CLEAN AIR TASK FORCE

Frequently Asked Questions: "No Escape From Diesel Exhaust"

February 28, 2007

- Your study shows high levels of pollution exposure while traveling to work on a highway. Much of that pollution is from long-haul trucks. What is your campaign doing to clean up those sources?

We are calling on U.S. EPA to issue regulations that require long-haul trucks to be retrofit with state-of-the-art particulate controls whenever their engines are rebuilt. Today, that means a Diesel Particulate Filter (DPF) that can reduce truck particulate emissions by up to 90 percent. Long-haul truck engines typically are driven over a million miles and are rebuilt at least once during their useful lives. The Clean Air Act authorizes EPA to require emissions controls be installed on highway diesel vehicles whenever their engines are rebuilt.

- People are exposed to high pollution levels traveling on commuter trains and buses. Does this mean that mass transit is a dangerous way to commute?

No. In fact, electrified subways and light rail were the cleanest modes of commute. For diesel commute vehicles, transit buses are the only mode for which a substantial number of vehicles have been cleaned up. For example, our monitoring demonstrated that retrofitted transit buses in New York City and Boston, Massachusetts offered a clean ride for commuters.

- How many vehicles would need these filters in order to bring the pollution levels down to safe levels for commuters? What would that cost? Who would pay for it?

Large box and long-haul trucks (Class 5-8) consume the greatest amount of diesel fuel of all vehicles in the U.S. We often drive along with these vehicles in traffic while we commute. We are calling on U.S. EPA to require all highway trucks be retrofitted with Diesel Particulate Filters (DPFs). At the time a truck is rebuilt, retrofitting it with a DPF costs only about $2,000. These vehicles are privately-owned and the DPF installation would be paid for by the owners. For transit buses, which typically are publicly-owned, a DPF can cost $5,000-7,000, and new programs are expected to push the price lower. We would propose that this cost be paid for by a combination of federal, state, and local funding sources.

- Can DPFs make all commutes safer? What about ferry commutes. Bus commutes? Train commutes? What about the cost of other modes mentioned in the report? Commuter Trains? Ferries?

For bus commutes, see answer above. For trains and ferries: Technologies to clean up locomotives and ferries are under development with the most recent progress being the successful proof-of-concept for implementing a diesel oxidation catalyst on two-stroke diesel engines. For locomotive and ferry engines, the best current practice first includes rebuilding the engine or repowering with newer Tier 2 engines, followed by retrofitting with a Diesel Oxidation Catalyst. There is insufficient experience with these techniques (Staten Island ferry and isolated instances of locomotive retrofits) to derive a cost estimate. However, when EPA issues its new engine rules for locomotive and ferry engines in the near future, these standards are expected to drive the implementation of diesel particulate filter (DPF) technology for these applications. In the meantime, the results of the CATF study suggest the need to improve coach ventilation systems on trains, have locomotives push passenger trains to the maximum extent feasible (to avoid blow-down of the exhaust plume into the coaches), and ban the use of diesel in underground stations and tunnels.

- You are advocating for DPFs but they are so expensive that I understand the state government prefers DOCs. DOCs are 1/3 as expensive so you can get at least some reductions from many more vehicles. Do DOCs get out the same kind of pollution that DPFs do? What about HPDOCs?

Generally, the debate about DPFs vs. DOCs has arisen in the context of school buses, but this was before the widespread availability of ULSD fuel which is required to make DPFs operate properly. There is a concern about pollution coming ***inside*** the bus as well, and a DOC does not eliminate the ultrafine pollution that is of greatest concern. So, to better protect public health, now that the availability of ULSD allows for DPFs, the best solution to most on-road diesel engines would be to install a DPF. In Boston, New York, Seattle, and other cities that have retrofitted transit buses, the preference has historically been for the DPF which is capable of cutting diesel particulate matter by 85 percent or more. As to HPDOCs, CATF has not monitored the benefits of these "flow-through" devices in this study. We cannot comment on their effectiveness in reducing commuter exposures, but they are certified to reduce only 50 percent of diesel particulate matter versus 90 percent from a DPF.

- What about biodiesel? Is that a solution? How about other bio-fuels like ethanol?

