Meeting air quality goals often requires unique and innovative solutions. To meet the challenge of reducing diesel emissions in the Pacific Northwest, state, local, and regional air quality agencies have partnered with the U.S. Environmental Protection Agency (EPA) and other entities to form the West Coast Collaborative. This innovative public–private partnership is reducing diesel emissions along the U.S. West Coast. To date, West Coast Collaborative partners have implemented more than 80 projects in Washington, Oregon, Idaho, Alaska, California, Nevada, Arizona, and Hawaii. These projects represent an investment of more than US$14 million in federal funds; but the key to the success of the Collaborative lies with its partners, who have contributed more than US$40 million in leveraged funding to augment their projects and achieve significant reductions in diesel emissions.¹

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The West Coast Collaborative was the first regional pilot under EPA’s National Clean Diesel Campaign, which bridges the gap between regulations aimed at cleaning up diesel fuel and engines and voluntary efforts to clean up the existing, or “legacy,” diesel engines. These legacy engines—more than 11 million nationally—are durable and long lasting. Many would remain in service for decades without aggressive efforts to clean up or replace them with newer technologies. EPA has partnered with state and local governments, public interest groups, and industry partners to set an ambitious goal of reducing emissions from these engines by 2014, decades earlier than they would otherwise be replaced.

Cleaner diesel engines mean greatly reduced emissions of nitrogen oxides (NOₓ) and particulate matter (PM), both of which contribute to serious health problems. EPA estimates that the health benefits from reducing diesel emissions from the existing fleet outweigh the costs by up to 13-to-1, preventing hundreds of thousands of asthma attacks, millions of lost workdays, and thousands of premature deaths each year. Meeting air quality standards, improving visibility, and reducing toxic air pollutants also drive regional and national efforts to reduce diesel emissions; fuel-saving measures have the additional benefit of reducing greenhouse gas emissions.

The success of the efforts to date in the Pacific Northwest in reducing diesel emissions is a testament to the collaborative approach and the importance of partnerships. A few key examples follow that highlight this success through collaboration: efforts in Oregon to reduce fuel consumption and emissions from on-highway trucks, and efforts in Washington to reduce emissions at ports and from marine vessels.

**Oregon’s Clean Diesel Initiative**

Since 2001, the Oregon Department of Environmental Quality (ODEQ) has been promoting clean diesel efforts through a broad-based program called the Oregon Clean Diesel Initiative. While cleaner fuels and exhaust system upgrades have been a strong part of the initiative, a third element promoting energy efficiency has also proven successful. With a variety of organizations and financial incentives in Oregon already focused on energy conservation, a partnership effort quickly developed around one problem area: truck idling during rest periods. Confronting this problem has resulted in significant environmental and economic gains.

**Reducing Truck Idle Hours**

Trucking is an important part of the U.S. economy. Life on the road, however, can be hard. Many drivers are away from home for weeks at a time. The margins are slim and it isn’t economical for truckers to spend the night in motels, so they rest in their trucks. Sleeper compartments have come a long way in recent years, offering many of the comforts of home, like televisions and refrigerators. But it takes power to run this technology, and that has typically required truckers to idle their engines.

With up to 700,000 sleeper cab trucks across the country, each idling almost 1800 hours per year, the impacts can be sizeable. Long duration idling by trucks is estimated to consume approximately 960 million gallons of diesel fuel every year, costing truck operators over US$3.1 billion for fuel and an additional US$168 million for wear and tear on engines. The diesel fuel consumed by truck idling during rest periods annually represents approximately 1% of the petroleum imported into the United States and 3% of the fuel used by heavy trucks altogether. That idling also results in significant air pollution impacts: 178,000 tons of NOₓ, 4,900 tons of PM, and 9.7 million metric tons of carbon dioxide (CO₂) emitted each year.

**Truck Stop Electrification.** Initially, long duration idling was identified as an issue of interest under the Western Governors’ Climate Change Initiative. Their recommendation was to develop a string of “electrified” truck stops along the Interstate 5 (I-5) corridor, a technique to provide for infrastructure changes at truck stops that allow drivers’ comfort needs to be met more efficiently with fewer environmental impacts. It would rely upon privately-owned truck stops to refit their facilities to incorporate these technologies into their operations.

