Public Workshop to Discuss Additional Requirements for the Commercial Harbor Craft (CHC) Regulation

December 4, 2018
Long Beach, CA

&

December 10, 2018
Sacramento, CA
Presentation Agenda

• **Section 1: Harbor Craft and Existing Requirements**
• **Section 2: Need for Additional Emission Reductions**
• **Section 3: Updates to Emission Inventory**
• **Section 4: Health Analyses**
• **Section 5: Potential Regulatory Concepts**
• **Section 6: Incentives**
• **Section 7: Next Steps**
What are Commercial Harbor Craft?

• Also called “Harbor Craft”
• Include a wide variety of vessel types owned by private or public entities, excluding:
  o Ocean-going vessels
  o Recreational vessels
• Generally equipped with diesel engines, 2 main & 1 auxiliary
Types of Harbor Craft

- Towing
- High-Speed Ferry
- Tractor Tug
- Ocean Going Tug
- Pilot
- Work Boat
More Types of Harbor Craft

- Dredge
- Research
- Crew and Supply
- Excursion
- Charter Fishing
- Commercial Fishing
Industry Has Reduced Emissions from Harbor Craft

• Since 2009, harbor craft owners have replaced older with newer, cleaner engines to comply with the existing Regulation

• Some harbor craft owners not subject to in-use requirements have voluntarily replaced older engines with newer, cleaner engines

• Many engine replacements have been funded by CARB’s Carl Moyer Program administered through local air districts
Requirements of Existing Regulation (2009-2022)

• Applies to compression-ignition (diesel-cycle) engines rated >50 horsepower (hp)

• Applies to all vessels operating in Regulated California Waters, within 24 nautical miles of the California Coast

• Specific vessel categories must repower or rebuild older Tier 1 and pre-Tier 1 engines to Tier 2 or Tier 3 standards

• New ferries must meet Tier 4 standards or use other controls

• All vessel categories: ongoing reporting, recordkeeping, ultra-low sulfur diesel requirements, and use of non-resettable hour meters
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Why does CARB Need Additional Requirements for Harbor Craft?

• In March 2018, CARB staff proposed to reduce emissions from all freight sources, including harbor craft, to control:
  - Diesel PM to minimize community health risk
  - NOx and PM$_{2.5}$ to attain regional air quality standards, especially in South Coast and Bay Area
  - GHGs to mitigate climate change

• Staff anticipate Board consideration of additional proposed harbor craft requirements in 2020
Ports of Los Angeles and Long Beach: Harbor Craft a Top 3 Source of Diesel PM Cancer Risk

- Trucks to ~3 mi
- On-site equipment
- Ships to ~40 nm
- Harbor Craft to ~40 nm
- Locomotives to ~3 mi

Activity held constant (no growth); reflects rules + fleet turnover

2016

2023
Community Health Protection

• AB 617 added emphasis on community health impacts

• Impacted communities say more action is needed now to reduce emissions from vessels

• Residents and community groups are concerned about visible smoke emissions observed from newer vessels and engines
CARB Regulatory Authority

- HSC 39650 et seq. – direct CARB to regulate toxic air contaminants from non-vehicular sources to reduce public exposure/risk
- HSC 43013 and 43018 – direct CARB to control criteria air pollutants from mobile sources to attain air quality standards
- HSC 38500 et seq. (AB 32) and HSC 38566 (SB 32) – direct CARB to reduce greenhouse gases to specific levels to combat climate change
Rulemaking is a Public Process

• Rulemaking is iterative – staff request public input at every step of the process
• Staff will hold additional public workshops during rule development
• Staff will post draft documents, reports, and analyses as they become available
• Key rulemaking documents (reports, analyses, and regulatory text) will be posted for 45-day public comment period prior to Board Hearing
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Harbor Craft Emissions Inventory

• Basis for developing proposed regulatory concepts, health analyses, and cost effectiveness

• Inventory quantifies diesel PM, PM$_{2.5}$, NOx, and GHGs from harbor craft statewide

• Staff currently refining emission inventory to support rule development
Overview of Methodology

- Vessel population from U.S. Coast Guard and CA ports
- Engine population and info from CARB reporting forms
- Emission factors assumed equal to certified emission levels as reported by U.S. EPA
- Load factors from fuel use reported in 2004 CARB surveys
- Other inputs from CARB’s OFFROAD model: correction for cleaner CARB fuel, engine deterioration

\[
\text{Emissions} = \text{Activity} \times \text{Emission Factor}
\]

\[
\text{Activity} \quad [\text{hp-hr}]
\]

\[
\text{Emission Factor} \quad [\text{g/hp-hr}]
\]
Statewide Diesel PM Emissions by Vessel Type with Full Implementation in 2023

