

New Jersey Clean Air Council Clean Air Annual Public Hearing Improving Air Quality through Energy Efficiency and Conservation

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Testimony by
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I appreciate the chance to testify at this hearing and want to focus on ways in which New Jersey may move most effectively toward the goals of making vehicle transportation a pollution-free and sustainable part of the State's future.

I present these views as President of Energy Vision, whose transportation team and I spend 15 years (when I served as President of the national environmental research organization, INFORM) analyzing the options for alternative fuels and advanced technology vehicles. We have produced a dozen reports used as planning tools by government, business and environmental leaders across this country and internationally.

New Jersey has taken some important policy initiatives in the last few years aimed at reducing vehicle emissions – including its Clean Cars Act in 2003, modeled after California's law, the 2005 Diesel Risk Reduction Law, and the just signed Executive Order no. 54 aimed at a sweeping reduction of greenhouse gases. This most recent initiative especially suggests the Governor's recognition that a long term vision is critical – which sets a new stage for considering where the state's power will come from and how an efficient pollution-free transportation system can be shaped.

The focus on clean air certainly could not be more important in a State that suffers the burdens of pollution and attendant health impacts that confront New Jersey. The emissions of heavy duty diesel truck and bus fleets operating in New Jersey as well as the emissions of the heavy duty long haul fleets that travel through the State are primary contributors to this problem. Of all vehicles on the State's roadways, 25 to 30% are heavy duty buses and trucks, which are primary sources of the Nitrogen Oxides (NOx), that are a precursor of smog, and the toxic particulate matter (PM) that have been linked to serious respiratory and cardiovascular health problems.¹

With 11% of all adults in the State (710,000) afflicted by asthma in 2003 (compared to a national average is 6%) and the rate among children at 12%, with even higher incidences of asthma among both adults and children in urban areas where concentrations of smog (ground level ozone) and fine soot (particulate matter, PM10) are higher, nothing is more crucial to addressing the air pollution problem than a focus on transportation.

¹ A key pollution information source¹, comparing the environmental performance of US states and counties, ranked New Jersey in 2006 as the 2nd worst state for cancer risk due to vehicle emissions and the 3rd worst state in the country for non-cancerous health hazards from vehicle emissions. Hudson (2nd), Bergen (12th), Essex (13th) Monmouth (16th) and Union (18th) Counties ranked in the top 20 with four more counties in the top 50 for added cancer risk due to vehicle emissions, most significantly those contributed by diesel fuels. As a main corridor connecting two of America's largest metropolitan areas, New York City, NY and Philadelphia, PA, as well as a trucking crossroads between the Northeast and the mid-Atlantic and beyond, New Jersey contains one of America's most densely traveled road systems. In 2005, the miles traveled statewide on its public road system was **203,076,000 daily**.

While land use and mass transit are vital planning topics for New Jersey's transportation future, I want to focus on the area of alternative fuels and advanced vehicle technologies that can mean the most to addressing the State's immediate air pollution challenge as well as helping solve the long term greenhouse gas emission challenge also facing the State. I would like to focus my comments in four areas:

- 1) How we see the relative contribution that alternative fuels can make to reducing health-threatening vehicle emissions in this State and to cutting down New Jersey's transportation-related greenhouse gas emissions over time
- 2) What we see as one of the prime transportation sectors in which to put alternative fuels to work where they can reap the greatest near term clean air gains and also major LONG TERM greenhouse gas reduction gains for the State
- 3) What kind of policies and programs might help most in driving the most promising avenues of alternative fuels use, and finally
- 4) What the consequences may be of not taking immediate action.

I. Transportation Fuels for a Pollution-free and Sustainable New Jersey.

I would first like to comment briefly on the roles that our research suggests the four key fuel options may play in reducing air pollution and greenhouse gas emissions that are commercial today or on the horizon:

Ethanol: While ethanol produced from renewable cellulosic sources may make an important contribution to displacing a meaningful percent of the gasoline used in today's light duty vehicles 10 years hence, ethanol made from corn has already demonstrated itself to be a net environmental loser. While the use of this fuel is less polluting and reduces greenhouse gas emissions by about 20%, the land and water resources used to produce it are emerging as major "negatives," and support for this fuel is even now beginning to skew agricultural practices² -- diverting for fuel use a very important food product. It is not clear that support for ethanol made from corn will play much of a constructive role in getting to cellulosic ethanol. It may rather produce vastly expanded and heavily subsidized vested corn interests that will be hard to dislodge.³ If and when cellulosic ethanol is proven to be a commercial option, investing in major infrastructure for this fuel will make sense.

