



# Population Profile of Marine Engines In the Northeast

**Northeast Diesel Collaborative –  
*Providence, RI***

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# Generating Benefits with Large Engine Repowers

## Topics Covered

Background – Why we pursued this project

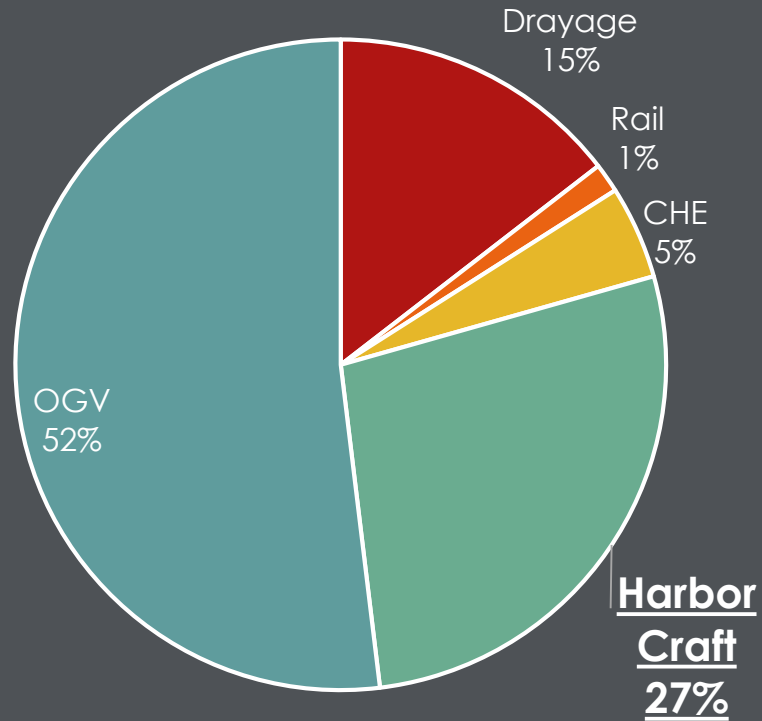
What are the benefits and how cost effective are they?

How long-lived are these assets and what are the benefits to local communities?