Biodiesel in its pure form at 100% (B100) may reduce fine particles beyond those reduced by today's Ultra Low Sulfur Diesel fuel. However, running B100

presents engineering challenges due to its solvency. CATF conducted preliminary monitoring while following biodiesel-fueled (i.e., B90) buses without emission control retrofits in Columbus, Ohio and still registered high levels of ultrafine particles in a car following behind. PM2.5 results were inconclusive. This issue merits further study.

- Do these higher pollution levels occur only during the rush hour commute?

Elevated fine particle levels were a function of the presence of diesel trucks on the roadway with the monitoring vehicle. During commute hours, we found particle levels in commuter cars average, over the course of many runs, four times higher than in the outdoor air in the test cities. Short term spikes were about 30 times as high. There is some anecdotal evidence that when possible trucks tend to avoid commuter rush hour—we found that when that was the case, particle levels in commuter cars approached outdoor background levels, despite heavy automobile traffic. So, non-commute hours may entail even higher levels of particles on these roadways.

- What should families do to protect themselves?

Overall, the best solution to the problem of commuter exposure to diesel exhaust is to clean up the existing diesel fleet with particulate filters (DPFs) that reduce 85% or more of this pollution. Until then, commuters can help protect themselves by taking clean transit, such as electrified subways and light rail. If you must drive to work, choose commuter routes that are less heavily traveled by trucks. To reduce your exposure when in traffic, our study suggests that you should close your windows and set your ventilation system to recirculate the cabin air.

- Page 4 of the report indicates that adding a DPF to a transit bus reduces the ultrafine particles in the passenger cabin. Your campaign has been lobbying to commit a lot of money to put DPFs on all transit buses to protect public health, but this study shows that even if we did that there would still be pollution on the buses from trucks that we can't do anything about. So what's the point in spending money to put DPFs on transit buses?

The study shows that in-cabin levels of diesel particles were substantially lower on transit buses retrofitted diesel particulate filters than on conventional buses, sometimes even lower than the outdoor air. However, when the buses' windows were open, we did monitor particles from other diesel vehicles in the roadway. To ensure a clean ride, transit buses and trucks should be retrofitted with DPFs.

- How can pollution from the back of the bus get inside the bus?

When the bus is underway, the exhaust plume trails behind. Based on our in-depth school bus study (http://www.catf.us/publications/view/82), when the bus stops, the exhaust plume may overtake the bus especially when wind is from the

rear of the bus, just as the doors are opened to let passengers on and off. The diesel exhaust infiltrates the bus through the open doors and is trapped inside when the doors close again. Exhaust levels typically build up over the course of a run with levels spiking at stops.

- Should people stay away from subways?

Relative to combustion-related pollutants, subways are among the cleanest modes of commutes for passengers because they are electric.

- How do you know that diesel pollution is causing all of the health effects?

In February 2005 CATF, using EPA Science Advisory Board-approved methodology, estimated that the particle emissions from diesel engines shorten the lives of 21,000 Americans each year while power plant pollution is responsible for 24,000 premature deaths. So, nationally, many pollution-related deaths are attributable to sources other than diesels. However, our commuter study found that for people who commute to and from work, over half of their exposure to fine particles (from whatever source) occurs during their commutes.

- If I get asthma attacks on the bus now, will my asthma symptoms disappear if they put a DPF on the bus?

Based on many medical studies of particles and heath, lower particles exposure should result in reduced risk for those asthmatics that are sensitive to diesel fumes.

- In terms of school buses people talk a lot about utilizing Closed Crankcase Ventilation systems (CCVs) to reduce pollution getting inside the bus cabin. I don't see this technology mentioned in the "No Escape" report, I assume that's because its not feasible for any of the different modes of transit mentioned (bus, train, or ferry)? What about on trucks to protect the truck driver's health?

CATF has not investigated the pollution source and plume dynamics of transit buses as closely as we have school buses. However, based on our experience, CCVs are most important in the front engine vehicles such as school buses where the crankcase is by the front door allowing particulate matter to enter the bus through the door. Transit buses typically are rear engine vehicles for which crankcases may not pose as much risk. In front engine vehicles, crankcases can be a significant source of particle pollution and should indeed be addressed by CCV technologies. For front engine vehicles, we suspect CCVs will have a direct benefit, for example for truck and bus drivers that were not a focus of the present investigation.

