Reducing Diesel Emissions: Projects Now Underway in Washington State

Many groups are already working to reduce diesel emissions throughout the state. Some of these include:

Washington State Local Government's Diesel Retrofits Grants Program Cities, counties, ports, and transit authorities are retrofitting their diesel fleets with $2 million funding from taxes on toxic substances, including crude oil, through the Washington State Department of Ecology. Ecology granted awards to 28 recipients to retrofit more than 900 vehicles. The retrofits, combined with the use of ultra-low sulfur diesel, reduce diesel emissions from each vehicle by 40 to 90 percent.	**Locomotive Idle Reduction** Four switchyard and short haul locomotives will be retrofitted with idle reduction equipment using $200,000 in public and Tacoma Rail funds. This will save over 42,000 gallons of diesel, eliminating 20 tons of air pollution and 550 tons of carbon dioxide, per year. In 2003, the Burlington Northern Santa Fe Railway also retrofitted three switchyard locomotives with idle reduction equipment in Vancouver, Washington.
Washington State Clean School Bus Program The Department of Ecology and the state's seven local air quality agencies have retrofitted nearly 5,000 school buses with emission reducing technology. The state legislature granted $5 million per year for five years to retrofit 100% of school buses suitable for retrofits. The retrofits, combined with readily available ultra-low sulfur diesel, reduce emissions on individual buses by 40 to 90 percent. Since 2002, a portion of the funding has also retrofitted public fleet vehicles.	**The Puget Sound Maritime Air Emissions Inventory and Diesel Emissions Reduction Project** With $410,000 in an EPA grant and matching funds, the Puget Sound Maritime Air Forum is creating an activity-based inventory of all maritime-related air emission sources in the Greater Puget Sound Region. The Port of Seattle will also implement projects that are identified as priorities in the emissions inventory project with $105,000 in EPA and matching funds.
The Puget Sound Clean Air Agency's Diesel Solutions Program The Diesel Solutions Program, an initiative to make diesel engines in the Central Puget Sound region significantly cleaner, has installed over 2,000 retrofits in nearly 50 school districts with funding from the State School Bus Program. They have also utilized more than $780,000 in EPA grants and other funding to retrofit 1,260 public fleet engines and provide funding for other regional diesel reduction projects.	**The Truck Idle Reduction Project** 75 Truck Electrified Parking (TEP) spaces will be installed at three truck stops in Washington with nearly $400,000 in funds from the EPA, Washington State Department of Ecology, Climate Trust, and private companies. This is part of a joint effort to reduce idling along the West Coast. A total of 275 parking spaces in Washington and Oregon will be electrified, saving an estimated six million gallons of diesel over five years.
Washington State Ferries' Clean Fuel Initiative With funding from EPA and the Puget Sound Clean Air Agency, Washington State Ferries began a year-long pilot test of ultra-low sulfur diesel (ULSD) on the M/V Elwha. Completing this pilot test helps users understand whether marine diesel engines can effectively burn ULSD over the long-term. It will also eliminate three tons of sulfur dioxide and approximately one-half ton of particulate matter.	**Eastern Washington Farmers Diesel Emissions Reductions** The Upper Columbia Resource Conservation & Development Council is using $500,000 in EPA and matching funds to promote no-till/direct seeding techniques for Eastern Washington farmers. The project will conserve an estimated 56,660 gallons of diesel fuel, reducing diesel emissions, and educates state farmers about the financial and environmental benefits of no-till/direct-seeding.
WSDOT Uses Biodiesel in Maintenance Vehicles In 2005, WSDOT started using five percent biodiesel (B5) mixed with regular diesel in maintenance vehicles operating in the Central Puget Sound area. B5 is now being pumped at 16 WSDOT fueling stations. By 2009, WSDOT plans to use 20 percent biodiesel (B20) in all feasible applications.	**WSDOT Maintenance Vehicle Retrofits in Yakima** With an $84,000 grant, WSDOT is working with the Yakima regional air agency, EPA, and Ecology to reduce over 30 percent of its engine and exhaust emissions on 29 maintenance vehicles. Vehicles included dump trucks, sweepers, and loaders that operate around the city of Yakima.
WSDOT Maintenance Vehicle Retrofits and Idle Reduction in Puget Sound In 2006, the Puget Sound Regional Council approved $1.5M in federal funding for WSDOT to install engine filters and exhaust retrofits on about 150 vehicles and to replace power burning incandescent lights with light emitting diodes (LED) on about 700 vehicles. LED's reduce idling pollution by allowing lights to work with the engine shut off.	**The Princess Cruise Shore Power Project at Port of Seattle** In 2004, the EPA, Princess Cruises, Port of Seattle, Puget Sound Clean Air Agency, and Seattle City Light invested in shore power technology so that two cruise ships don't have to run diesel engines while docked at port. Approximately 35 metric tons of turbine engine fuel will be eliminated per ship call by connecting to shoreside power, reducing the air emissions from dockside cruise ships in Seattle by more than a third.

