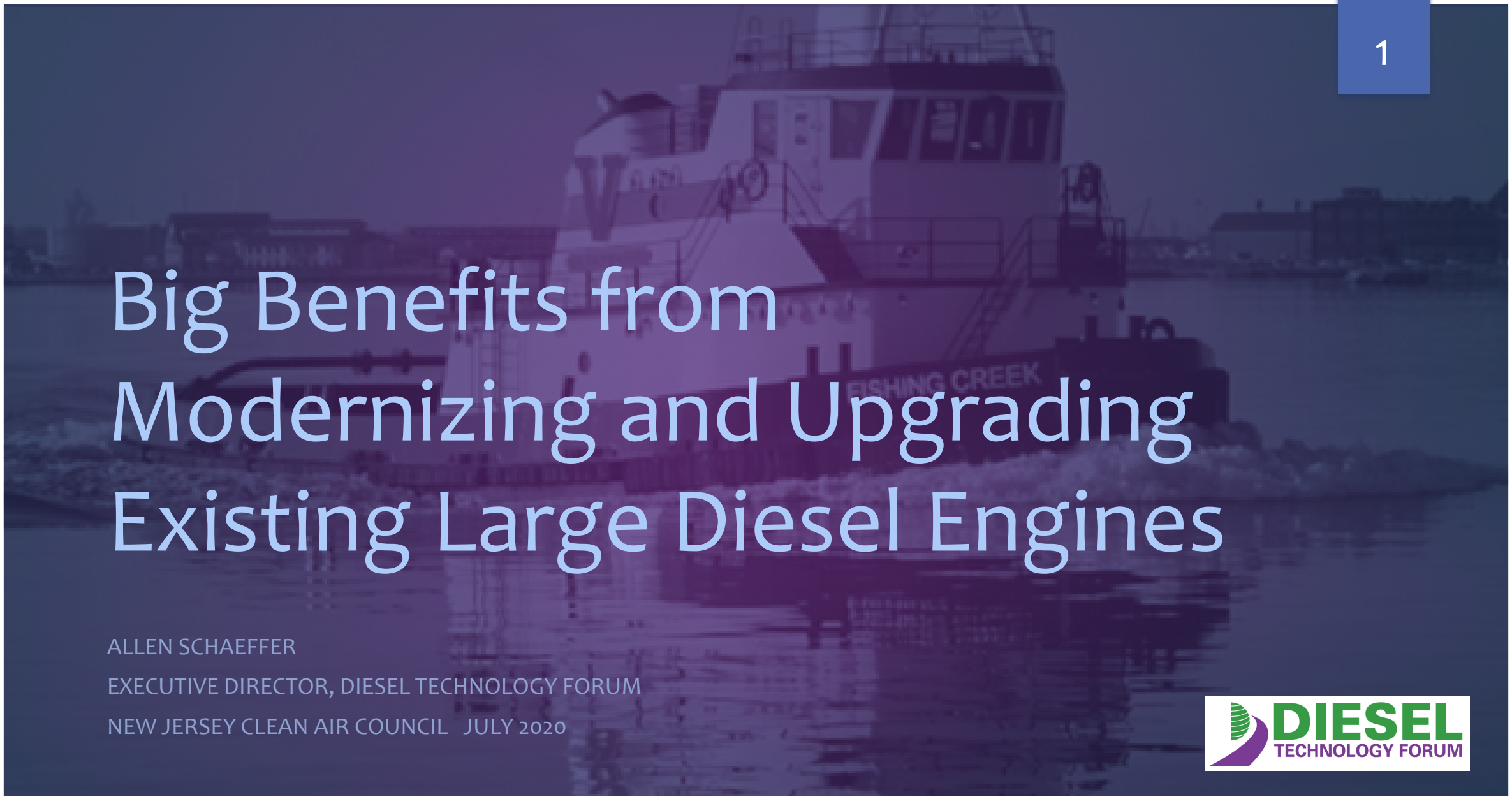


Big Benefits from Modernizing and Upgrading Existing Large Diesel Engines

ALLEN SCHAEFFER

EXECUTIVE DIRECTOR, DIESEL TECHNOLOGY FORUM

NEW JERSEY CLEAN AIR COUNCIL JULY 2020

DIESEL TECHNOLOGY FORUM

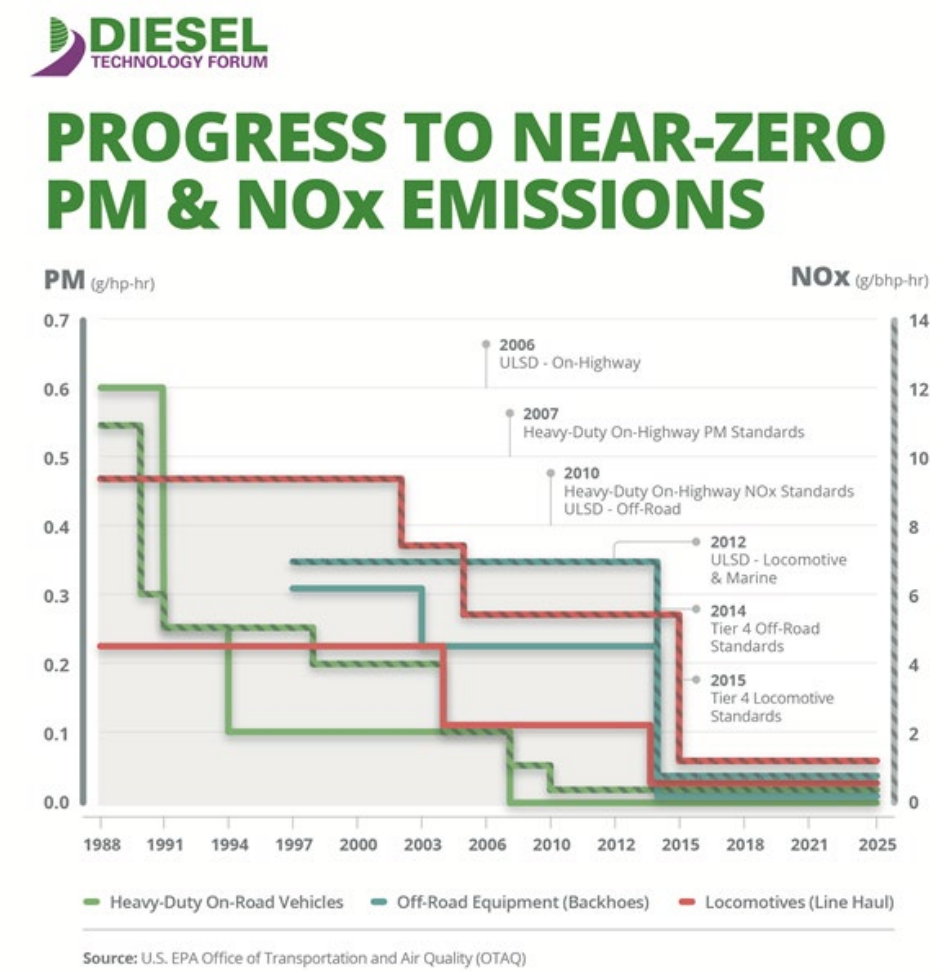
