



Connecticut Department of Environmental Protection (CTDEP) Diesel Risk Reduction Strategies

Background

The Connecticut Department of Environmental Protection (CTDEP) has developed programs to minimize the public health risks from the inhalation of particulate matter in the ambient air. Fine particulate matter is a complex mixture of extremely small solid and liquid particles, not only emitted directly as a product of combustion (primary PM), but it is also formed secondarily in the atmosphere from chemical reactions between gases like SO₂, NO_x and ammonia (secondary PM). Health studies have shown that concentrations of fine particulate matter, even below the level of the National Ambient Air Quality Standards (NAAQS), increase the risk of heart and lung diseases.

Since 1999, CTDEP has experienced great success in reducing sulfur dioxide (SO₂) and nitrogen oxides (NO_x) emissions from power plants in Connecticut. Several programs implemented by CTDEP have reduced power plant SO₂ emissions by 80% from 1999 levels and NO_x emissions by over 61%. As a result of the drastic emission reductions from the power plant sector¹ mobile sources, including heavy duty diesel trucks and buses, and area sources, including the combustion of home heating oil, now account for the majority of SO₂ and NO_x emissions in Connecticut. Sulfates and nitrates present in these emissions form secondary pollutants including fine particulate matter² (PM_{Fine}). In order to further protect human health and the environment and meet federal air quality standards, these source sectors must now be required to make their fair share of reductions.

Secondary components of ambient PM include ammonium sulfate, ammonium nitrate, organic aerosols and nitric acid. Control programs to reduce these particles are best directed at sources of the precursor gases. In the case of sulfates, the reduction of sulfur in fuels or the removal of SO₂ emissions at the stack of major power plants is the most effective control strategy; while NO_x emissions can also be reduced from power plant controls as well as from mobile source tailpipes and stationary engines. CTDEP and the EPA have developed numerous programs to reduce the emissions of secondary fine particle precursor gases and descriptions of these programs can be found elsewhere. The remaining focus of this discussion, however, will be on programs developed or under development to reduce primary diesel PM emissions.

Why focus on diesel emissions?

- Diesel exhaust is a significant contributor to air pollution and has been classified as a probable human carcinogen by the Environmental Protection Agency (EPA).
- Diesel engines emit high levels of NO_x and PM, and in addition, a complex mixture of gases many of which are known or suspected cancer causing agents. Diesel exhaust exacerbates asthma and causes inflammation of the airways.
- Diesel exhaust is an important contributor to airborne concentrations of fine particle pollution, especially in urban areas.
- Connecticut was the first State to recognize the potential climate impacts of diesel emissions.

¹ When compared to 1999 data, power plants have reduced SO₂ emissions by 33,109 tons per year and NO_x emissions by 7,887 tons per year based on preliminary EPA data for calendar year 2003.

² Fine particulate matter has a diameter of less than 2.5 μm (about 1/30th the diameter of a human hair).

What is DEP doing about diesel?

CTDEP has made the reduction of diesel emissions a priority and continues to move forward with a multi-faceted reduction strategy that includes stationary and mobile source applications. Measures implemented and considered include: emission reduction technology, clean fuels, education and outreach and voluntary partnerships. These strategies are targeted at school buses, off-road construction equipment, stationary diesel engines and electric generating units, and transit buses and trucks. Future sectors include barges, ferries and locomotives.

School Bus Retrofits

- 387,000 children ride 6,100 school buses each day in Connecticut. Of the 6,100 school buses, 99% run on diesel fuel.
- The amount of time a child spends on a school bus varies from 20 minutes to several hours each day.
- Children are more sensitive to air pollution due to a higher intake of air per pound of body weight than that of adults. These factors lead DEP to prioritize school buses for diesel retrofits and initiated Connecticut's Clean School Bus Program in January 2002.

Norwich - Beginning in January 2002, CTDEP partnered with the City of Norwich, Norwich Public Schools, NESCAUM, First Student Inc., other state and local agencies, and the Mohegan Tribal Nation to develop and implement a diesel technology demonstration project. This project utilized a multi-faceted approach to reducing diesel emissions from school buses including adoption of an anti-idling policy, an extensive education and outreach component, the implementation of school bus retrofits, and requiring the use of ultra-low sulfur diesel (ULSD). Thirty-two school buses were fitted with diesel oxidation catalysts (DOCs) and nine with diesel particulate filters (DPFs), and the entire fleet has been operating on (ULSD) since September of 2002.

