California Ship and Harbor Craft Regulation Update

California Environmental Protection Agency
Air Resources Board
Programs Driving California’s Marine Vessel Program

- Diesel Risk Reduction Plan
  - 85% reduction by 2020

- Goods Movement Plan
  - Cleaner fuels, engines, add-on controls, operational controls

- Attainment of State and National Ambient Air Quality Standards
  - Most of California’s population lives in nonattainment areas
Regulation Overview

♦ Adopted by Air Resources Board*

♦ Planned or Under Development
  – Ship Main Engine Fuel Rule (expected 6/08)
  – Vessel Speed Reduction Program
  – Clean Ship Program
  – Shore-side Power II
  – Harbor Craft Rule II

*Adoption date in parentheses
Adopted Regulations for Ships and Harbor Craft
Auxiliary Engine Regulation
Applies to Auxiliary Engines and Diesel-Electrics

Motor-Ship
Main Engine for Propulsion (not covered)
Auxiliary Engines for Electricity (covered)

Diesel-Electric
Engines Provide Electricity for both Propulsion & Shipboard Uses (covered)
Auxiliary Engine Regulation
Use of Cleaner Distillate Marine Fuels within 24 Nautical Miles of California’s Coastline

♦ Effective January 1, 2007
  – Use marine gas oil (up to 1.5% sulfur ISO limit)
  – Use marine diesel oil up to 0.5% sulfur limit
  – Use equally effective emission control strategies

♦ Effective January 1, 2010
  – Use marine gas oil with a 0.1% sulfur limit
  – Use equally effective emission control strategies
  – Fuel supply review in 2008
Auxiliary Engine Rule
Estimated Emissions of Diesel PM with and without the Regulation in the 24 nm Zone

<table>
<thead>
<tr>
<th>Year</th>
<th>Diesel PM (tons/day)</th>
<th>Estimated Emission Reductions (TPD)</th>
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</thead>
<tbody>
<tr>
<td>2000</td>
<td>Without Regulation</td>
<td>6</td>
</tr>
<tr>
<td>2005</td>
<td>With Regulation</td>
<td>5</td>
</tr>
<tr>
<td>2010</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>2015</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>2020</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>2025</td>
<td></td>
<td>1</td>
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</table>

Graph showing the estimated emissions of Diesel PM over time with and without the regulation.
Shore-side Power Regulation
Affected Ships and Berths

♦ Container ships, cruise ships, and reefers
♦ Affect fleets that make more than 25 visits to a port
♦ Affected berths at each port
  – Hueneme: 3 berths
  – Los Angeles: 23 berths
  – Long Beach: 23 berths
  – Oakland: 23 berths
  – San Diego: 3 berths
  – San Francisco: 1 berth
Shore-side Power Regulation
Implementation Schedule

♦ Two compliance options
  – Grid-based power
  – Technology-neutral emission reduction

♦ Both options required to achieve:
  – 50 percent reduction in 2014
  – 70 percent reduction in 2017
  – 80 percent reduction in 2020

♦ Provide flexibility in early years for alternative technologies
Shore-side Power Regulation
PM Reductions

![Graph showing PM Reductions over time for Auxiliary Engine Fuel Regulation and Auxiliary Engine Fuel Regulation Plus Shore Power.](image)
Shore-side Power Regulation
NOx Reductions

- Auxiliary Engine Fuel Regulation
- Plus Shore Power

TPD

Commercial Harbor Craft Regulation
Summary of Rule

♦ Emission reduction focus on ferries, excursions vessels, tugboats and towboats
  – In-use engine requirements
  – Oldest highest use engines must comply first
♦ All Commercial Harbor Craft
  – New vessel and engine requirements
  – Monitoring (hour meter), reporting, and recordkeeping
Commercial Harbor Craft Regulation
In-Use Engine Requirements

♦ Existing ferries, excursion vessels, tug and towboats
♦ Tier 0 and Tier 1 engines replaced/rebuilt or retrofitted to meet Tier 2/3 emission std.
♦ Two compliance timelines
  – Statewide
  – South Coast
♦ Phased compliance schedule
  – December 31, 2009 - first compliance date
Commercial Harbor Craft Regulation
Engine Compliance Schedule

✧ Statewide
  – Begin replacing engines by 2009
  – Replace all Tier 0 engines 2009-2016
  – Replace all Tier 1 engines 2017-2022

