Executive Summary

The Washington State Department of Ecology (Ecology) has identified diesel exhaust as the air pollutant most harmful to public health in Washington State. Seventy percent of the cancer risk from airborne pollutants is from diesel exhaust. It makes healthy people more at risk for respiratory disease and worsens the symptoms of people with health problems such as asthma, heart disease, and lung disease. More than four million people in Washington live or work close to highways and other major roads where they are most likely to be exposed to diesel exhaust.

The harmful effects of diesel exhaust

Diesel engines emit a complex mixture of gaseous pollutants and fine particles that include over forty cancer causing substances. Diesel exhaust contains several regulated air pollutants such as oxides of nitrogen and volatile organic carbons (ozone precursors), and unregulated pollutants such as carbon dioxide (a greenhouse gas). Worst of all, diesel exhaust contains toxic microscopic particles that are less than 2.5 microns in diameter (also known as $PM_{2.5}$).

Diesel $PM_{2.5}$ poses the most serious risk from diesel exhaust because of its toxicity. $PM_{2.5}$ from diesel exhaust is more toxic than other forms of $PM_{2.5}$, such as wood smoke. Recent research shows that diesel $PM_{2.5}$ can cause very serious health effects even at levels much lower than what air quality standards allow. This is due to both the toxic nature of the particles and the fact that they can be breathed deep into the lungs where they remain lodged. Exposure to diesel $PM_{2.5}$ causes both immediate and long-term health effects. Healthy children and adults become more at risk for respiratory diseases. People with pre-existing heart disease or circulatory problems are more likely to have a heart attack or stroke. Short-term exposure to diesel exhaust can irritate the eyes, nose, and throat, and cause coughing, labored breathing, chest tightness, and wheezing. Diesel exhaust can also lead to lung cancer, as well as cancers of the bladder and soft tissues.

Ecology estimates that over 4 million people in Washington live and work very near major urban roads, where diesel engine exhaust is most common. These people can be exposed to harmful levels of diesel exhaust every day. Within these areas, there are about 4,000 day care centers, 1,500 kindergarten through grade 12 schools, 100 hospitals, and 200 nursing homes. These places all house the people most sensitive to diesel exhaust. In addition, a higher percentage of economically disadvantaged people live very near major urban roads than the population in general.

Major urban areas are not the only places where people come in contact with harmful levels of diesel exhaust. A small town near a rail yard, a rural school near a busy truck stop, and any place where a community and a major road meet – people at all these places can be exposed to harmful levels of diesel exhaust.

The federal Environmental Protection Agency recently adopted a new, more stringent, air quality standard for $PM_{2.5}$. All areas of Washington meet the old federal standard for $PM_{2.5}$, but Ecology expects some areas will not meet the new 2006 standard. Even if the new standard is met,

adverse health effects from diesel $PM_{2.5}$ occur at levels well below what is allowed by the standard.

Ecology's strategy to reduce diesel exhaust

Ecology's Air Quality Program developed this strategy to guide its work on reducing diesel exhaust. In developing this strategy, Ecology analyzed the many sources of diesel exhaust and identified the ones most likely to affect public health. The goals of this strategy are to:

- decrease the amount of diesel pollution emitted into the air; and
- reduce the negative health effects of diesel pollution, especially for:
    - children, the elderly and people whose existing health problems put them at risk (sensitive populations); and
    - economically disadvantaged communities (environmental justice communities) that are exposed to a higher amount of air pollution than the general population.

Key actions in the strategy

Address existing diesel engines

To significantly reduce diesel pollution, we must clean up emissions from the large number of existing diesel engines (pre-2007 model year). These existing engines -- with higher emissions -- have a long life span, and we expect them to continue polluting for decades. New federal engine standards require on-road diesel engines (beginning with the 2007 model year) to have very low emissions of the small particles and other pollutants in their exhaust (phased in later for non-road equipment such as construction equipment). But because the existing pre-2007 diesel engines will be around for such a long time the new engine standards will take decades to significantly reduce the adverse effects of diesel exhaust overall.

The most significant existing sources of diesel exhaust in Washington are:

- Heavy duty on-road (highway) vehicles
- Non-road construction equipment
- Marine vessels and port related equipment
- Locomotive emissions (especially at switchyards near population centers)

Ecology will use a phased approach to reduce diesel emissions from existing vehicles and equipment. This approach will first focus on reducing diesel exhaust from the above sources in areas where the most people are located. Areas with sensitive populations and economically disadvantaged communities will have priority.

Put new technologies on old engines

The first step in reducing diesel exhaust from existing engines will involve using technologies and programs that are both cost effective and relatively easy to implement:

- Installing pollution reducing technologies such as particulate filters or oxidation catalysts on existing engine exhausts – often called "exhaust retrofitting"
- Reducing vehicle idling through technologies such as auxiliary power units, electrified truck parking and operational changes
- Installing add-on technologies, such as aerodynamic fairings and single wide tires, that increase fuel efficiency, thereby decreasing diesel emissions
- Replacing older engines and vehicles

Ecology's strategy will focus on these technologies first, but other emission reducing technologies and programs will be evaluated and used where appropriate.

There are nearly 134,000 existing diesel engines in Washington that are suitable for exhaust retrofitting, idle reduction, add-on fuel efficiency technology, or vehicle and engine replacement. Nearly 90 percent of these engines are owned and operated by the private sector. Many of the public sector engines have been addressed. Proposals to address the remaining suitable public fleet are part of the Governor's 2007/2009 budget request. Funding and programs to address the private sector fleet are still needed. If the private fleet is not addressed a whole generation of Washingtonians will continue to be adversely affected by diesel pollution.

Accomplishments so far

Several projects are currently underway to help reduce diesel exhaust emissions from existing engines, mostly in the public fleet. The major Ecology directed projects are:

- The Washington Clean School Bus Program has retrofitted the exhausts of 5,000 school buses, with the remainder of the fleet scheduled to be retrofitted over the next three years.
- The Washington Local Government Diesel Grant Program has funded exhaust retrofits for more than 900 public vehicles and equipment. Additional retrofits are expected for the 2007/2008 period.
- As a demonstration project, Ecology will electrify 75 commercial truck parking spaces in Washington, so that truckers can turn off their main engines and plug in for power needed to run cab amenities and equipment while taking their rest period. This project compliments a similar effort in Oregon where 200 truck parking spaces will be electrified.

Although these projects represent a significant effort to reduce diesel emissions, much more needs to be done, especially with private sector diesel vehicles and equipment.

Next steps

The Air Quality Program is actively seeking sources of funding to install exhaust retrofits, idle reduction equipment and fuel efficiency technology on private diesel vehicles. In the past,

funding has come from federal grants, money provided by the Washington State Legislature, and private matching funds.

The Air Quality Program is also working cooperatively with the Puget Sound Clean Air Agency (PSCAA), the Ports of Tacoma and Seattle, and other agencies to develop a strategy and projects for reducing port-related diesel exhaust.

The Air Quality Program will continue to track and evaluate other technologies and programs for reducing diesel exhaust, and will implement them as appropriate.

Is reducing diesel exhaust worth the cost?

The benefits to human health outweigh the costs of reducing diesel pollution. The California Air Resources Board has found that every dollar invested in reducing diesel emissions results in three to eight dollars in savings in improved health, avoided health problems, or lower operating and maintenance costs for diesel fleets. The Union of Concerned Scientists estimates that, for every dollar invested in diesel retrofits, 9 to 16 dollars are returned to society.