

# Clean Air and Safety Benefits of Natural Gas and Diesel Technology

The "Facts" according to International Truck and Engine  
vs. the Real Facts



**Diesel Truck on Boston Highway**

Photo Source: Diesel Exhaust: Health Effects and Research Needs,  
Eric Garshick, MD, Harvard Medical School,  
<http://www.pmanet.org/safety/B%20-%20Dr%20Eric%20Garshick.pdf>



**Natural Gas Bus in Washington, DC**

Photo Source: Author

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## International Says:

([http://www.greendieseltechnology.com/pt\\_news174.html](http://www.greendieseltechnology.com/pt_news174.html) copied 1/4/05)

## The Facts Say:

### “Scientific Studies Show the Clean-Air and Safety Benefits of Diesel Engine Technology

#### Guide to Scientific Research on Diesel and Natural Gas Engines

Recent scientific research confirms that advanced, low-emitting engine technology and ultra-low-sulfur fuel make diesel trucks and buses as clean as or cleaner than natural gas. Research of relative fire risk also shows that diesel is safer than natural gas. Use this brief guide to research on diesel emissions and fire safety to learn more about the advantages of diesel.

### Independent Research Shows That Natural Gas Buses Have Higher Emission Levels

Exhaust emissions from natural gas school buses contain higher levels of air pollutants and substances identified by the California Air Resources Board as “toxic air contaminants” than those from school buses powered by advanced-technology, low-emitting diesel engines.

That is the chief finding by an independent research laboratory presented recently to a Society of Automotive Engineers conference. The research compares emissions from a popular model natural gas bus with emissions from diesel school buses.

Source: Study by Southwest Research Institute, presented at the Society of Automotive Engineers (SAE) International Truck and Bus Meeting, November 18, 2002, by Charles A. Lapin, Ph.D, DABT, toxicologist, co-author of SAE paper 2003-01-1381. Summary of findings is available at [www.greendieseltechnology.com](http://www.greendieseltechnology.com), or an Adobe .pdf copy of the research report can be obtained by email to [Cathy.Hope@nav-international.com](mailto:Cathy.Hope@nav-international.com).

### Can it be True? Well...Not Really!

#### Not with an “Apples to Apples” Comparison

*Some studies (many funded by International) purport to show that new, so-called “green” diesel vehicles are as clean as or cleaner than natural gas (NG) vehicles. These studies are not honest “apples to apples” comparisons between diesel and natural gas vehicles.*

*For example, they compare new diesel buses with advanced particulate traps (and ultra-low sulfur fuel) against natural gas buses with no pollution controls. In a fair comparison, the buses would be equipped with comparable levels of technology.*

*And while International speculates about diesel and NG safety, statistics show there has never been a natural gas fuel system related fatality in the US.*

*Why is International adamantly against NG? Perhaps because they’re the only heavy-duty engine manufacturer that hasn’t had a NG product to sell.*

### The Research wasn’t “Independent” and Compared “Apples to Oranges”

Four of the 10 authors of this paper were International employees!

The study compared a “Green Diesel” pre-production engine, including catalyzed particulate trap and ultra-low sulfur diesel, with an in-use NG engine with no aftertreatment, meeting 1998 standards!

When you compare “apples to apples,” the results are far different. In 2003 we compared EPA certification numbers for International’s 466 diesel with those for a 466 converted to natural gas, and a “green diesel”:

<u>Engine</u>	<u>PM</u>	<u>NOx</u> (Nos. in g/bhp-hr)
Diesel 466	0.103	3.66
NG 466	0.00	1.4
“Green Diesel Technology”	0.005	3.0

And, in 2007, when diesels will have to meet a 1.2 gm NOx standard, the manufacturer of the NG bus engine in the study expects its engine to meet the 2010 0.2 NOx standard, 1/6 that of diesel!

Source: SAE Paper quoted by International at left. EPA and AFT websites for 466 cert. numbers, International’s “Green Diesel” website for “Green Diesel Technology” emissions. Communications with John Deere Power Systems for 2007 NG engine emissions plans.

