

# California State Senate Ports & Goods Movement Hearing

May 8, 2015

Advanced Maritime Emissions Control System (AMECS®)  
Advanced Environmental Group, LLC (AEG)



# Technology Patents

*AEG owns several patents covering the system and various aspects of the design described herein.*

*Additional patent applications have been filed with the United States and Patent and Trademark Office .*

- 8,402,746 Exhaust gas capture system for ocean going vessels
- 8,327,631 Air pollution control system for ocean-going vessels
- 8,075,651 Ellipsoid exhaust intake bonnet (EIB) for maritime emissions control system
- 7,275,366 High thermal efficiency Selective Catalytic Reduction (SCR) system
- 7,258,710 Maritime emissions control system





**Advanced Maritime Emissions  
Control System**

Dock-Based

Exhaust  
Capture  
System  
(ECS)

Emissions  
Treatment  
System  
(ETS)





Barge-Based

Advanced Maritime Emissions  
Control System

Exhaust  
Capture  
System  
(ECS)

Barge-Mounted  
Emissions  
Treatment  
System  
(ETS)





Auxiliary engines and boilers of ocean going vessels (OGVs) are used at ports for power, lighting, cargo refrigeration, ventilation, communication and other on-board equipment while berthed. They are a significant source of Particulate Matter (PM<sub>10</sub>), NO<sub>x</sub> and SO<sub>x</sub> emissions at ports.

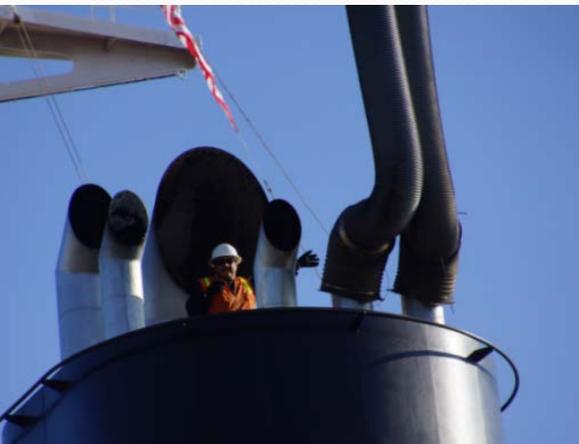


# Regulatory Response

- In response to the large quantities of harmful emissions produced by OGV, the California Air Resources Board (CARB) put in place the “At-Berth Regulation” which requires vessels to reduce emissions by 50% in 2014, increasing to 80% over the next few years.
- Two methods for achieving compliance are provided by the regulation:
- Shore Power
  - Requires over \$1.7M per ship in modifications.
  - Relies on expensive electricity.
  - Taxes an already challenged power grid
  - Takes 3-5 hours to connect and disconnect from vessels.
  - Cannot be deployed until US Customs clears the vessel.
- “Alternative Technology”
  - Only one technology has a test plan which has been approved by CARB:

# What is AMECS

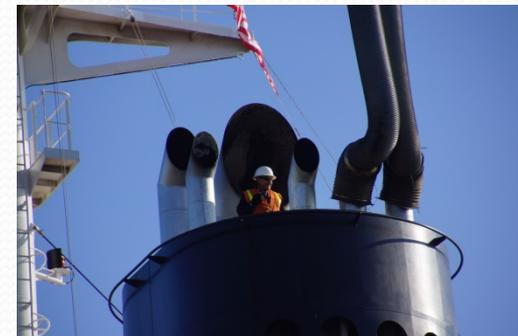
- AMECS is a state-of-the-art dock-based or barge-based system designed to capture and process exhaust emissions from the auxiliary engines and auxiliary boilers of ocean-going vessels.
- AMECS is comprised of two major components: The Exhaust Capture System (ECS) and the Emissions Treatment System (ETS). The AMECS ETS is composed of an active diesel particulate filter (DPF), selective catalytic reduction (SCR) technology, and an SO<sub>2</sub> scrubber.