- In an area with a heavy concentration of coal- fired power plants, aren't the background levels for particulate matter already high? How many of these deaths and diseases come from power plants and not from being exposed to diesel during your daily commute?"

Exposures when commuting are a combination of background pollution (like power plants and industry) and diesels in the road. Our report is focused on the incremental additional exposures due to diesels on the road. CATF's data is presented as "net" data with the regional background subtracted so the exposures shown on the highway, rail and bus commutes etc are just the part of the exposure due to that mode of transit. The total exposure (especially PM2.5, when outdoor levels are high) is the combination of regional pollution that is augmented by the commuter's near-field exposure to diesel pollution sources. Moreover, the other pollutants (ultrafine particles, black carbon and PAH) were very low in the outdoors. They are not typically regional pollutants like PM2.5, but instead are caused by local diesel combustion sources.

Furthermore, with regard to the applicability of the report results to areas with a high concentration of coal-fired power plants, we did a commuter profile for Columbus, Ohio (see report page 9) to demonstrate that in an area whose particulate levels are thought to be dominated by coal-fired power plant emissions the vast majority of daily particle exposure still occurs during commutes. In Columbus, we found that although commuting comprises up to only 4% of the day, 55% of ultrafine particle exposure came during those commutes.

In fact the average outdoor air in Columbus was "dirtier" on the few days we monitored than in the other cities on the days on which we monitored there. The source of this additional pollution in the air was likely regional background particle pollution from power plants and from local factories because the control monitors we used to measure the ambient outdoor background air were located in a site in Columbus well removed from busy roadways and direct diesel pollution. However, the bar charts on page 9 show how much additional pollution we measured in the cars in Columbus above and beyond the average levels in the outdoor air. For ultrafines, black carbon, and PAH's (good markers of diesel exhaust), the pollution exposure levels during the commute were much higher than the ambient outdoor levels. For PM2.5, levels averaged higher than the diesel exposures principally because of one particularly bad day where ambient outdoor levels exceeded 100 ug/m3 (micrograms per cubic meter) and had a strong effect on air inside the vehicle. In fact, PM2.5 levels inside the car with windows closed and recirculation on, were, on that day, much lower than the outdoor air.

- How do these exposure levels relate to the federal particle standards in terms of health risk and attainment?

EPA has set National Ambient Air Quality Standards (NAAQS) for fine particles (PM2.5), but not for ultrafine particles, PAH and black carbon, so there are no health protections currently in place for the other 3 pollutants tracked in this study

There are two PM2.5 standards, a 24 hour daily standard of 35 ug/m3 and an annual average standard of 15 ug/m3. PM2.5 monitors air quality in the larger more populated US cities, but in fact, these monitors are few and far between and are only capable of tracking air in a small area near the monitor. Exposure studies consistently show that your exposure is much greater if you are exposed to localized sources of air pollution, sometimes referred to as "hot spots" such as if you live by a busy roadway. CATF's study, in fact, shows that exposures can be much higher than the daily standards over shorter time frames. Importantly most of your exposure to particles may come when you commute—and commute exposures can be much higher than the regional PM2.5 background tracked by the few PM2.5 sites. For chronic health impacts like premature mortality, chronic bronchitis, etc. long-term cumulative exposures are important. If Americans' lives are being shortened by a lifetime of exposure to fine particles and most of this exposure is coming during their commutes, then commute exposures pose a serious and significant health risk.

- You say that 70,000 people die a year from fine particles, "such as those found in diesel exhaust." How many of these deaths are due to diesel pollution? What are other sources of these fine particles and what proportions of premature deaths do they represent? Why are you so focused on diesel pollution?

About a year ago, CATF released its report: 'Diesel and Health in America: The Lingering Threat" based on a study by Abt Associates using U.S. EPA Science Advisory Board-approved methodology which estimated that 21,000 premature deaths per year are attributable to diesel particulate matter. Other sources of fine particles include all sources of fossil-fuel combustion such as power plants and industrial facilities. Automobiles and other light-duty vehicles are responsible for some portion of the total as well. CATF advocates for policy reforms that would address emissions from each of these sectors as well.

