



**WEST COAST COLLABORATIVE**  
Public-private partnership to reduce diesel emissions

## West Coast Diesel Emissions Reduction Collaborative

### Bio-diesel in Small Watercraft

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Working with leaders from government, the private sector, and environmental groups the West Coast Diesel Emissions Reduction Collaborative (Collaborative) encourages projects that reduce diesel emissions. The Collaborative seeks to fund projects that are regional in scope, leverage other funds, result in real measurable reductions/results, and create momentum for future reductions. This document describes a potential Collaborative project in the Marine Sector: Bio-diesel in Small Watercraft.

#### Project at a Glance

- Projected total emissions reductions of NO<sub>x</sub>, PM<sub>2.5</sub>, Sulfur, and/or GHG is 30 percent over the life of the project.
- Project will benefit entire air shed of greater Puget Sound region, with surrounding population of approximately 2 million.
- Project will ultimately reduce emissions from Navy and other diesel powered marine vessels operating in the waterways of greater Puget Sound.
- Projected direct fuel savings of 10 percent
- Bio-diesel may not be classified as a hazardous material resulting in storage and transportation requirements having additional cost savings.

#### Problem Statement

Sustainable operation of diesel powered marine vessels on Puget Sound waterways is essential to meeting the mission requirements of the U.S. Navy and other government and private maritime organizations. Increasingly, these organizations are turning to alternative fuels such as bio-diesel to operate with lower engine emissions of particulate matter (PM), nitrogen oxides (NO<sub>x</sub>), carbon monoxide (CO), and carbon dioxide (CO<sub>2</sub>), hydrocarbons (HC), and sulfur oxides (SO<sub>x</sub>). Marine engines comprise some of the least regulated sources of diesel emissions in the U.S. Global trade and port activity are increasing, while controls on land-based air emissions are tightening, making the share of total air emissions represented by the marine industry a growing target for regulation.

Bio-diesel is the first and only alternative fuel to have a complete evaluation of emission results and potential health effects submitted to the U.S. Environmental Protection Agency (EPA) under the Clean Air Act Section 211(b). Bio-diesel is a nontoxic and biodegradable fuel made from organic fats and oils. Bio-diesel can serve as a replacement or enhancer for petroleum diesel. Bio-diesel can be blended with petroleum diesel when used in existing diesel engines with little or no modification to the engine. In blends as low as 20 percent volume (B20) bio-diesel has been shown to substantially reduce particulate and other emission pollutants and improves engine wear. Sulfur emissions are essentially eliminated with pure bio-diesel, which contains no sulfur. However, the absence of detailed government specifications and quality assurance procedures for military grade Bio-diesel hamper efforts for expanding its use.

#### Proposed Actions

Navy Region Northwest (NRNW) is initiating the use of bio-diesel in selected diesel engines. NRNW intends to evaluate bio-diesel in several applications including small watercraft (i.e. tug boats), power

generators, fire engines, construction equipment, and armored vehicles, including the long-term storage aspects. The first of these systems to be evaluated is small watercraft.

The application of bio-diesel in small watercraft will be a 12-month project to investigate the application of bio-diesel fuel as an alternative fuel component for Navy small watercraft such as tugboats. The project will be conducted in two phases. The first phase evaluates engine and fuel performance and emissions on a test stand, and the second phase evaluates performance in an actual watercraft. Engine performance as well as engine emissions will be monitored and measured. Success of the project will be measured by a substantial reduction in air emissions, potential for reduction in operating costs, and minimal or no reduction in engine performance

A detailed test protocol for evaluating bio-diesel use as a fuel in small watercraft will be developed. The goal is to reduce emissions and operating costs while maintaining performance. The test protocol developed will document the performance requirements and testing methods to be used in the bench testing and the operational testing. These protocols will be designed to aid government agencies in establishing their detailed government specifications and quality assurance procedures for military grade Bio-diesel.

The Navy will identify a small watercraft organization to evaluate the use of bio-diesel on selected watercraft. A test plan will be developed incorporating the test protocol, lessons learned from bench testing, and application specific requirements. The test plan will be executed in the testing of a pre-determined number of small watercraft. A final test report will be written and delivered to the Navy documenting assumptions, test methods, and test results.

This project will follow the international standard for project management embodied by the Project Management Institute and will be conducted by project managers formally trained in the associated methodologies of the Project Management Body of Knowledge (PMBOK). The information storage and analysis will be conducted within the rigor of Computer Maturity Model Integrated (CMMI) Level Three.

This project is anticipated to have a period of performance of 12-months and be conducted in accordance with an approved Project Management Plan (PMP) with all associated reporting.

### **Anticipated Benefits**

Several questions about bio-diesel emissions in larger engines, long-term storage issues, effects of increased fuel solvency in existing systems, on-site mixing requirements, effects of saltwater with bio-diesel, and watercraft performance characteristics have been unanswered to-date. It is anticipated that bio-diesel will reduce emissions by 30 percent of most pollutants, but that the emissions reductions will depend on the percent mixture of bio-diesel to neat diesel.

### **Estimated Costs**

With the increasing cost of diesel fuel it is estimated that a potential savings of 10 percent or more per gallon will be possible if switching to bio-diesel mixtures over neat diesel. In addition to the direct cost savings, reduced air emissions of about 30 percent are expected. The project as a whole is scalable based on the number and types of watercraft and associated marine engines involved but to achieve optimum benefit from the results, should be funded at approximately \$1,000,000 for the 12-month project.

## **Collaborative Partners**

NRNW operates several bases in the Puget Sound with port operations at Naval Base Kitsap – Bremerton as a voluntary testing organization, Manchester Fueling Station as the partner with the available fuel and fuel testing capability, and as an additional partner from the community (Port of Seattle) will be a participating on the team. Concurrent Technologies Corporation (*CTC*) a non-profit organization is targeted to do the third party testing and evaluation. Other partners for this collaborative work will be researched as the project solidifies, but may include U.S. Coast Guard, National Oceanic and Atmospheric Administration (NOAA), Washington State Ferries, etc.

## **More Information on the Collaborative and Contacts**

The West Coast Diesel Emissions Reduction Collaborative is made up of federal government agencies from the U.S., Canada and Mexico, and state and local governments and non-profit and private sector partners from California, Oregon, Washington, Alaska and British Columbia. The Collaborative's purpose is to support voluntary diesel emissions reductions, create a forum for information sharing among diesel emissions reductions advocates, and leverage significant new resources to expand voluntary diesel emissions reductions efforts.

The goal of the Collaborative is to leverage significant federal funds to reduce emissions from the most polluting diesel sources in the most affected communities and to significantly improve air quality and public health. By targeting the higher polluting engines with the most cost effective strategies, the benefits from the Collaborative are estimated to significantly outweigh the costs.

For more information on bio-diesel in small watercraft, contact: Hayden Street, U.S. Navy Region NW, 360-396-5098, [hayden.street@navy.mil](mailto:hayden.street@navy.mil), Gary Frogner, Concurrent Technologies Corporation, 360-782-5555.

For more information on the Collaborative in general, go to [www.westcoastcollaborative.org](http://www.westcoastcollaborative.org) or contact Peter Murchie, [murchie.peter@epa.gov](mailto:murchie.peter@epa.gov) or Michelle Roos, [roos.michelle@epa.gov](mailto:roos.michelle@epa.gov).