The Diesel Technology Forum Represents Leaders in Clean Diesel Fuels and Technologies.

DIESEL TECHNOLOGY FORUM

Diesel Plays an Essential Role in New Jersey

NJ Transit Places order for 334 motor coaches powered by Cummins X12 clean diesel engines

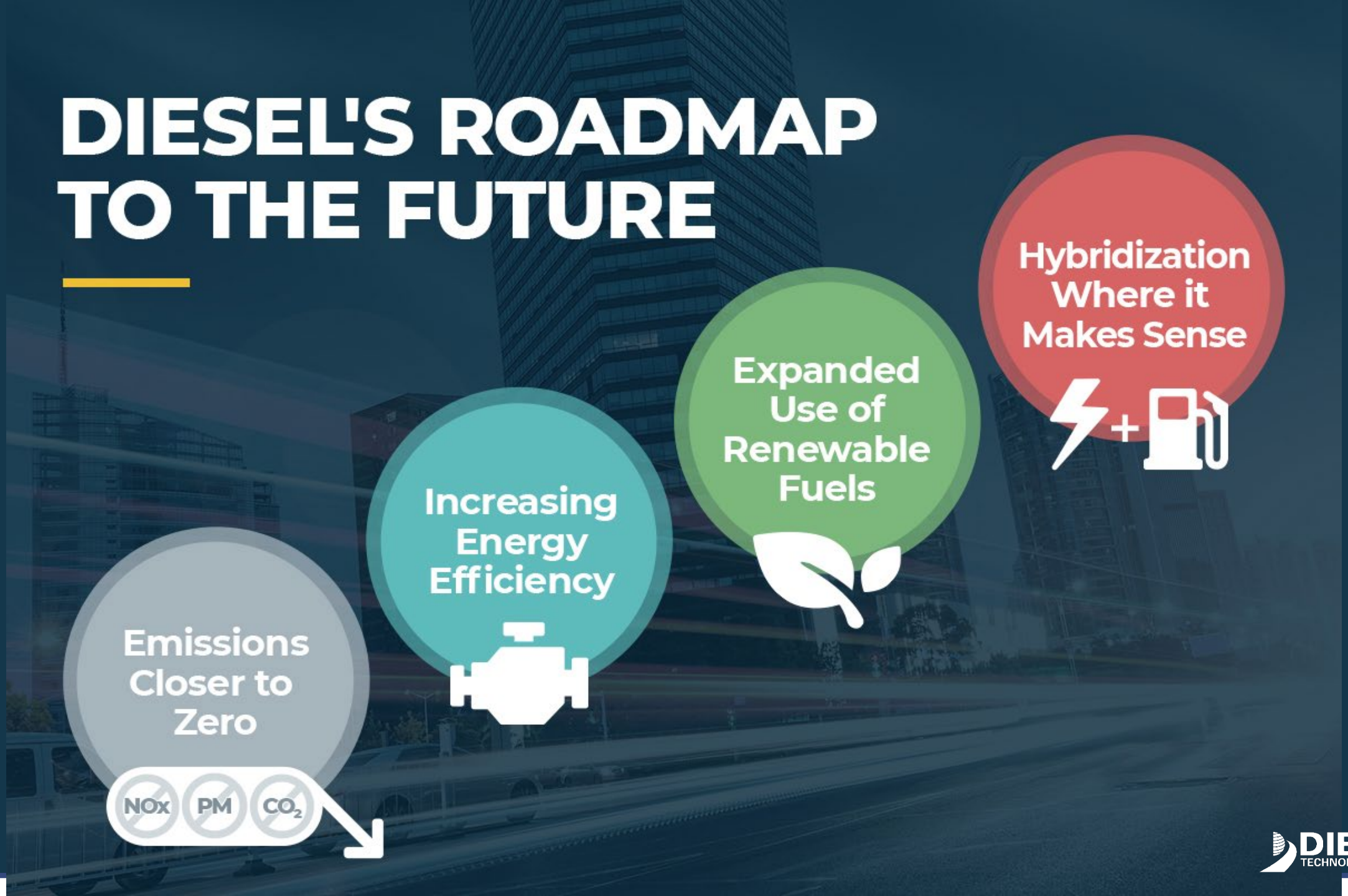
https://www.njtransit.com/pdf/NJTRANSIT_2018_Annual_Report.pdf