✧ Accelerated schedule for South Coast
  – Begin replacing engines by 2009
  – Replace all Tier 0 engines 2009-2013
  – Replace all Tier 1 engines 2014-2020
Commercial Harbor Craft Regulation
New Vessel and Engine Requirements

♦ All harbor craft vessel types
♦ New build vessels
  – Install engine meeting the most current new engine standard
  – Ferries have additional BACT requirement
♦ Replacement engines on in-use vessels
  – Install engine meeting the most current new engine standard
Projected PM Reductions With and Without the Regulation

Commercial Harbor Craft Statewide PM Emissions

Calendar Year

Tons/day

Baseline

Controlled with Proposed Regulation
Projected NOx Reductions With and Without the Regulation

Commercial Harbor Craft Statewide NOx Emissions

Baseline
Controlled with Proposed Regulation
Ship & Harbor Craft Regulations
Planned or Under Development
Proposed Ship Main Engine Fuel Rule
Current Draft Proposal

♦ Similar to Ship Auxiliary Engine Regulation (use of low sulfur distillate fuel within 24 nm)

♦ Two step implementation
  – MGO; or MDO to 0.5% sulfur (2009)
  – MGO/MDO to 0.1 or 0.2% (2012)

♦ Auxiliary Boilers Included in Rule

♦ Board Hearing Expected in June
Proposed Ship Main Engine Fuel Rule Technical Investigations

♦ Lifecycle Analysis of GHG impacts

♦ Analysis of fuel properties at low sulfur levels
  – DNV data on fuel properties
  – Lubricity testing of distillate fuel samples
  – Bench testing of fuel pumps with low viscosity and/or low lubricity distillate fuel

♦ Long-term Impacts of Fuel Switching

♦ Fuel Availability Analysis
Preliminary Estimates of Emissions Reductions

PM Emissions for Main Engine by S% (Includes Auxiliary Rule)

Main Rule includes main engines and auxiliary boiler
s24 NM Boundary
Preliminary Estimates of Emissions Reductions

SOx Emissions for Main Engine by S% (Includes Auxiliary Rule)

Main Rule includes main engines and auxiliary boilers

24 NM Boundary
Clean Ship Program Concept

- Develop a program to bring cleaner new build or retrofitted ships to California ports
- Program to reduce PM and NOx per Goods Movement Plan
  - Potential technologies: SCR, scrubbers, water injection, HAM, SAM, fuel emulsification, slide valves, electronically controlled fuel injection, lube oil control, DOC’s
- Will also address greenhouse gases (GHG’s)
  - Potential technologies: advanced hull and propeller design, improved antifouling coating programs, waste heat recovery, vessel speed reduction, weather routing, wind assistive devices
# Clean Ship Program Concept

## Goods Movement Plan Reductions Schedule

<table>
<thead>
<tr>
<th>Ship Visits by Year</th>
<th>2010</th>
<th>2015</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>30% Lower than Current Standards</td>
<td>20%</td>
<td>50%</td>
<td>40%</td>
</tr>
<tr>
<td>Best Available Controls</td>
<td>--</td>
<td>25%</td>
<td>50%</td>
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Vessel Speed Reduction Program

- Existing voluntary program since 2001
  - Vessels slow to 12 knots within 20 nm of the ports of Los Angeles/Long Beach
- ARB study underway to determine whether to expand VSR
- ARB staff to present findings to Board in early 2008
Shore-side Power Regulation II
Remaining Ship Categories

- Evaluating options for ship categories not covered under existing shore-side power rule
  - Bulk vessels
  - General cargo
  - RORO
  - Tankers
Commercial Harbor Craft Rule II
Remaining Harbor Craft Categories

- Evaluating options for crew/supply boats, and pilot boats
- Coastal Districts interested in further reductions
- Not focusing on charter fishing and commercial fishing vessels
What about Greenhouse Gas Emission Reductions?

- California Global Warming Solutions Act of 2006
  - 25% reduction by 2020 (1990 level)
  - 80% below 1990 level by 2050
- Early Action Items for Marine Vessels
  - Shore-side Power Rule
  - Vessel Speed Reduction Program
- Scoping Plan Development
  - Goods movement “sector analysis” will include measures for marine vessels
# CARB Marine Vessel Contacts

<table>
<thead>
<tr>
<th>Regulation</th>
<th>Manager</th>
<th>Email Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ship Fuel Rules, Clean Ship Program, GHGs</td>
<td>Peggy Taricco, Manager Technical Analysis Section</td>
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<tr>
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<tr>
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