>DPM</th>
<th>NOx</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. emissions reduced (kg/day)</td>
<td>% of emission inventory</td>
<td>Max. emissions reduced (kg/day)</td>
<td>% of emission inventory</td>
</tr>
<tr>
<td>Reduce Emissions from Char Broiling</td>
<td>1,207</td>
<td>4.4%</td>
<td>0</td>
</tr>
<tr>
<td>Reduce Emissions from Wood Combustion</td>
<td>1,050</td>
<td>3.8%</td>
<td>0</td>
</tr>
<tr>
<td>Reduce Emissions from Bldg. Const. and Demolition</td>
<td>177</td>
<td>0.6%</td>
<td>0</td>
</tr>
<tr>
<td>Expand Street Sweeping</td>
<td>584</td>
<td>2.1%</td>
<td>0</td>
</tr>
<tr>
<td>Reduce Road Dust from Construction Sites</td>
<td>30</td>
<td>0.1%</td>
<td>0</td>
</tr>
<tr>
<td>Accelerate ZEV Adoption</td>
<td>9</td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>Zero Emission Port Trucks</td>
<td>261</td>
<td>0.9%</td>
<td>219</td>
</tr>
<tr>
<td>Low Emission Trucks in GC - Natural Gas or PHEV</td>
<td>182</td>
<td>0.7%</td>
<td>367</td>
</tr>
<tr>
<td>Advanced Tech for Port CHE: Battery Electric Hostler</td>
<td>7</td>
<td>0.0%</td>
<td>7</td>
</tr>
<tr>
<td>Advanced Tech for Port CHE: Electric RTG Cranes</td>
<td>2</td>
<td>0.0%</td>
<td>2</td>
</tr>
<tr>
<td>Control of At-Berth Ship Emissions: Shore Power</td>
<td>45</td>
<td>0.2%</td>
<td>45</td>
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<tr>
<td>Clean Ship Engine Technologies - Seawater Scrubbing</td>
<td>172</td>
<td>0.6%</td>
<td>172</td>
</tr>
<tr>
<td>Emission Controls for Pleasure Boats</td>
<td>2</td>
<td>0.0%</td>
<td>0</td>
</tr>
<tr>
<td>Low/Zero Emission TRUs - Cryogenic Liquid CO2</td>
<td>7</td>
<td>0.0%</td>
<td>5</td>
</tr>
</tbody>
</table>

Total Maximum Potential Emission Reduction | 3,686 | 13% | 780 | 53% | 30,749 | 23% |
## Summary – Cost Effectiveness

<table>
<thead>
<tr>
<th>Measures</th>
<th>Cost Effectiveness ($/ton)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PM2.5</td>
</tr>
<tr>
<td><strong>Area Source Measures</strong></td>
<td></td>
</tr>
<tr>
<td>Reduce Emissions from Char Broiling</td>
<td>8,100</td>
</tr>
<tr>
<td>Reduce Emissions from Wood Combustion</td>
<td>6,100</td>
</tr>
<tr>
<td>Reduce Emissions from Bldg. Construction and Demolition</td>
<td>1,600</td>
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<tr>
<td>Expand Street Sweeping</td>
<td>6,700</td>
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<tr>
<td><strong>On-Road Vehicle Measures</strong></td>
<td></td>
</tr>
<tr>
<td>Accelerate ZEV Adoption</td>
<td>&gt;10M</td>
</tr>
<tr>
<td>Zero Emission Port Trucks</td>
<td>572,000</td>
</tr>
<tr>
<td>Low Emission Trucks in GC - Natural Gas or PHEV</td>
<td>1.2M – 5.2M</td>
</tr>
<tr>
<td><strong>Other Off-Road Measures</strong></td>
<td></td>
</tr>
<tr>
<td>Advanced Technology Port Yard Hostlers</td>
<td>2.6M – 5.2M</td>
</tr>
<tr>
<td>Advanced Technology RTG Cranes</td>
<td>2.3M – 4.9M</td>
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<tr>
<td>Control of At-Berth Ship Emissions: Shore Power</td>
<td>2.1M</td>
</tr>
<tr>
<td>Emission Controls for Pleasure Boats</td>
<td>2.4M</td>
</tr>
<tr>
<td>Low/Zero Emission TRUs</td>
<td>24K – 73K</td>
</tr>
</tbody>
</table>
Today’s Agenda

• Presentation
  • AQAP Status Update
  • Review of New Measures Selection Process
  • Results of New Measures Analysis

• Questions and Discussion
• Next Steps
Next Steps

- Incorporate new measure recommendations and implementation steps into draft AQAP
- Circulate draft AQAP for review and comment