EPA Tailpipe Emissions Standards for Heavy-Duty On- and Off-road Applications

Today's generation of diesel technology achieves near zero emissions – all applications

DIESEL'S ROADMAP TO THE FUTURE



DIESEL TECHNOLOGY FORUM

Big Benefits from Modernizing and Upgrading Existing Large Diesel Engines

COST EFFECTIVE SOLUTIONS TO DELIVER BIG EMISSION REDUCTION BENEFITS WITH MARINE REPOWER PROJECTS

About Marine Workboats

What is a marine workboat?

- Tugs, push boats and other harbor craft that support maneuvering, positioning and Barging operations
- Fireboats and some fishing vessels
- Offshore service vessels that deliver crew and equipment and supplies supporting off-shore oil & gas operations, windfarms and other of-shore activities supply ships
- Passenger vessels including ferries and some cruise vessels

M/V NEW JERSEY

NOT ocean going vessels
NOT recreational or pleasure craft


COMFORT


EVERGREEN
LOS ANGELES City FIRE DEPARTMENT
L.A. FIREBOAT 2


FISHING CREEK


CLEVELAND
11
10

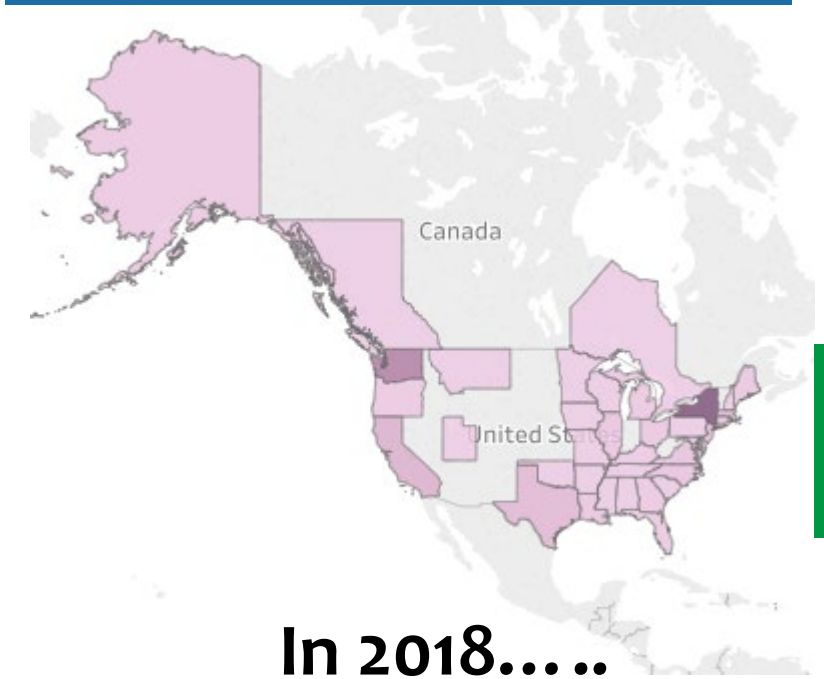

WENDELLA LTD.

Work Boat Engines: Diesel is the technology of choice

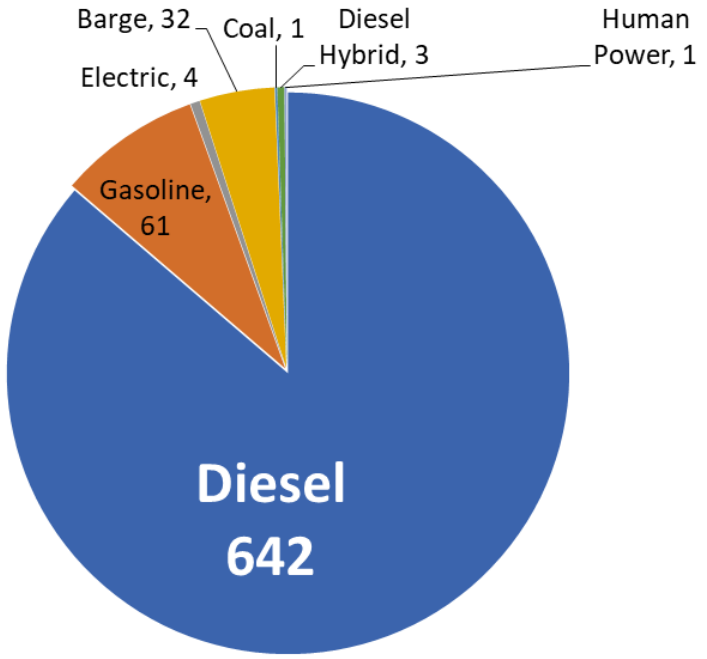
- Diesel is the technology of choice for marine workboats, due to unique combination of power, performance, efficiency reliability and durability… and most recently, near zero emissions
- Few LNG and other power systems

Passenger Vessels are Important Asset in Transportation Systems, Nearly All Are Powered by Diesel

Bureau of Transportation Statistics



39 Ferries in Operation in New Jersey



In 2018…..