**California Government Research Shows That Natural Gas Exhaust Contains High Levels of Pollutants**

California’s Air Resources Board conducted two studies in 2001-02 comparing emissions from diesel and natural gas transit buses. In 8 of 11 categories tested, a low-emitting diesel bus powered by ultra-low-sulfur fuel and equipped with a particulate trap produced lower levels of pollutants than a similar transit bus powered by natural gas.

The natural gas bus discharged more particulate mass, hydrocarbons, carbon monoxide, and mutagenic material than the low-emitting diesel bus. These findings were confirmed in a parallel study conducted by a broad group of government, academic and industry research partners (Department of Energy, National Renewal Energy Laboratory, California Air Resources Board, South Coast Air Quality Management District, West Virginia University, UC Riverside, Desert Research Institute, BP, Engelhard and Johnson-Matthey).

Test numbers show that adding oxidation devices to natural gas buses and running them on a special, not-yet-available fuel does help reduce some emissions. Other emissions, however, are still higher than those from diesel buses equipped with particulate traps and running on low-sulfur diesel fuel that is already being sold in California and is mandated for national availability by a new federal rule.

Source: Air Resources Board, California Environmental Protection Agency  
[www.arb.ca.gov/research/cng-diesel/cng-diesel.htm](http://www.arb.ca.gov/research/cng-diesel/cng-diesel.htm);  
a fact sheet on this research is available at [www.greendieseltechnology.com](http://www.greendieseltechnology.com). Information on the research partners study is available at <http://ecdiesel.com>.

**When CA Government Compared “Apples to Apples” Natural Gas Exhaust was Far Cleaner than Diesel**

When it was pointed out to the California Air Resources Board (CARB) that they had compared old-technology natural gas buses to present-day and future technology diesel, and their method of measuring mutagens wasn’t accurate at such low levels, they retested on a more “apples to apples” basis, and confirmed that, given equal technology, natural gas is best on almost all emissions.

The *old* NG bus (no aftertreatment) showed about ¼ the particulate matter (PM) of the diesel with an oxidation catalyst and ½ the nitrogen oxides (NOx.) The *present-day* NG bus (with an oxidation catalyst) had about 1/5 the PM of the diesel and 2/5 the NOx. PM and NOx are the major pollutants of concern today.

The “Clean Diesel,” with an expensive diesel particulate filter, which won’t be standard equipment for all diesels until 2007, had about the SAME total PM emissions as the *present-day* NG bus and about 2 ½ times the NOx.

As International points out on the left, oxidation catalysts in today’s buses reduce most of the regulated and non-regulated emissions in a NG vehicle’s exhaust – and they use pipeline natural gas, which has always been available. CARB’s data show that ultrafine particles are about the same for *old* NG buses bus and *future* diesels with a trap – today’s NG buses are substantially better!

Source: Air Resources Board, California Environmental Protection Agency  
[www.arb.ca.gov/research/cng-diesel/cng-diesel.htm](http://www.arb.ca.gov/research/cng-diesel/cng-diesel.htm);  
Look at “Overview of Results to Date.”

**Attack on Diesel School Buses is Not Based on Scientific Evidence, Not Relevant to Diesel Technology, Research Report Says**

Countering claims by the Natural Resources Defense Council (in a report entitled “No Breathing in the Aisles” in 2001), the American Council on Science and Health issued a report confirming that there is no scientific evidence that diesel exhaust from school buses poses a cancer risk to school children.

This peer-reviewed critique “shows the difference between hype and sound science,” according to the authors, saying the NRDC report did not show scientific evidence and had no relevance to current diesel engines.

Source: School Buses and Diesel Fuel, by Gilbert Ross, M.D., Daland R. Juberg, Ph.D., DABT, reviewed by 12 independent scientists in academia and consultative toxicology. The American Council on Science and Health, 1995 Broadway, New York, NY 10023-5860; available from ACSH at [www.acsh.org](http://www.acsh.org).

**Federal Government Study Unable to Quantify Cancer Risks, Suggests Promise of Low-Emitting Diesel Engines**

In 2002, the U. S. Environmental Protection Agency completed a long-term study of diesel emissions. In its "Diesel Health Assessment Document" (HAD), the EPA found the available evidence was insufficient to support a conclusion that diesel exhaust is carcinogenic to humans. Although the HAD did conclude that diesel exhaust is “likely to be carcinogenic to humans,” it found that the data do not provide a basis for quantifying this risk and the risk may in fact be zero.