- Ferries & Excursion: 25%
- Tugboats & Towboats: 29%
- Crew & Supply: 4%
- Barge & Dredge: 3%

No Existing In-Use Engine Requirements:
- Commercial Fishing: 14%
- Charter Fishing: 15%
- Other Work Boats: 6%
- Other: 4%
Statewide Diesel PM, NOx, and CO₂ Emissions by Selected Region with Full Implementation in 2023

<table>
<thead>
<tr>
<th></th>
<th>Statewide</th>
<th>Bay Area</th>
<th>South Coast</th>
<th>All Other Regions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diesel PM [TPY]</td>
<td>233</td>
<td>85</td>
<td>66</td>
<td>82</td>
</tr>
<tr>
<td>NOx [TPD]</td>
<td>19.9</td>
<td>8.0</td>
<td>5.9</td>
<td>6.0</td>
</tr>
<tr>
<td>GHG [MT CO₂/yr]</td>
<td>1,900</td>
<td>846</td>
<td>480</td>
<td>574</td>
</tr>
<tr>
<td>Vessels [#]</td>
<td>3,096</td>
<td>1,060</td>
<td>564</td>
<td>1,472</td>
</tr>
</tbody>
</table>
Minimal Emission Reductions Expected from 2023 to 2031 Without Additional Requirements

<table>
<thead>
<tr>
<th>Expected Change in Emissions from 2023 to 2031</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diesel PM</td>
</tr>
<tr>
<td>NOx</td>
</tr>
<tr>
<td>GHG</td>
</tr>
</tbody>
</table>
Planned Near-Term Updates to Data for Emission Inventory

- CARB contract with UC Berkeley, UC Riverside, and University of Southern California
  - GPS logging of selected vessels to understand where vessel activity is concentrated
  - Emission factor updates from in-use testing using Portable Emissions Measurement Systems (PEMS)
- Vessel and engine specification updates through outreach to owners, operators, ports, and other harbors
- Engine load factor updates through fuel or electronic engine logging provided by owners/operators
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Health Analyses

Potential excess cancer risk

• Health risk assessments
  o Two locations, Bay Area and San Diego
  o Will consider Maximum Exposed Individual Resident (MEIR) cancer risk (chances per million) and population exposed to cancer risk levels

• Draft report for public comment in advance of formal rule proposal

Non-cancer effects

• Staff will estimate and monetize regional impacts
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Proposed Concepts for Additional Reductions

• More stringent in-use requirements to achieve NOx, PM and GHG emission reductions
• In-use requirements for additional vessel categories
• In-use requirements for engines less than 50 horsepower
• Annual opacity testing requirements
• Facility requirements
Proposed Concept: More stringent in-use requirements to achieve reductions

- Existing regulation has accelerated turnover to mostly Tier 2 and 3 engines, with some Tier 4 (new ferries)
- Under this proposal, engines on vessels subject to in-use requirements would need to either:
  1. Retrofit Tier 2 and 3 engines with a Verified Diesel Emission Control Strategy (VDECS);
  2. Repower with Tier 4 engines; or,
  3. Adopt approved zero- or near-zero emission technology.
Trends based on NOx emissions from a pre-Tier 1 baseline of 11 g/bhp-hr, and marine engine standards for a 1000-hp Category 1 engine. Retrofit assumed to achieve an 85% reduction from Tier 3 standards.
Tier 4 Feasibility Study

- CARB-funded study by Cal Maritime Academy to evaluate feasibility of Tier 4 and VDECS retrofits
- For each participating vessel, identify or assess:
  - Available Tier 4 or equivalent control options
  - Vessel changes necessary to accommodate equipment
  - Vessel stability analysis by naval architect
  - Cost information on procurement, installation, maintenance, or vessel replacement
- Report release in mid-2019
Zero Emission and Other Advanced Technologies

- Emerging technologies to help achieve 2031 emission targets for NOx, PM$_{2.5}$, diesel PM, and GHG
- Goal: simplify process for emerging technologies to be approved as a compliance pathway
- Hybrid diesel-electric vessels would reduce fuel use and emissions; a few hybrid tugs operate today
- Battery-electric technology now deployed in marine sector; hydrogen fuel-cell under development today
- Alternative fuels such renewable diesel and liquefied natural gas (LNG) likely not standalone pathways
Zero/Near-Zero Emission Vessels

Red and White Fleet “Enhydra” - battery electric plug-in hybrid excursion vessel – built and operational today

Golden Gate “Water-Go-Round” Zero Emission hydrogen fuel cell ferry demonstration – under construction today
### Proposed Concept: In-use requirements for additional vessel categories