92.7 million Passengers

24.1 million Vehicles

Diesel is the technology of choice for powering Ferries – 2018

"National Census of Ferryboat Operators"

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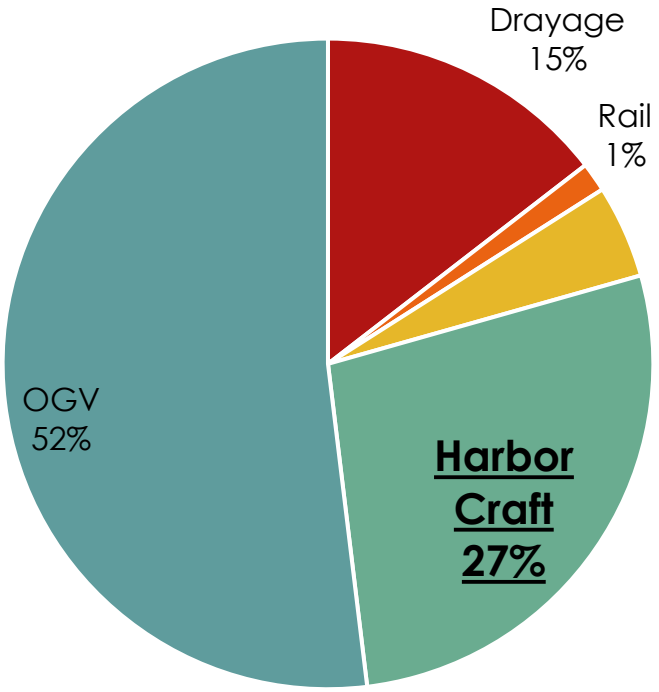
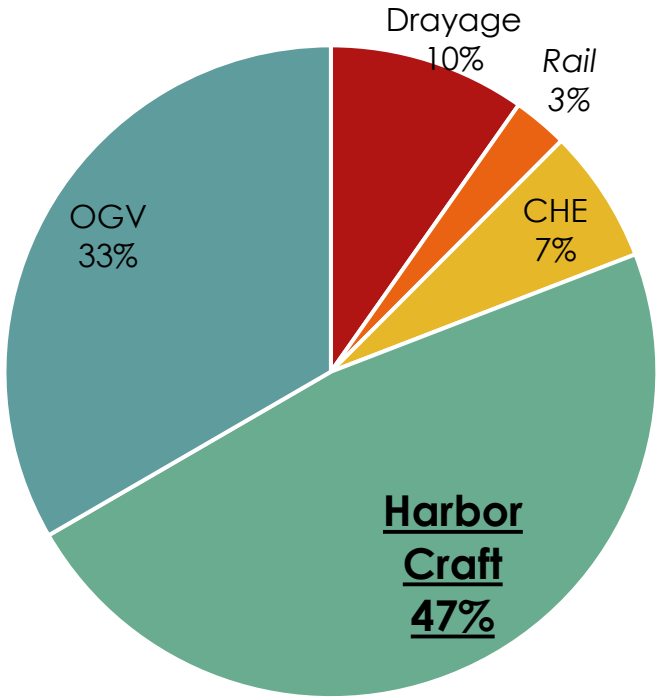
Harbor Craft are Significant Contributors to Local Emissions Inventories

PM 2.5 Emissions (2011)



Average emissions inventory for near port communities

NOx Emissions (2011)



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

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New Jersey's Near Port Communities Demand Clean Air Now

What Residents See ….