In addition, Dr. Paul Gilman, EPA Assistant Administrator for Research and Development, noted that, with introduction of diesel engines using the latest after-treatment technology and ultra-low-sulfur diesel fuel, "the composition of the exhaust particulates and the gases will...change." Dr. Gilman emphasized that "as cleaner diesel engines replace a substantial number of existing engines, the general applicability of the conclusions in this health assessment document will need to be reevaluated."

Source: Federal Register of September 3, 2002; report available from U. S. EPA Internet site ([www.epa.gov](http://www.epa.gov)) at [www.epa.gov/otaq/url-fr.htm](http://www.epa.gov/otaq/url-fr.htm); fact sheet available from International Truck and Engine Corporation at [www.greendieseltechnology.com/news148.html](http://www.greendieseltechnology.com/news148.html).

**Diesel Exhaust is a “Known Carcinogen”: School Children Breathe it, do we need further “scientific evidence” to want to protect our children?**

**CALIFORNIA PROPOSITION 65 WARNING**  
Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

CARB reports that “increased exposures from commuting by school bus...were estimated to increase a child’s lifetime cancer risk due to diesel particulate matter by approximately 4%.... An increased risk of lower respiratory symptoms (~6%) and daily hospitalizations for asthma (~1%) were also estimated.”

School buses are the safest way to transport children to school, but should our children have to breathe diesel exhaust?

Source: Warning posted on vehicle in CA. Children’s School Bus Exposure Study, CARB Fact Sheet, 10/03,

**Federal Government Study Reports: “...long-term...inhalation (of diesel exhaust) exposure is likely to pose a lung cancer hazard to humans.”**

The Abstract to the study quoted by International says:

“The assessment concludes that long-term (i.e., chronic) inhalation exposure is likely to pose a lung cancer hazard to humans, as well as damage the lung in other ways depending on exposure. Short-term (i.e., acute) exposures can cause irritation and inflammatory symptoms of a transient nature, these being highly variable across the population. The assessment also indicates that evidence for exacerbation of existing allergies and asthma symptoms is emerging..”

The state of California has listed diesel exhaust as a known carcinogen under Proposition 65 since 1990, “and in 1998, the California Air Resources Board (CARB) formally listed diesel particulate as a toxic air contaminant.”

Diesel exhaust *will* get cleaner under 2007 requirements, but natural gas exhaust is *already clean* and WILL BE CLEANER YET IN 2007!

Sources: See HAD cited by International at left. “Public Health and Diesel,” and American Lung Association of CA, [http://www.californialung.org/spotlight/diesel\\_health.html](http://www.californialung.org/spotlight/diesel_health.html)

**Natural Gas Risks of Explosions and Global Warming Are Found to Be Elevated, In Qualitative Analysis Conducted at Harvard School of Public Health**

Harvard's Center for Risk Analysis found in 2000 that "natural gas is highly flammable and explosions are a common fear." This, coupled with the fact that natural gas is stored at high pressures, led them to conclude that natural gas "poses potentially greater safety hazards than diesel."

This study also found that "the use of natural gas as a motor vehicle fuel may exacerbate the greenhouse gas effect because methane will escape into the atmosphere during refueling operations and at natural gas storage facilities."

The Harvard study noted that methane is approximately 20 times more potent as a greenhouse gas than carbon dioxide.

Source: Fueling Heavy Duty Trucks: Diesel or Natural Gas? Harvard Center for Risk Analysis, Volume 8, Issue 1, January 2000, Risk in Perspective, January 2000; available at [www.hcra.harvard.edu/risk.html](http://www.hcra.harvard.edu/risk.html).

**Recent Government Data Report 120 Deaths in Diesel Truck Fires, 0 in Natural Gas Vehicle Fires.**

**There has NEVER been a fatality in a US Motor Vehicle, Caused by the Natural Gas Fuel System!**

**But 1/5 of DIESEL Truck Drivers Killed in Highway Accidents are Killed in Fires!**

Even the Harvard paper, *funded by International*, and quoted at left, found that "In some ways, natural gas may be safer than diesel," referring to the relative safety of long-distance pipeline transportation of NG compared to tanker trucks hauling diesel on the highway.