New Haven -The New Haven School Bus Retrofit Project, launched on September 14, 2004, will reduce the diesel emissions from school buses by introducing cleaner fuels and new emission control technology. A total of 182 New Haven school buses will be retrofitted with emission control technology and run on ULSD. The emission control technologies include the use of the Donaldson Company's DOC and their Spiracle closed crankcase ventilation system, which virtually eliminates exhaust emissions from the crankcase of the engine. To further reduce emissions, a clean fuel additive, known as a fuel borne catalyst (FBC) produced by Clean Diesel Technology Inc., will be added to the ULSD, which is already in place. Emissions of fine particulate and carbon monoxide are expected to be reduced by 40 percent and hydrocarbons will be reduced by 45 percent. In addition, a small reduction in nitrogen oxides is expected.

Hartford and Bridgeport -CTDEP intends to utilize the \$1.1 million in supplemental environmental projects (SEP) money collected from an action against an out of state power plant to fund two urban school bus retrofit projects in the cities of Bridgeport and Hartford. The funding will be utilized to purchase approximately 148 DPFs and to pay for the cost differential for the use of ULSD in 308 school buses for one year.

CTDEP will continue to work with municipalities to assist in the development of proposals to secure funding from federal grants and other Supplemental Environmental Projects (SEPs). EPA recently announced the availability of funding under the Toyota SEP and CTDEP will work with state-wide organizations, and municipalities to pursue funding opportunities.

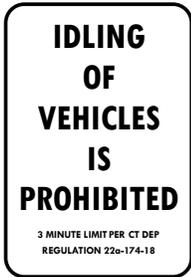
Connecticut Schools Air Quality Curriculum

Connecticut's school bus retrofit program also includes an educational component to use retrofit projects as a learning opportunity for middle school students to further understand air quality issues as part of the science curriculum. To support this effort, DEP has developed an air quality curriculum that has been utilized by the Norwich School District for two years and this year will be pilot tested in New Haven and Bridgeport.

- The Connecticut Schools Air Quality Curriculum was created to educate middle school students on the Connecticut Clean Bus Program and the need to promote clean air.

- The Connecticut Schools Air Quality Curriculum teaches students about sources of air pollution, how it affects people and the environment, and what the students can do to be leaders for the environment.
- In conjunction with a successful retrofit project in Norwich, two Norwich middle schools implemented the Connecticut Schools Air Quality Curriculum in the spring and fall of 2003.
- The Connecticut Schools Air Quality Curriculum will be implemented in several New Haven Middle Schools in the Spring of 2005.
- Boys and Girls Clubs throughout the state of Connecticut actively used activities from the Connecticut Schools Air Quality Curriculum in the summer of 2003 and 2004.

Anti-Idling



Reducing idling from school buses will help reduce diesel emissions and improve air quality around the school environment. An anti-idling policy was provided to school bus drivers statewide advising them of regulatory requirements concerning unnecessary idling. To remind school bus drivers and the general public about their obligation not to idle their vehicles, CTDEP, with the help of the Connecticut Department of Transportation (CTDOT) is introducing a new anti-idling signage program. Research has shown that constant reminders in the form of signs should significantly improve compliance rates with the CTDEP's regulatory restriction on idling. Beginning in New Haven and Norwich, CTDEP will provide a pair of anti-idling signs to Connecticut public schools for voluntary posting in school bus loading

areas. Working with the Department of Transportation (CTDOT) regulatory sign was developed to inform vehicle drivers that they may not idle for more than three minutes. These regulatory signs will also be used throughout the state to raise awareness of the idling issue at rest areas in cooperation with CTDOT.



CTDEP has also utilized enforcement tools to supplement this compliance assistance effort. Enforcement staff has lead a targeted effort to eliminate unnecessary idling at truck stops and in school bus yards. This effort conducted over the past year has yielded numerous Notice of Violations (NOVs) and increased compliance with Connecticut's anti-idling rule.

Off-Road Construction Equipment

During construction on the I-95 New Haven Harbor Crossing Corridor Improvement Program that will continue for approximately 10 years, certain off-road construction equipment will be part of a voluntary emission reduction initiative to reduce the impact on air quality that would otherwise be associated with such a large-scale, long-term construction project. Contractor requirements include:

- Use of emission control devices (such as oxidation catalysts) and/or clean fuels (such as PuriNOx) are required for: diesel-powered construction equipment, with engine horsepower (HP) ratings of 60 HP and above, that are on the project or assigned to the contract in excess of 30 days.
- Creation of truck staging zones for diesel-powered vehicles waiting to load or unload materials. The zones will be located where diesel emissions will have the least impact on abutters and the general public.
- Limiting idling to three minutes for delivery and dump trucks and other diesel-powered equipment (with some exceptions).