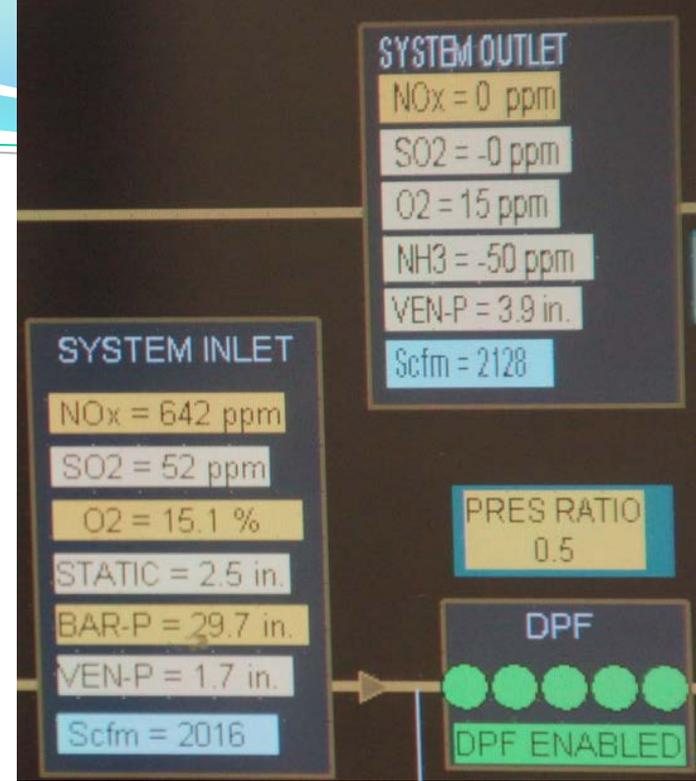


# The AMECS Solution

## AMECS:

- Is the ONLY Alternative Technology approved by pending approval with CARB.
- Is protected by numerous issued patents.
- Does not require any ship modifications.
- Does not rely on the power grid or expensive electricity.
- Deploys in minutes, not hours.
- Achieves superior environmental results.
- One third the operational cost of Shore Power.





## Proven Emission Reductions

- PM 94.5 – 98.0%
- NO<sub>x</sub> (@1.6ppm ammonia slip) 99 +%
- SO<sub>2</sub> 98.5%
- VOCs 99.5%

# Emission Reductions, aggregate

## Pollution Removed by each AMECS (tons/year)

**NO<sub>x</sub>**                    **135**    tons/year/AMECS

**SO<sub>x</sub>**                    **8.9**    tons/year/AMECS

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**PM**                    **3.2**    tons/year/AMECS

**TOTAL**                **147**    tons/year/AMECS



# Current Status

- Approved by CARB for the At-Berth Regulation.
- Treated 40+ vessels for over for 1500+ hours.
- First barge being deployed.
- Secured \$2.1M grant from the Port of Long Beach.
- Secured a three year sole-provider contract for two systems.