- Although you say "fine particles" in the first paragraph of the Executive Summary, you talk about exposure to "ultrafine particles" while commuting. How do these compare, and how many people die prematurely from "ultrafine particles"? Are ultrafine particles the unhealthy particles?

Ultrafine particles are a subset of fine particles. A growing body of scientific literature links ultrafine particles with adverse health effects. Many researchers now believe that ultrafine particles may be the most dangerous because they are small enough to pass through the lungs into the bloodstream.

- I've heard about PM10 and PM2.5. How do these relate to your study?

We measured PM2.5, not PM10 which is largely made up of road dust and other crustal material.

- My area is out of attainment for PM 2.5. Will following your recommendations get us into attainment?

Reducing diesel PM2.5 through retrofitting existing diesel engines with best available controls likely will be an important attainment strategy for areas with chronic PM2.5 nonattainment problems that are due to urban particle pollution (as opposed to regional background pollution from power plants and other stationary sources.

- My area is in attainment for PM 2.5, so the US government says we are healthy enough. Why should we implement your recommendations?

To learn your risk from diesel particles at www.catf.us/goto/dieselhealth and plug in your zip code. Also, see the answer above relative to "hot spots"

- You show "box" trucks in your study. We have a lot of those on our roads here. What can we do to control their pollution? What authority do we have over them?

Retrofitting existing box trucks with diesel particulate filters is an effective, affordable solution to the particle pollution from these vehicles. We are calling on the U.S. EPA to issue regulations requiring that all on-road diesel engines retrofit with DPFs whenever they rebuild their engines. States can also require that these trucks install retrofits as part of state legislation, regulations, and/or as part of their attainment strategies.

- Can a state mandate that all these sources (buses, truck, ferries, trains, etc) be cleaned up? What authority/jurisdiction is there for actions on each of the sectors you highlight in your report? If the state can't clean them all up, can the federal government?

Yes, states can mandate the clean up of all on-road vehicles. For locomotive and marine engines, states can only adopt regulations adopted by California, if any. California in the next year is expected to issue a "harbor craft" rule that will cover ferries. To date, California has proposed only a "voluntary" approach to existing locomotives through a "memorandum of understanding" with industry that may not be able to be adopted outside of California. As mentioned above, U.S. EPA is expected to issue regulations for locomotives and marine vessels that should help address emissions from the existing locomotives and marine vessels in service today.

- I thought a new federal law went into effect in January that cleaned up diesels. Why is this still a problem?

EPA's new highway diesel engine rules apply only to ***new*** diesel engines beginning in the current (2007) model year. There are 13 million diesel engines in service today, and virtually all of them are exempt from pollution controls.

- What other rules or regulations are already in the pipeline to clean up the various sectors you mentioned?

For coal-fired power plants in the Eastern U.S., U.S. EPA has issued the "Clean Air Interstate Rule" (CAIR) that is expected to reduce substantially the fine particle pollution due to power plant nitrogen and sulfur emissions. U.S. EPA has issued new car emission standards (Tier 2) to reduce pollutants from light-duty vehicles.

- Don't Diesel Particulate Filter's require extra maintenance?

Diesel Particulate Filters should require minimal maintenance during their useful lives, namely regular cleaning out of any carbon accumulated in the unit. Most vendors will provide this service for a small fee.

- When you report the 4-8 times greater exposure level during the commute than during in the average outdoor air, how is the situation when this is measured? Are the windows open, closed, etc?

Windows open. With windows closed and ventilation set to "recirculate" the cabin air, diesel particle exposures were reduced.

- What sorts of instruments were used to conduct the monitoring and what do they measure? Why are these measurements important?

CATF researchers utilized the same or comparable air quality monitoring instruments and methodological protocols that currently are used in major research universities conducting similar research. The report references several published, peer-reviewed studies whose methodology we employed. See also www.catf.us/goto/noescape for White Paper that explains the methodology in detail.