With support from the West Coast Collaborative and grant funding from EPA’s SmartWay program, a partnership was developed between the College of Engineering at Oregon State University, ODEQ, the Climate Trust, and the Oregon Department of Energy that combined state tax credits and loans with CO₂ offset funds to underwrite installation. Providing public assistance was necessary to help overcome the chicken-and-egg barrier that had stymied installations previously: truck stop operators were reluctant to install units on their sites if they didn’t see a demand for the service; truckers weren’t able to demand a service they couldn’t see in the marketplace; and technology providers found it difficult to overcome the risk to put new technology in place.

In the past year, this effort has resulted in truck stop electrification systems being installed along major freight corridors at six locations in Oregon and two in Washington, with another Oregon location coming online in 2008. These facilities are now beginning to save truckers more than US$2 million per year in operating costs, reduce NOₓ, PM, and CO₂ by a combined total of over 12,000 tons per year, and are serving as a strong foundation to support and stimulate future expansion.

**Fuel Efficiency and Diesel Retrofits**

Not all idling occurs at truck stops. Trucks still idle for long periods of time at other locations, including public rest areas, “wide spots” in the road, and distribution centers. Emissions from idling at these locations can be significant, and they are...
not addressed by an effort that focuses only on truck stops. Technological solutions for these situations exist—such as auxiliary power units, onboard cabin heaters, and battery powered systems—but many challenges have prevented widespread adoption.

**Cascade Sierra Solutions.** A pilot program started at the Lane Regional Air Protection Authority in Lane County, OR, found that over-the-road truck drivers lacked information about the best ways to reduce emissions and improve fuel economy and didn’t have the financial capability to pay for equipment upgrades. This pilot program also discovered that truckers with a good credit history were an excellent credit risk and were very responsive to a lease/purchase program for equipment that reduced fuel consumption and emissions.

From that experience, a new nonprofit organization, Cascade Sierra Solutions (CSS), was formed in March 2006 to offer a complete approach that would provide not only auxiliary power units, but all known technologies to save fuel and reduce diesel emissions. These solutions, many of them vetted as part of EPA's SmartWay Transport Partnership, include idle reduction equipment, improved aerodynamics, improved freight logistics, automatic tire inflation systems, “single wide” tires, low viscosity lubricants, weight reduction, and driver training. CSS outreach centers, conveniently accessible to truckers along the I-5 corridor, offer a variety of services, including equipment selection and sales, installation contracting and coordination, financing, monitoring, testing and reporting, as well as advice on relevant regulatory programs and financial incentives.

As a nonprofit organization, CSS can access a number of public and private grants and loans that can be packaged together, for instance, in a lease/purchase program that removes the capital investment barrier that might otherwise prevent truckers from using technology with such a strong positive return. Each truck fitted with their “SmartWay package” is expected to save up to US$15,000 in fuel costs annually while reducing over 50 tons of pollution (NOx, PM, and CO2 combined) each year.

With over 900 trucks already upgraded, CSS is well on its way to making a difference for the economy, the environment, and a trucker’s ability to get a good night’s rest in the Pacific Northwest.

**Washington Tackles Maritime Emissions**

West Coast ports allow people across North America to travel and move goods around the world. As world trade continues to grow, the Pacific Northwest economy stands to benefit further from its ports; however, many marine and port-related activities contribute significantly to regional air pollution, as described by a comprehensive air emissions inventory prepared for the Puget Sound region.

Diesel engines in ships, trains, trucks, and other equipment are the primary power source for maritime trade and the passenger transportation industry. While these engines are more efficient and cleaner than they used to be, they still emit significant amounts of sulfur oxides (SOx), PM, NOx, and CO2.

HAL and the Puget Sound Clean Air Agency are partnering on a demonstration of technology to control exhaust emissions from large cruise ships.