and What They Do Not See Every Day

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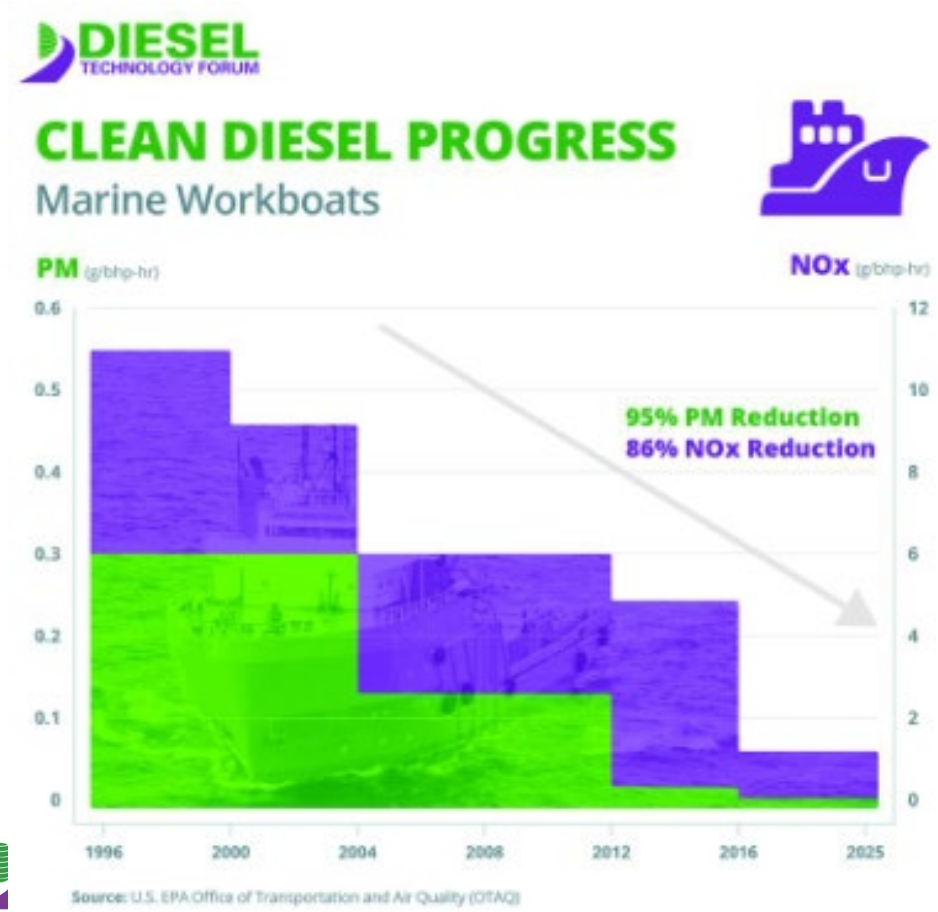
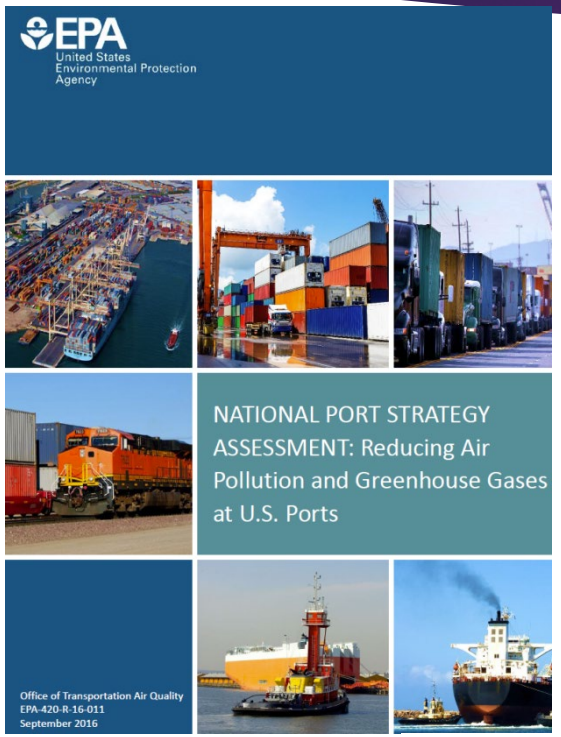
Since 2014 New Diesel Marine Engines Now Achieve Near Zero Emissions



Workboats
Typically 2 propulsion engines with additional auxiliary engines

Passenger Vessels
Large variety of vessel types with differing propulsion and auxiliary needs

Opportunity: Major Clean Air & Fuel Saving Benefits of Large Engine Repowers



- Tier 3, Tier 4 engine replacements yield substantial benefits
  - Workboat repower is similar to 96 dray truck replacements (30 tons NOx per year)
  - Switch locomotive repower is similar to 36 dray truck replacements (9 tons NOx per year)

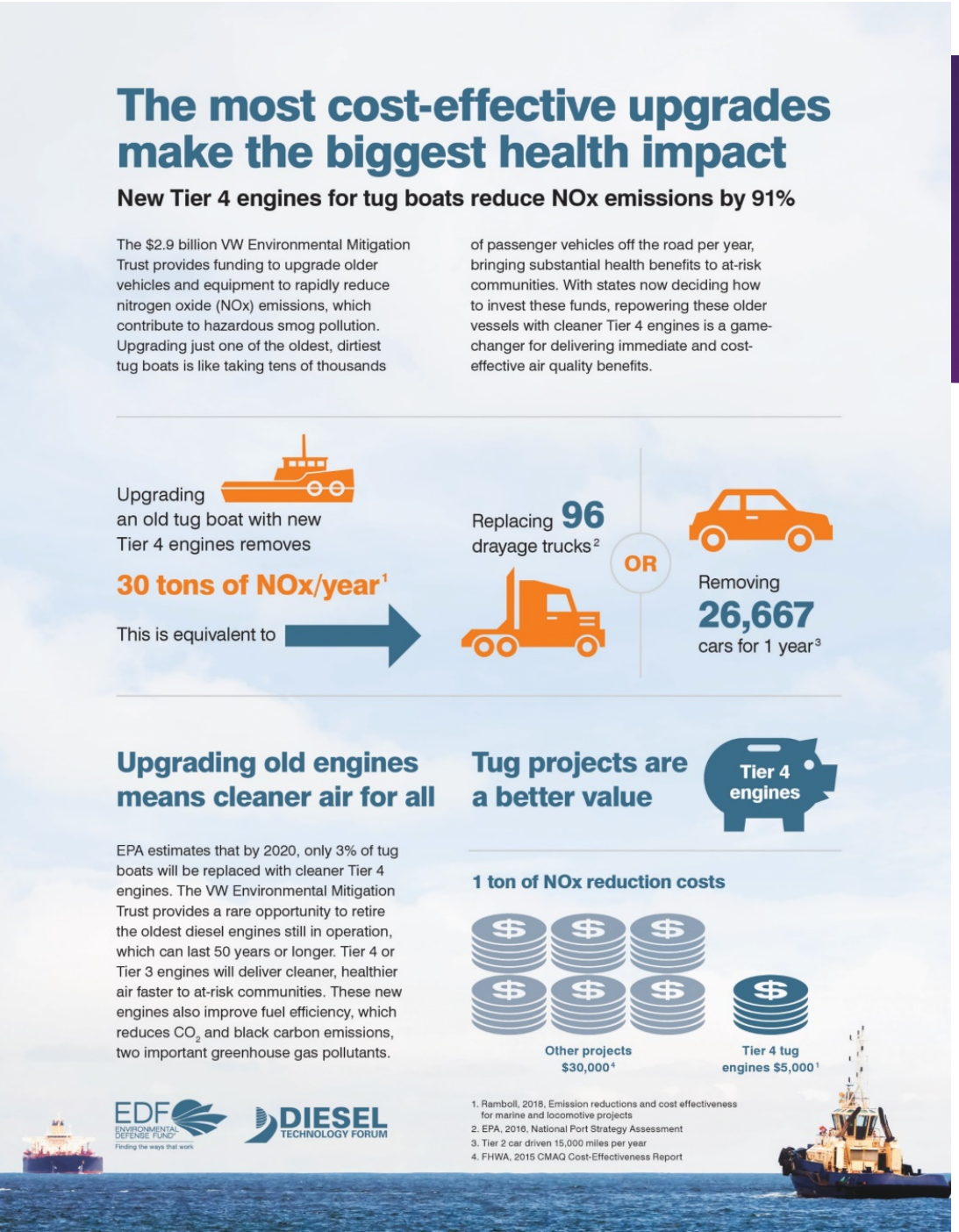
EDF ENVIRONMENTAL DEFENSE FUND®
Finding the ways that work