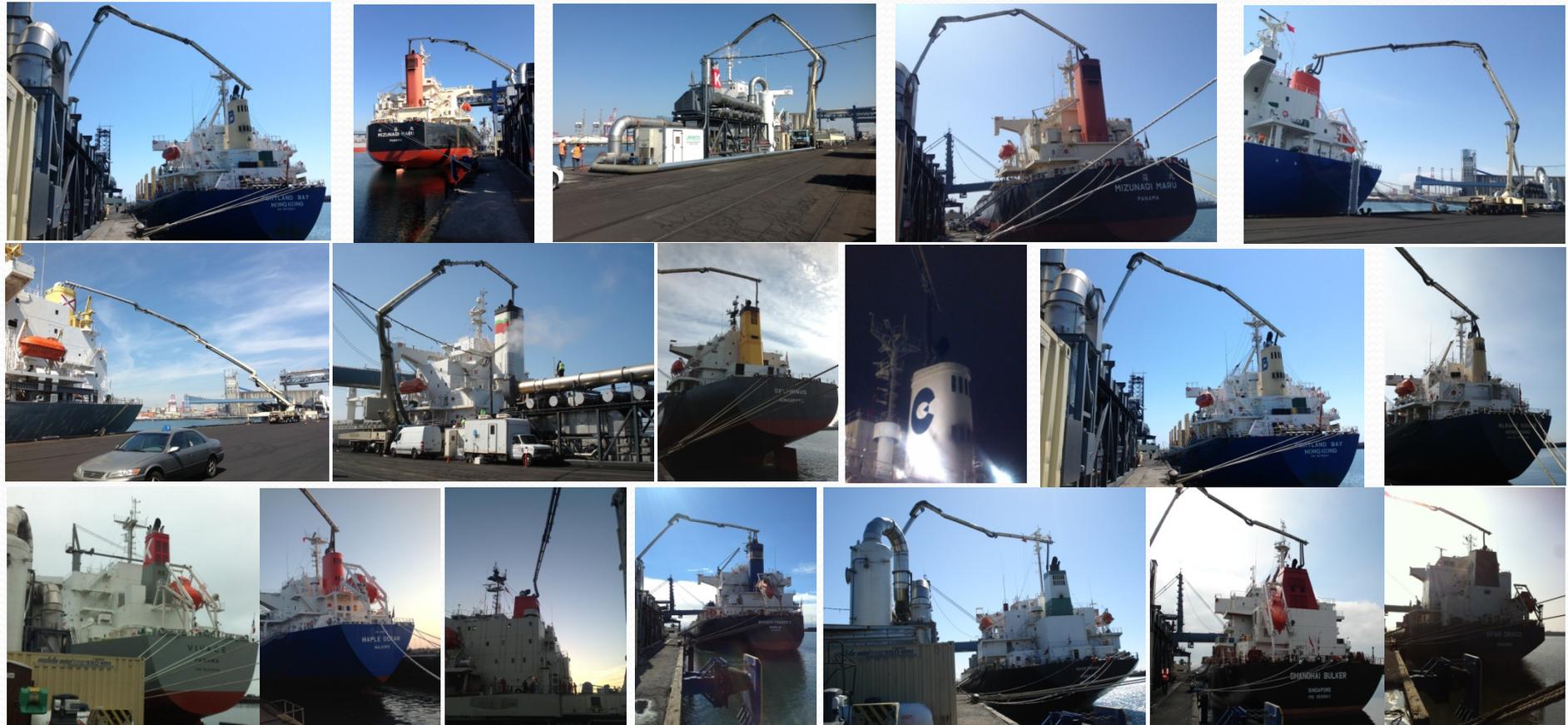


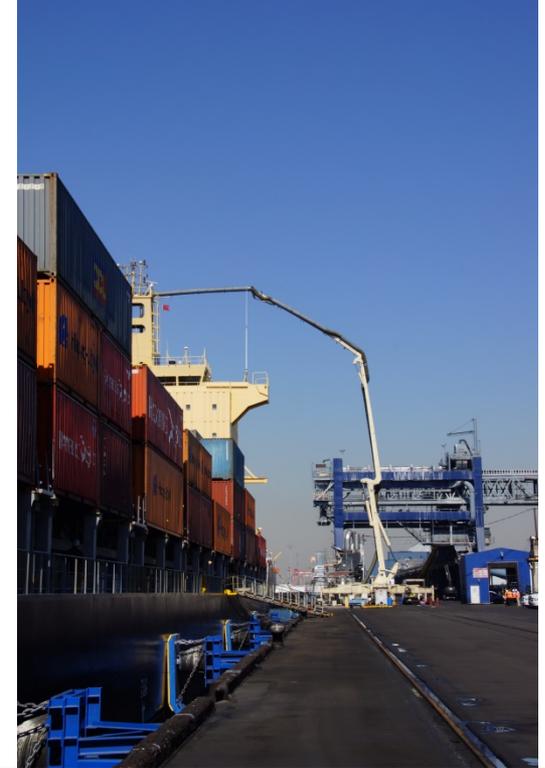
**AMECS is the ONLY Shore Power alternative that has been tested on actual vessels per CARB standards and has proven it works in all weather and on a variety of vessels.**

## ● Technology Patents Secured

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# 1,200 Hour Durability Test





- Less expensive than shore power
- No vessel or berth retrofit required
- Eliminates ship blackout concerns associated w/ grid
- Transparent to vessel operations
- Meets existing and planned regulations
- Ten years of development and testing

**MECS**  
Advanced Maritime Emissions  
Control System

# Placement Device

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# Placement Device





# Connection to Exhaust Pipes

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# AMECS Design Progression

- 2005 - Original Design
- 2006 - Locomotive Testing (Roseville)
- 2007 - Moved to Long Beach
- 2008 - OGV Testing
- 2009 - Redesigned (Lower Cost / Safer)
- 2010 - AMECS 2
  - New PM Design
  - New SO<sub>x</sub> Option
  - New Exhaust Capture Design (Direct Connect)
- 2011-2012 - System Modification
- 2012-2013 - Verification Testing
  - (1,200+ Connected Hours @ Metro Ports, G214 and G212)
- 2013 - CARB Approval
- 2014 /2015-Installation and testing on a Barge Unit





Barge mounted AMECS with a direct connection to the ship's exhaust.

# Cooperative Effort



**Advanced Maritime Emissions  
Control System**



# Questions & Answers

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