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Washington State Department of Transportation

January 2007

Reducing Diesel Emissions in Washington State: Progress to Date, Future Needs and Efforts

Efforts are underway to reduce emissions from diesel exhaust in Washington. However, still more needs to be done.

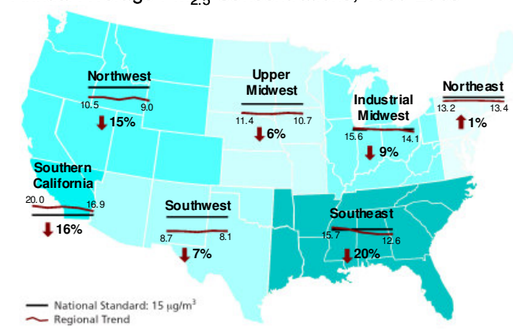
The following graphs and charts show how the US Environmental Protection Agency's (EPA) national engine and fuel rules reduce harmful emissions from diesel engines over time. However, some engines continue to produce higher levels of pollution. There are opportunities to reduce these emissions for better public health and air quality. State and local agencies in Washington State are working on many fronts to promote emission reductions as soon as possible.

Trends Show We are on the Right Track

Fine Particulate Matter ($PM_{2.5}$) Concentrations Have Been Declining Since the 1990s

Throughout the United States, the concentration of fine particulate matter ($PM_{2.5}$) in the air has been generally declining. The EPA estimates that concentrations decreased 10 percent from 1999 to 2003, and limited information suggests as much as a 30 percent decrease from 1979 to 2003. In the eastern United States, results have been achieved mostly from cleaner processes at large power plants. In the western United States, results have been achieved through reduced wood burning in homes and cleaner engines for vehicles.

National Trends in Fine Particulate Matter ($PM_{2.5}$) Emissions
Annual Average $PM_{2.5}$ Concentrations, 1999-2003

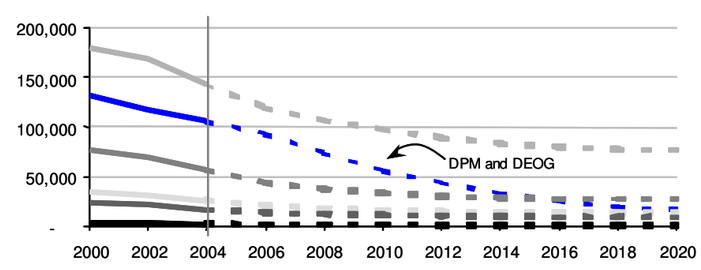


* US Environmental Protection Agency (2005)

Diesel Emissions are Projected to Decrease Even More by 2020

New engines standards and requirements for cleaner fuels will continue to decrease emissions from diesel engines in the future. At the national level, diesel emissions (measured as Diesel Particulate Matter and Diesel Organic Gases) are projected to decrease 87 percent from 2000 to 2020. Meanwhile, transportation will be growing with a projected 64 percent increase in vehicle miles traveled over the same period. However, even small quantities can be harmful so having even less of them is better.