TERP
TEXAS EMISSIONS REDUCTION PLAN
PROGRAM OF THE TCEQ

GET MONEY TO UPGRADE OR REPLACE YOUR TRUCK OR EQUIPMENT—AND CLEAR THE AIR!

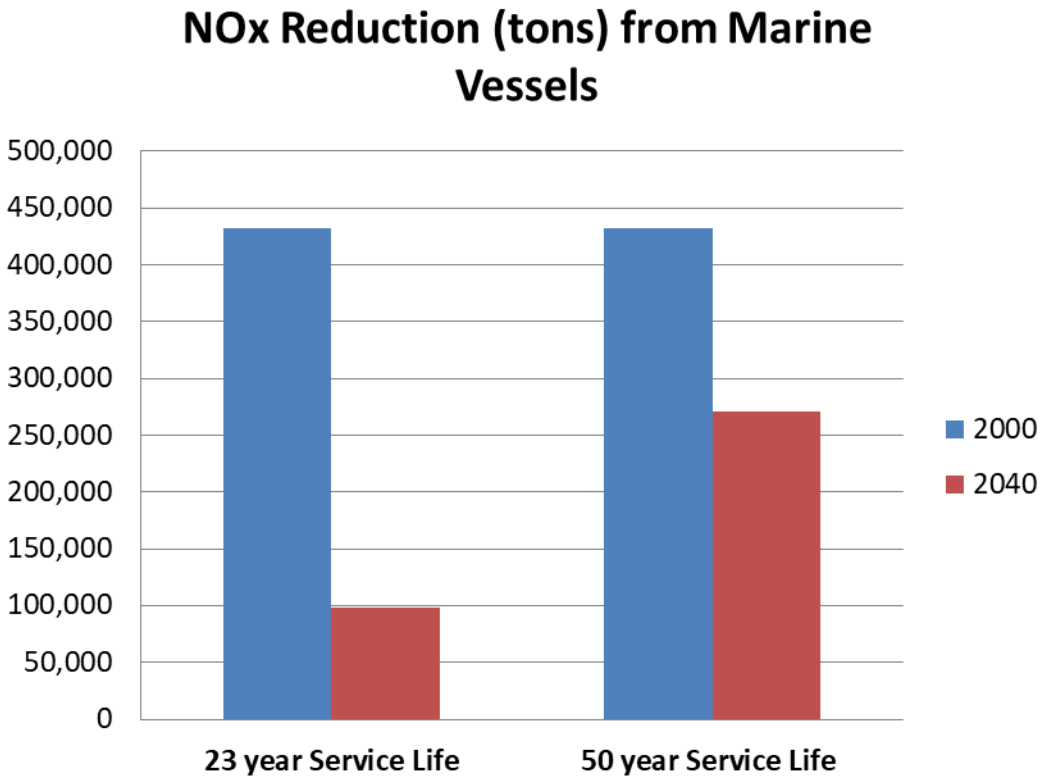
Texas Emission Reduction Program = Large engine replacements are enormously cost effective

Research Results Confirm Cost Effective Benefits From Large Engine Replacements



1 ton of NOx eliminated = $5,000

Marine Engines have Life Expectancy ~ 2X EPA Assumptions



77% NOx Reduction

37% NOx Reduction

Phase 2 Research Finding:
Marine Engines have a service life 2X as EPA emission model assume
(50 years as opposed to 23 years)

Why is this important? EPA emissions models overestimate anticipated benefits.

Introducing new clean diesel engines should be a priority to to achieve modeled benefits.

What if marine engines were replaced as quickly as EPA assumed?

New York – New Jersey
8 tons per day

But Wait… There's More… Emissions Reduction Opportunity multiplied From Advanced Biofuels

Biodiesel & Renewable Diesel fuel, what are they?