Heavy-Duty Diesel Truck Engines

In 2003, the Connecticut adopted a new regulation, R.C.S.A. section 22a-174-36a ("Section 36a") concerning heavy-duty diesel engines. This section establishes a program to reduce emissions from heavy-duty diesel vehicles pursuant to Section 22a-174g of the general statutes. Any new vehicle equipped with a heavy-duty diesel engine of model years 2006 and beyond sold or otherwise transferred in Connecticut must be approved for sale in

California. The Department of Motor Vehicles (DMV) will ensure compliance through the vehicle registration process. The section will prevent a significant potential increase in NO_x emissions in Connecticut from new diesel engines in calendar year 2006, estimated to be approximately 2 tons per day. Additional substantial increases would be avoided for about twenty years which is the lifetime of such diesel engines. While the reduction in NO_x emissions alone is significant, Section 36a will also result in reductions in other constituents of diesel exhaust including carbon dioxide, nitrogen compounds, carbon monoxide, sulfur compounds, hydrocarbons and toxic air pollutants.

Truck Opacity Testing

Connecticut has established a smoke-testing program for heavy-duty trucks. The Connecticut Department of Motor Vehicles (CTDMV) runs this roadside-testing program using standards provided by CTDEP. These standards are similar to those applied to light duty diesel vehicles subject to the Inspection and Maintenance (I/M) program. Those trucks that emit pollution above the standards must be repaired so that they emit pollution below the standards. Review of the test data from the program indicates that more stringent emission standards may be viable.

Diesel Engines and Other Distributed Generators

As our demand for electricity grows, new opportunities are created for satisfying this demand with smaller-scale electric system generating units distributed throughout an electrical system, referred to as "distributed generators." Distributed generators may be of many types -- microturbines, fuel cells, solar panels, reciprocating engines -- but the most common type currently in operation are high emission diesel generators.

The potential electric supply benefits of distributed generators, such as improved reliability and security and lower costs, come with air quality impacts. Operation of distributed generators is highest during May through September to supplement electricity supplies that are insufficient to meet demand. Connecticut is most likely to experience days with unhealthy air quality from exceedances of the 8-hour national standard for ozone during this time period. To address the potential air quality impact of distributed generators, DEP is in the process of adopting R.C.S.A. section 22a-174-42 (Section 42). The proposal augments and updates existing air quality regulations to ensure that clean distributed generators become available in the future and to limit the adverse impacts from existing distributed generators. Regulatory requirements applying to distributed generators are particularly important now because the number and use of such generators is anticipated to increase, particularly in southwest Connecticut where predicted electricity supply is insufficient to meet demand in summer months. Similar state regulations with consistent standards are under development in Massachusetts, Maine, Rhode Island and Delaware.

The Section 42 proposal includes requirements for emergency engines to use ultra-low sulfur fuel and to limit hours of operation. This new regulation is anticipated to be adopted and effective by January of 2005.

Future Efforts

All of these efforts on both the federal and state levels are not sufficient to reduce the public health risk from fine particle pollution. While there are legal constraints in the federal Clean Air Act on states' authority to regulate mobile sources and fuels, Connecticut needs to pursue:

- Further Reductions of the Sulfur Content in Home Heating Oil. Reducing the sulfur content of home heating oil from 3000 ppm to 500 ppm would reduce sulfur emissions in Connecticut by 10,000 tons per year. This first important step will pave the way for introducing ULSD over time and will promote the introduction of low-NO_x furnaces into the market.
- Legislative authority to issue infractions for violations of Connecticut's anti-idling regulation. With this authority CTDEP will be able to streamline the enforcement process and provide local police with an appropriate tool to address this problem.

- Promoting state-wide retrofits of construction equipment by developing preferential standards as part of the contracting process will further reduce diesel emissions and emissions of fine particles and promote the success of the cooperative public/private partnership created as part of the I-95 New Haven Harbor Crossing pilot project.
- Promote diesel retrofits and the use of clean fuels for transit buses, state owned vehicles and other privately owned fleets through cooperative partnerships and environmental leadership programs such as the Green Circle Awards. There is an opportunity to create incentives through recognition programs that encourage government and private industry to lead by example.
- Tighten diesel opacity standards that trucks are required to meet. Ontario adopted a new regulation that phases in tighter standards beginning this year and the State of New Jersey is currently evaluating the feasibility of reducing their standards by as much as 50%. Connecticut would also benefit by adopting tighter standards to address diesel emissions from trucks.
- Pursue funding opportunities for truck stop electrification. Trucks idling at rest stops for significant period of time leads to the release of excess diesel emissions that could be prevented. Investment in infrastructure at trucks stops that would allow trucks to utilize electricity for heating and cooling rather than idling diesel engines would eliminate diesel emissions from trucks at rest areas. Not only does electrification have emission reduction benefits, but also conserves fuel.
- Continue to investigate emission reduction opportunities from other sectors such as locomotives and marine engines. Several studies are currently underway to quantify the emission reduction opportunities from these sectors. When completed the results should be evaluated for opportunities to initiate pilot projects in Connecticut.