National Trends in Mobile Source Air Toxics Emissions, 2000-2020
National Emissions (tons per year)



* Federal Highway Administration (2005)

	Percent Change From 2002 Emissions		
	2000-2004	2004-2020	Total Aggregated
Diesel Particulate Matter and Diesel Organic Gases (DPM and DEOG)	-20%	-84%	-87%
Benzene	-21%	-46%	-57%
Formaldehyde	-27%	-51%	-65%
Acetaldehyde	-25%	-49%	-62%
1,3-Butadiene	-28%	-44%	-60%
Acrolein	-27%	-49%	-63%
Vehicle Miles Traveled	10%	48%	64%

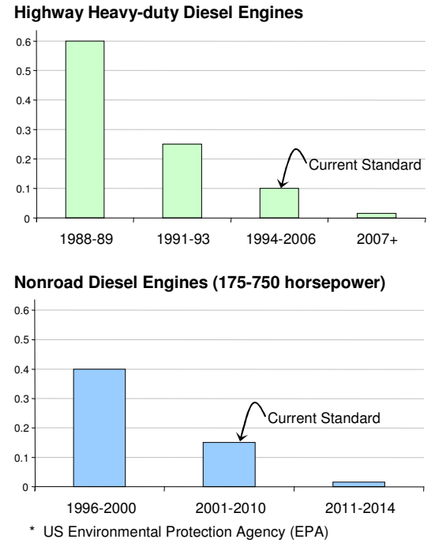
Some Diesel Engines are Releasing Lower Amounts of Toxic Pollutants - Thanks to Nationwide Standards

Trucks and buses on the highway today are much cleaner than the vehicles of 20 years ago. By comparison, engines manufactured to today's standards emit only one-sixth as much particulate matter and less than four-fifths as much NOx.

Requirements for cleaner fuels are also reducing emissions. In 2006, EPA required ultra low-sulfur diesel across the country for highway vehicles. This enables the implementation of new engine standards for heavy-duty vehicles with model years 2007 and later (EPA's 2007 Heavy-Duty Highway Engine Rule). EPA estimates that these new standards, combined, will reduce diesel pollutants from each vehicle by 90 percent.

Future diesel engines used off the highways will also be getting cleaner. EPA's 2008 Clean Air Nonroad Diesel Rule will make new engines in construction, agriculture, and industrial equipment 90 percent cleaner than they were just over a decade ago. EPA is also developing new emission requirements for trains and marine vessels.

National PM Emissions Standards by Engine Model Year
PM Grams per Brake-Horsepower-Hour (g/bhp-hr)



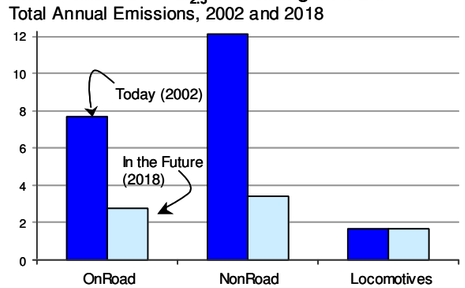
* US Environmental Protection Agency (EPA)

What Does This Mean for Washington State?

In Washington State, annual particulate matter emissions from diesel engines are projected to decrease 64 percent from 2002 to 2018. Particulate matter emissions from marine vessels are not currently projected.

Like national trends, the full benefits of new diesel fuel and engine standards will be realized over time in the state. New, cleaner vehicles will replace older models, but diesel engines last a long time and may last for another 20 to 30 years before being retired. In addition, new regulations for commercial marine emissions may have little affect on actual emissions because most ships calling in the US are foreign flag vessels (about 90 percent) and are not subject to US standards.

Diesel Sources of $PM_{2.5}$ in Washington State
Total Annual Emissions, 2002 and 2018



Does not include marine vessel emissions.

* Western Regional Air Partnership (2006)

What Strategies Can Help Reduce Diesel Emissions Sooner?

While national standards will help reduce emissions from future diesel engines, more can and should be done to reduce emissions today. There are more immediate things that the public, government, and private entities can do. These can range from turning off vehicles when not in use to replacing a whole vehicle. These "voluntary" programs and strategies often rely on public funds to offset the high cost of implementation. They also require strong cooperation between the public and private sectors. Up to 90 percent of diesel engines in the state are privately owned and operated.