The Harvard study focuses on *perceived fear* rather than *actual statistics*. Year after year there are zero highway fatalities caused by natural gas vehicles, while 1/5 of DIESEL truck drivers killed on the highway are killed in fires!

Most studies find NG vehicles produce somewhat less greenhouse gas (GHG) than conventionally fueled vehicles. EPA reports that, "In many case CNG vehicles generate fewer exhaust and greenhouse gas emissions than their gasoline- or diesel-powered counterparts." Shell found "The least greenhouse gas emissions are produced by natural gas and hydrogen hybrid and fuel cell vehicles." NG vehicles have low GHG because they burn a cleaner fuel, have sealed fuel systems, and processing and transporting the fuel produces fewer GHGs. .

Sources: Harvard paper quoted by International at left, National Highway Traffic Safety Administration (DOT) FARS data run for Natural Gas Vehicle Coalition in 2003. Copy available from [hseiff@cleanvehicle.org](mailto:hseiff@cleanvehicle.org), EPA fact sheet, [www.epa.gov/otag/consumer/fuels/altfuels/420f00033.pdf](http://www.epa.gov/otag/consumer/fuels/altfuels/420f00033.pdf), SAE paper 2001-01-1343, Well-To-Wheel Energy Use and Greenhouse Gas Emissions for Various Vehicle Technologies, J. J. J. Louis, Shell Global Solutions.

**School Bus Fire Safety Research Shows Higher Risk of Fire Fatality in Natural Gas Bus**

According to findings presented at a Society of Automotive Engineers conference in November 2002, a University of Maryland research team studied school bus fire fatality risk, comparing diesel and compressed natural gas school buses. The research concluded that CNG buses are on average 2.5 times more prone to fire fatality risk than diesel buses. Moreover, a passenger inside a bus where natural gas is the fuel has a much higher risk of being killed in an accident involving fire (an estimated 230 times higher) than if the bus is fueled with diesel fuel.

Source: Compressed Natural Gas Bus Safety: A Qualitative and Quantitative Risk Assessment by Mohammad Modarres, Samuel Chamberlain, Frederick Mowrer, Center for Technology Risk Studies, University of Maryland, presented at the Society of Automotive Engineers (SAE) International Truck and Bus Meeting, November 18, 2002, by Prof. Mohammad Modarres; available from University of Maryland, Center for Technology Risk Studies, 2100 Marie Mount Hall, College Park, MD 20742; [www.enre.umd.edu/ctr/ctr14.htm](http://www.enre.umd.edu/ctr/ctr14.htm)

**There has NEVER been a fatality in a US Motor Vehicle, Caused by the Natural Gas Fuel System!**

**But 1/5 of DIESEL Truck Drivers Killed in Highway Accidents are Killed in Fires!**

International and the study it funded *speculate* about fire risk, but year after year there are zero highway fatalities caused by natural gas vehicles, while 1/5 of DIESEL large truck drivers killed on the highway are killed in fires!

All motor vehicle fuels burn. But compare the projections from the International-sponsored study with the facts from the Department of Transportation. DOT figures show almost 1/5 of large truck (almost all diesels) occupants killed over a five-year period (most recent data) were killed in fire accidents. This is a far higher figure than for gasoline vehicles. And there has *never* been a fatality in a US vehicle, caused by the natural gas fuel system.

Source: National Highway Traffic Safety Administration (DOT) FARS data run for Natural Gas Vehicle Coalition in 2003. Copy available from [hseiff@cleanvehicle.org](mailto:hseiff@cleanvehicle.org)

*International Truck and Engine Corporation **provided funding** (emphasis added) for the independent (non-government) research studies referenced in this guide”*

*The Clean Vehicle Education Foundation **did not** fund any of the studies cited by International or in this response to International.*

**For further information, see [www.cleanvehicle.org](http://www.cleanvehicle.org) or contact Hank Seiff at the Clean Vehicle Education Foundation, [hseiff@cleanvehicle.org](mailto:hseiff@cleanvehicle.org) or 703-534-6151**