<table>
<thead>
<tr>
<th>Vessel Category</th>
<th>Existing In-Use Engine Requirements</th>
<th>Proposed In-Use Engine Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ferries, Excursions</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Crew and Supply</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Barge and Dredge</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Tanker Barges</td>
<td>Not Included</td>
<td>Yes</td>
</tr>
<tr>
<td>Tugboat, Towboat</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Pilot Vessels</td>
<td>No</td>
<td>Under Evaluation</td>
</tr>
<tr>
<td>Workboats</td>
<td>No</td>
<td>Under Evaluation</td>
</tr>
<tr>
<td>Charter Fishing</td>
<td>No</td>
<td>Under Evaluation</td>
</tr>
<tr>
<td>Commercial Fishing</td>
<td>No</td>
<td>*</td>
</tr>
<tr>
<td>Research, Others</td>
<td>No</td>
<td>Under Evaluation</td>
</tr>
</tbody>
</table>

*Likely no; however, health impacts still under evaluation*
Proposed Concept: In-use requirements for engines less than 50 horsepower

- Existing CHC regulation in-use requirements do not apply to engines below 50 horsepower
- Staff estimate 23 percent of auxiliary engines are rated below 50 horsepower
- Emissions from engines under 50 horsepower contribute approximately 8 percent of total auxiliary engine PM emissions
- Under proposed concept, all engines on applicable vessel categories would be subject to in-use requirements, regardless of engine power rating
Proposed Concept: Annual Opacity Testing Requirement

- Every engine would need to meet opacity limits using a defined procedure
- Opacity test limits and procedure under development – will consider original engine certification and engine/retrofit configuration
- Vessel owners or operators could become certified to self-test, or hire a certified tester
Proposed Concept: Facility Requirements

• Facilities include ports, terminals, marinas, harbors, and private land with docks: any entity that accepts payment for allowing a vessel to dock on a regular and ongoing basis

• Facility responsibilities would increase vessel compliance

• Concept requirements for facilities:
  - Facilities must allow installation and maintenance of on-site infrastructure to support zero and near-zero emission vessels
  - Electronic verification of vessel compliance status in CARB’s freight reporting system (currently under development)
  - Report to CARB which vessels permanently or regularly dock
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Incentives

• Incentives critical to achieve additional reductions beyond regulatory requirements, while providing investments into needed technologies

• **Carl Moyer Program ($78 million in FY 18/19)**
  - Fundable projects include engine repowers, verified hybrid systems, and hybrid/zero-emission technology infrastructure
  - Over 2,000 engines upgraded from Tier 0/1/2 to Tier 3 or 4 with $145 million through 2017

• **AB 617 Community Air Protection Funds ($245 million in FY 18/19)**
  - Projects will be implemented under Carl Moyer Program
  - Focus on emission reductions in communities most impacted by air pollution
Incentives (Continued)

• Volkswagen Mitigation Fund
  • Expected available in 2019, funds must be used by 2027
  • Combustion Freight and Marine ($60 million)
    o Tier 4 or Hybrid Ferry, Tugboat, and Towboat Repowers
  • Zero Emission Freight and Marine ($70 million)
    o Zero-Emission Ferry, Tugboat, and Towboat Repowers

• Other local air district programs, port programs including San Pedro Ports Technology Advancement Program (TAP) offer additional opportunities
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Solicitation of Regulatory Alternatives

• Staff are seeking early feedback on alternatives to proposed concepts

• Stakeholder input is important for Standardized Regulatory Impact Assessment
  o SRIA is required for “major regulations,” pursuant to SB 617 and the California Environmental Quality Act (CEQA)

• CARB encourages public input on alternatives that:
  o Yield the same or greater benefits than proposed regulatory concepts; or
  o Do not yield, or are less likely to yield, the same level of benefits than proposed regulatory concepts
Ongoing Activities

- Collect survey information from vessel owners/operators, facilities, engine manufacturers, and VDECS manufacturers – early 2019
  - To support environmental and economic analyses
- Complete contracts in progress – early-mid 2019
  - Vessel activity and emissions characterization by UC Berkeley
  - Tier 4 engine and retrofit feasibility study by Cal Maritime
- Outreach to VDECS manufacturers and processing of technology applications – ongoing through 2019
Key Milestones

- Additional Public Workshops in 2019
  - Discussion of refined regulatory concepts, emission inventory, solicitation of additional feedback

- Staff will post advance materials or draft documents for public input

- Staff Report and Proposed Regulation Order Posted for 45-Day Public Comment Period prior to Board Hearing
  - Includes Staff Report (Initial Statement of Reasons), Proposed Regulation Order, Draft Environmental Analysis, Standardized Regulatory Impact Assessment, Health Risk Assessment

- Board Hearing – 2020
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CARB Commercial Harbor Craft Website:  
https://www.arb.ca.gov/ports/marinevess/harborcraft.htm