- *Advanced Biofuels* derived from waste animal fats & oils

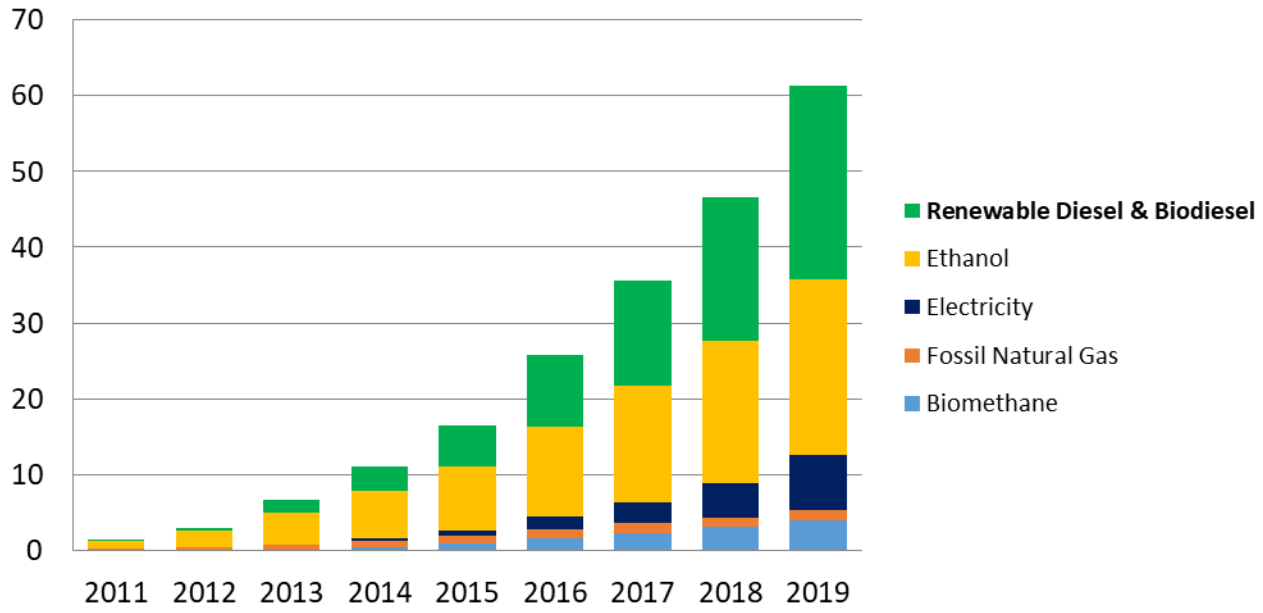
Biodiesel may be blended with petroleum diesel up to 20%

Renewable diesel fuel may be used as a 100% replacement fuel… actually meets the same engineering standard as petroleum diesel fuel

Use of Biofuels magnifies clean air and climate benefits of diesel technology

Cumulative C02 Reductions (million tons)

SOURCE: California Energy Commission, Low Carbon Fuel Standard Dashboard



Of all the fuel types and technologies, biodiesel and renewable diesel are contributing the greatest C02 reductions in California…**.and it takes a diesel engine to realize the benefits**

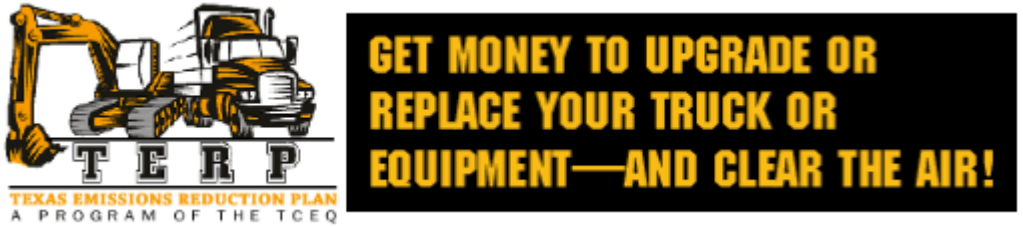
California's Experience with Low Carbon Fuels

Greenhouse Gas Emissions Reduced (2011-2018)

Renewable Diesel and Biodiesel = 25.5 million tons

Battery-Electric = 7.2 million tons

Diesel upgrades yield Texas-Sized Benefits to Texas Port Communities



2019 TERP Grant Recipients

5 Marine Vessel repower projects (Propulsion & Auxiliary)

$4.5 million in Incentive funds to deliver 388 tons of NOx reduction.

PORT CORPUS CHRISTI®

3 Vessel Repower Projects
10 propulsion engines
4 Auxiliary engines

86 tons NOX Reduction

Learn More:
https://www.tceq.texas.gov/assets/public/implementation/air/terp/reports/FY19_ERIG_Applications_Selected_for_Award_FOR_WEB_030119.pdf