Single Wide-Based Tires Reduce Fuel Use

Alternative Fuels Reduce Pollutants

Hooking Up to Power Reduces Idling

Exhaust Filters Lower Emissions from Older Diesel Engines

Strategies to Reduce Emissions From Diesel Engines Can Include:

- Technological strategies to modify a piece of equipment or its fuel.
- Operational strategies to change the way a piece of equipment is used.

Technological strategies are often summarized as the "Six Rs" – Reduce (decreasing fuel use), Refuel (using alternative fuels), Retrofit, Repair / Rebuild, Repower, and Replace. Effective strategies suggested by the EPA include:

- **Reducing** fuel use with new equipment and technologies. These offer excellent opportunities for the engine owner to save money through decreased fuel use and maintenance costs, while also reducing emissions. Some examples include equipment for idling management, truck stop electrification, single wide-based tires, automatic tire inflation systems, weight reduction, low viscosity lubricants, hybrid power train technology, and aerodynamic improvements.
- **Refueling** with alternative fuels such as biodiesel, ultra-low sulfur diesel, and compressed or liquefied natural gas. Some of these fuels require new or modified engines. Ultra-low sulfur diesel is already required for heavy-duty highway vehicles, and will soon be required for non-road diesels.
- **Retrofitting** an engine so that it produces fewer emissions than was required when the engine was built. Retrofit devices usually include crankcase and exhaust filters. Engines manufactured in the mid to late 1990s are considered good candidates for retrofits.
- **Repairing and rebuilding** an engine with routine maintenance or major engine overhauls to ensure engine performance.
- **Repowering** by replacing an old engine with a newer, cleaner model. Engines manufactured before the early 1990s are considered good candidates for engine replacements because they often cannot be retrofitted.
- **Replacing** an old vehicle or piece of equipment with a newer, cleaner model.

Operational strategies change the way that diesel vehicles and equipment operate, resulting in fewer pollutant emissions and greenhouse gases. Most of these strategies also reduce fuel use and result in lower operating costs for the equipment owner. Some examples include education about how to operate equipment more efficiently, decreased idling during mandatory truck rest stops, decreased idling while picking up and dropping off goods or people, reduced empty trips or trips linked more directly, and maintaining moderate steady speeds.

Using Strategies to Reduce Emissions

Some, or all, of these strategies can be used to reduce diesel emissions. EPA has identified sectors that provide the best opportunity to reduce air pollution from diesels. Reducing emissions from sources in these sectors may provide the best opportunities to improve air quality. Strategies target diesel engines that are a major source of emissions close to populations. Many early efforts have focused on public sector fleets because of the need to show public benefit when using public funds. The use of public funds for private entities is more challenging. The following are major sources of diesel emissions in Washington State where these strategies could reduce emissions:

- **Freight and Goods Movement** includes diesel vehicles and equipment used for long-haul and local trucking, some industrial and commercial equipment, railroads, and marine port activity. Available information for Washington State indicates that 56 percent of diesel particulate matter in 2002 came from freight transportation and goods movement. Almost all vehicles and equipment for goods movement are privately owned and operated.
- **Construction** includes equipment that is used to construct buildings and roads, such as bulldozers and backhoes. Over 18 percent of diesel particulate matter in Washington State came from construction equipment in 2002. This equipment frequently operates near human populations. Most construction equipment is privately owned and operated, although it is frequently used for public projects under contract with state and local agencies.
- **Agriculture** includes diesel powered machines and equipment used by farmers and growers. In 2002, 12 percent of diesel particulate matter in Washington State came from agricultural equipment. Usually, these emissions occur far from large populations. Machines and equipment in this sector are usually privately owned and operated.
- **Public Fleets** include public maintenance vehicles, mail trucks, garbage haulers, school buses, transit, and ferries. According to the Washington State Department of Ecology, ten percent of diesel engines and vehicles in Washington State today are public. These vehicles are most likely to operate near large or sensitive populations.