**Northwest Ports Clean Air Strategy**

To systematically address the public health and environmental impacts from marine and port-related activities, the Port of Seattle, the Port of Tacoma, and the Vancouver Fraser Port Authority (Vancouver, British Columbia) worked with EPA, Environment Canada, the Puget Sound Clean Air Agency, and the Washington Department of Ecology to create a clean air strategy for the three ports in the Pacific Northwest. The strategy addresses, to varying degrees, a wide range of port-related emissions, including PM, NOx, SOx, and CO2.

The strategy was completed in December 2007 and adopted by the Ports of Seattle and Tacoma in January 2008. Due to a recent consolidation of the Vancouver Port Authority, the Fraser River Port Authority, and the North Fraser Port Authority, adoption by the Port of Vancouver is expected in late 2008.

Through the strategy, all three ports are committed to improving the environment, public health, and the regional economy by reducing their impacts on air quality and climate change. The clean air strategy addresses emissions reductions through voluntary or incentive-based actions by 2010 and 2015 for each of the major marine or port-related source categories: oceangoing vessels, harbor vessels, cargo handling equipment, port trucks, and railroad locomotives. For all categories except harbor vessels, the ports have identified a performance measure as a goal and means of
measuring success. Regional regulatory agencies are also leading, in cooperation with the three ports, an effort with other regional ports and nonport emitters of diesel emissions (including harbor vessels) within the same air basin to achieve goals similar to those outlined in the strategy.

**Seawater Scrubber Demonstration Project**

Reducing emissions from marine vessels often poses unique challenges. To address this challenge, Holland America Line (HAL) and the Puget Sound Clean Air Agency are partnering with several public and private entities (including Krystallon, Environment Canada, EPA, the Port of Seattle, the Vancouver Fraser Port Authority, and the British Columbia Clean Air Research Fund) on a demonstration of technology to control exhaust emissions from a large, oceangoing cruise ship.

With financial contributions from its partners, HAL installed seawater scrubbing technology on one of the engines on the MS Zaandam, a 1500-passenger vessel, in April 2007 while the vessel was in dry dock. Additional piping and other activities were completed while the vessel was in passenger service, and the scrubber system has since been operational during service in Hawaii and along the U.S. West Coast and Canada.

Seawater scrubbing works by reacting calcium carbonate (CaCO₃) in the seawater with sulfur dioxide (SO₂) in the exhaust to form calcium sulfate (gypsum) and CO₂. This process eliminates up to 98% SO₂, 50–80% PM, and 10% NOₓ from engine exhaust. Wash water resulting from the process is treated on-ship and discharged to the sea, while solids are returned to shore for disposal.

The equipment will be tested in accordance with an environmental impact assessment plan, which was completed under the guidance of a broad-based technical advisory committee. This environmental assessment includes collection of data quantifying air emissions, water effluents, and solid waste. Limited testing has been completed and will continue through 2008.

This demonstration of marine emissions control technology is transferable not only along the U.S. West Coast, but throughout the world. It enables the use of lower cost bunker fuels instead of more costly distillate fuels, while providing significant reductions in emissions.

EPA, through the West Coast Collaborative, provided funding assistance for the project through a US$300,000 grant to the Puget Sound Clean Air Agency in August 2006. The total project cost will likely exceed US$1.3 million, and the project will extend through December 31, 2008.

**Partnerships and Funding Pave the Way**

The collaborative process has succeeded in bringing diverse stakeholders together to address the issue of reducing emissions from diesel engines in the Pacific Northwest. The future of these efforts looks bright, thanks in part to the strong partnerships already in place. An additional piece to the puzzle—funding—is now being filled under the U.S. Energy Policy Act of 2005’s title on diesel emissions, known as the Diesel Emissions Reduction Act (DERA), which authorizes up to US$200 million per year in funding for grant and loan programs aimed at reducing diesel emissions. The first DERA appropriation for nearly US$50 million was included in the fiscal year 2008 EPA budget, and President Bush’s budget request for 2009 includes an additional US$49 million for diesel emissions reductions. This funding, along with the now nationwide network of diesel collaboratives under EPA’s National Clean Diesel Campaign, provides a significant foundation for meeting EPA’s ambitious diesel emissions reduction goals.

**References**