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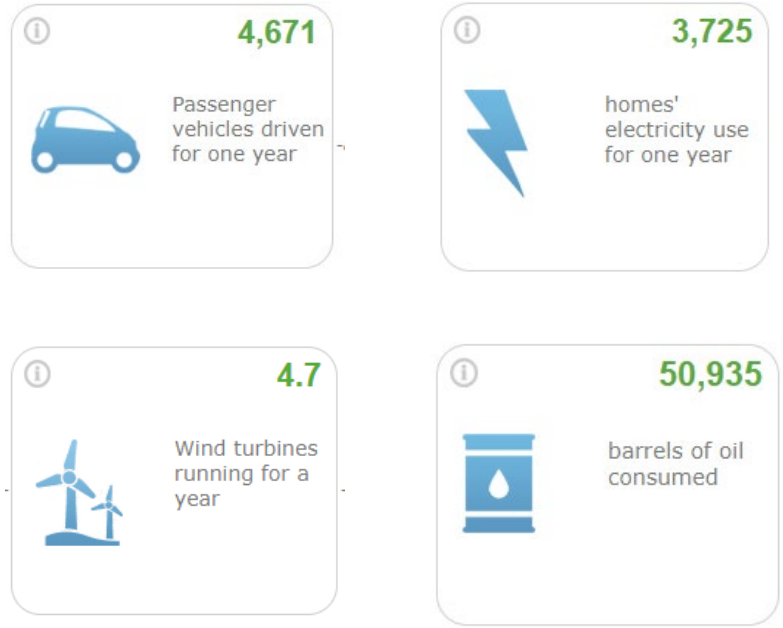
Advanced Renewable Biofuels Reduce GHG and Other Emissions

What is 22,000 tons of C02?



SF Bay ferry fleet floats toward renewable diesel

Switching the entire fleet of ferries that serve San Francisco's waterfront to renewable diesel will reduce greenhouse gas emissions by more than 22,000 metric tons per year, according to officials.

sfbay.ca ALL BAY ALL DAY
DIESEL TECHNOLOGY FORUM

More About the Benefits of the *Enhydra*

WORKBOAT

WorkBoat names its 2018 Boat of the Year

By **David Krapf** on NOVEMBER 29, 2018

The 2018 Boat of the Year was the *Enhydra*, a 600-passenger hybrid tour vessel built by **All American Marine** for **Red and White Fleet**……and it's a diesel electric hybrid.

Powered by two Tier 4 410-hp Cummins engines along with hybrid technology developed by BAE Systems

Cummins

DIESEL TECHNOLOGY FORUM

Hybridization for some applications yields further GHG and other emissions Benefits, fuel savings for operator

Ohio Environmental Protection Agency

Retire 8 Lake Erie Tugs Built Between 1897 and 1931 and replace with 4 Diesel-Hybrid Electric

"Ohio" = Twin Tier 3 MTU 1,000 HP propulsion engines
Single John Deere 65kW Genset coupled with Hybrid systems for service power

Benefits Generated:

32 tons of NOx emissions reduce
353 tons of greenhouse gas emissions eliminated

Learn More:
https://www.epa.gov/sites/production/files/2019-05/documents/ohio-ports-projects-2019-mcdi-mtg-19pp.pdf

Mix of VW Environmental Mitigation Trust & Diesel Emission Reduction Act Funds

Funding Opportunities Exist to Replace Large Engines through DERA and VW Settlement

32 projects | 9 States

OHIO – 4 vessel repowers to generate **32.7 tons** of NOx emission reductions per year
CONNECTICUT – 4 vessel repowers to generate **25.5 tons** of NOx emission reductions per year

Washington State – Converted the *Wenatchee* car ferry to diesel electric hybrid. Expected to contribute to half of the state's anticipated 3,000 tons of NOx emission reduction through VW funding opportunities.

How to Get Big Benefits from Just a Few Projects

Ohio Environmental Protection Agency

Projects Funded with VW Opportunities

10 Commercial Vehicles ---------- 2.75 tons NOx reduced

85 Trucks ---------- 30.4 tons NOx reduced

179 School Buses ---------- 33.1 tons NOx reduced

4 Vessel Replacements ---------- 32.7 tons NOx reduced

General Comments to the Clean Air Council

- Regarding the **Transportation Climate Initiative** we believe the state's "cap and invest" strategy embodied in the regional that presently excludes consideration of all non-electric alternatives should **be reconsidered and expanded to a fuel neutral approach.** Electrification of some aspects of the transportation system are envisioned but could be decades away from fruition. On the other hand, **diesel engines using low-carbon renewable biodiesel fuels can deliver substantial reductions in greenhouse gas emissions, up to 80 percent compared to conventional fuels, across the entire fleet of existing vehicles and fueling infrastructure.**

  The opportunity to make meaningful reductions in carbon emissions from diesel-powered transportation sources of all kinds would be constrained by the current approach and **we encourage a more fuel and technology-neutral approach.**

- The Port of New York and New Jersey's **truck replacement program is a success and should be boosted** in funding and expanded to continue aiding truck owners to invest in newer technology vehicles with lower emissions, that has accelerated clean air progress in the port and surrounding communities.

- We **support the state's efforts to step up enforcement against tampering with emissions controls** on diesel engines. It is important that we work together to raise awareness of the importance of ensuring emissions integrity and educate truck and vehicle owners about proper maintenance.

Summing It All Up

Diesel is the Workhorse of New Jersey's Economy

The Latest Diesel Innovations Can Reduce Emissions from Marine Vessels

Marine Vessel Engines Are the Most Cost Effective Clean Air Investments for Port Communities

Near Port Communities Get Big Clean Air Benefits by Replacing Marine Engines– NOW !

Marine Engines and Vessels are Biofuel and Hybrid Ready to Deliver Big on Climate Benefits

Thank you !

Allen Schaeffer
Executive Director
aschaeffer@dieselforum.org

Additional Resources:
www.dieselforum.org
https://www.dieselforum.org/new-jersey
https://www.dieselforum.org/largeengineupgrades