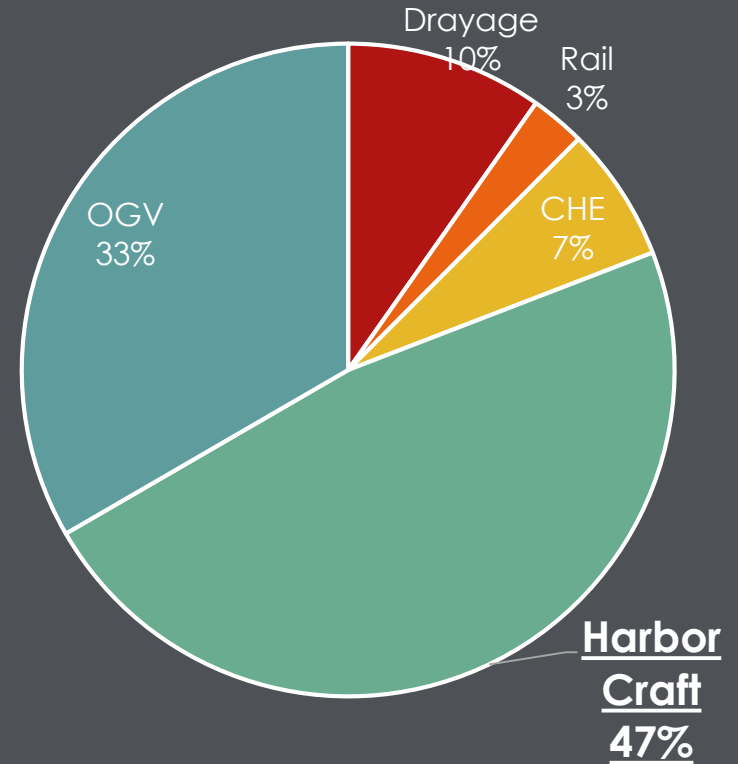


# Emission Reductions From Harbor Craft Matter

### PM 2.5 Emissions (2011)



### NOx Emissions (2011)

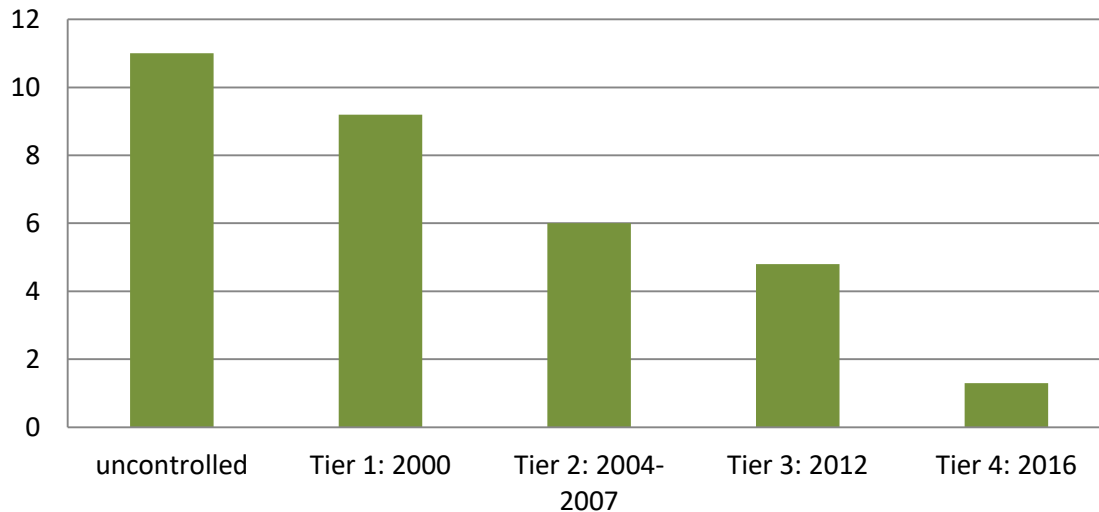


SOURCE: U.S. EPA, *National Port Strategy Assessment (2016)*



# Progress to Near Zero Emissions with Clean Diesel Workboats

88% Reduction NOx Emissions for Marine Workboats [g/Kw-Hr]



Typically 2 propulsion engines with additional auxiliary engines

## The most cost-effective upgrades make the biggest health impact

New Tier 4 engines for tug boats reduce NOx emissions by 91%

The \$2.9 billion VW Environmental Mitigation Trust provides funding to upgrade older vehicles and equipment to rapidly reduce nitrogen oxide (NOx) emissions, which contribute to hazardous smog pollution. Upgrading just one of the oldest, dirtiest tug boats is like taking tens of thousands

of passenger vehicles off the road per year, bringing substantial health benefits to at-risk communities. With states now deciding how to invest these funds, repowering these older vessels with cleaner Tier 4 engines is a game-changer for delivering immediate and cost-effective air quality benefits.



## Upgrading old engines means cleaner air for all

EPA estimates that by 2020, only 3% of tug boats will be replaced with cleaner Tier 4 engines. The VW Environmental Mitigation Trust provides a rare opportunity to retire the oldest diesel engines still in operation, which can last 50 years or longer. Tier 4 or Tier 3 engines will deliver cleaner, healthier air faster to at-risk communities. These new engines also improve fuel efficiency, which reduces CO<sub>2</sub> and black carbon emissions, two important greenhouse gas pollutants.

## Tug projects are a better value



1. Ramboll, 2018, Emission reductions and cost effectiveness for marine and locomotive projects  
 2. EPA, 2016, National Port Strategy Assessment  
 3. Tier 2 car driven 15,000 miles per year  
 4. FHWA, 2015 CMAQ Cost-Effectiveness Report

# These are the Most Cost Effective Projects to Reduce the Most Emissions for a Fixed Investment

## Phase 2 Tug Service Life Finding

- In 2008, EPA estimated that the service life of Category 2 harbor craft propulsion engines was **23 years**
- **EDF and Diesel Technology Forum report estimates that actual service life is, on average, 50 years**
- EPA estimated that the 2008 Heavy Duty Diesel Locomotive and Marine Rule would reduce NOx emissions by **333,925 tons**, assuming a 23 year average service life.
- Since Category 2 engines are operating, on average, 50 years, the actual NOx reductions are **161,167 tons, 52% weaker** than EPA predicted.

### Baltimore

Just under 1 ton per day

### New York – New Jersey

8 tons per day

### Houston

16 tons per day

# CASE STUDY

## *“Island Chief”* Workboat Engine

- 2 unregulated propulsion engines replaced with 2 Tier 3
- 1 unregulated auxiliary engine replaced with Tier 4

**Cost:** \$225,000

### **Benefits Provided**

- Reduced 3.2 tons of NOx per year
- Eliminated 400 lbs of fine particles
- Saved the operator 45,000 gallons of fuel resulting in 1,000 tons of GHG emissions

**BIG Co-Benefits**





# Summary

- **Category 2 marine engines are 2X as long lived as EPA emissions models assume.**
  - Using incentive funds to replace older marine engines faster generates more real world benefits than assumed by EPA emissions models
  - Switcher and Marine Engine Replacements are Among the Most Cost Effective Investments for Reducing Emissions on a \$/ton basis
  - More emissions can be removed for a single large engine project and deliver immediate benefits to communities

Read more about our Large Engine research:

<https://www.dieselforum.org/largeengineupgrades>





# Thank You

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