Bio-diesel: Bio-diesel fuel may make a valuable contribution by replacing perhaps 10-12% of petroleum diesel fuel used today, with the immediate benefits of lower pollution levels and fewer greenhouse gases. It is so far the only way other than pollution control retrofits to improve the environmental performance of heavy duty diesel vehicles in operation which is important. But while bio-diesel made from waste oil has significant double-value in turning a polluting waste

² Despite the astounding growth in U.S. ethanol production this decade, the bottom line is that the approximately 4 billion gallons of ethanol currently in use displaces just 2.5 percent of the gasoline used (140 billion gallons in 2005) by motor vehicles. According to the National Academy of Sciences, even if every bushel of corn were diverted from food to motor fuel use, it would displace just 12 percent of gasoline usage. (3) Ethanol made from corn, therefore, can be at best a marginal fuel option for displacing oil in the near term.

³ *Ethanol: Assessing its value as a Transportation Fuel for New York State*, a paper prepared by Energy Vision for New York State leaders.

into a clean fuel, bio-diesel made from soy is a different story. Like ethanol made from corn, it raises many questions about the land, water, fertilizer and energy resources that would be consumed in making to produce a food – important for a hungry world – just to turn it into a vehicle fuel.⁴

Bio-methane: Bio-methane, made by capturing and compressing the bio-gases escaping today from landfills, sewage plants, municipal solid wastes and dairy and other agricultural wastes, in contrast to ethanol and bio-diesel, can be a very significant source of fuel that can be fed into natural gas pipelines and used to generate electric power or that can be processed into a transportation fuel – for which production systems are even now being refined. Capturing these gases will indeed be essential as a way of eliminating the large methane streams that are today one of the country’s major greenhouse gas sources. The good news is the possibility of using them to produce billions of gallons a year of a renewable clean gas fuel⁵. Landfill generated-methane alone could completely fuel every refuse truck coming to and leaving its landfill site, while many landfills, once closed, can continue to generate this fuel for two decades or more.

Natural gas: Natural gas as a transportation fuel is capable of making the greatest contribution to meeting New Jersey’s near term need to reduce the health-threatening vehicle emissions from its highly polluting diesel school and transit bus and truck fleets and to helping the transportation sector make a maximum contribution to meeting the State’s long term goal of reducing greenhouse gases by 80% from 2006 levels by 2050. In the long term, it is also the fuel that currently holds the greatest promise of enabling this country to leave the era of petroleum-derived fuels behind and to move systematically toward adoption of the carbon-free and pollution free hydrogen fuel that can be a “centuries,” not a “decades,” solution.

The benefits of natural gas fuel in the near term are these:

- It is the cleanest vehicle fuel available today. It is composed of four hydrogen atoms and just one carbon atom.⁶ (compared to petroleum-derived fuels that are more than 35% carbon)
- It is available through a pipeline system that runs throughout New Jersey and only refueling stations are needed to deliver it to vehicles.
- For virtually every type of medium and heavy duty vehicle, natural gas engines are a viable commercial option. And today’s new heavy duty natural gas engine can not only meet the US Environmental Protection Agency’s 2007 standards for Nitrogen Oxides (NOx) and

⁴ Total biodiesel production in 2006 – virtually all from soy -- was 250 million gallons. An eight fold increase would be needed to produce just 2 billion gallons nationwide. The total US soybean production in 2006 was (a record) 3.19 bushels. You get 1.4 gallons of fuel per bushel so it would take 1.43 billion bushels of soybeans to produce that 2 billion gallons of biodiesel. That would be equal to almost half of the entire US soybean crop in 2006. That’s a lot of land, water, fertilizer and fuel to make biodiesel and what you give up is an important source of food.

⁵ The US Department of Energy Estimates that 10 billion gallons of fuel a year could be produced from these sources a year.

⁶ More broadly, while natural gas extraction, transport by pipeline and storage are not processes free of environmental impacts, these are nowhere as significant and damaging as those related to the production, transport and storage of petroleum-derived fuels which include: pollution generated by refining operations, which are amongst the most polluting industrial facilities in the nation, spills from tankers or tanker trucks, and leaks from under or above ground tanks at fueling stations, which have been major sources of groundwater contamination in New Jersey and elsewhere. Further, used in a vehicle, natural gas, in the case of an accident, does not pool on the ground posing the risk of vehicle fires; instead, being lighter than air, it rises and dissipates.

Particulates (PM) but can meet the even more stringent 2010 NO_x standard. It is not at all clear if or how diesel powered heavy duty engines will accomplish this.

- The best estimates today, while more data on this subject are needed, are that natural gas use in heavy duty trucks and buses reduces greenhouse gas emissions by about 15% on a wells to wheels basis compared to diesel. Light duty fleets using natural gas can make an excellent contribution to greenhouse gas reduction as well, since they generate 20% fewer greenhouse gases than gasoline-powered fleets. Use of this fuel, as is discussed below, also paves the way for a transition to hydrogen fuel use that may ultimately be carbon-free.
- Once natural gas refueling infrastructure is in place⁷, it sets fleets up for a long term transition to better and better options:
 - To take advantage not only of natural gas as a fuel but also to use a fuel blended to take advantage of the significant supplies of renewable biomethane discussed above produced from landfills, sewage plants and agricultural wastes.
 - To take advantage of being used more efficiently in combination with hybrid electric engine technology⁸
 - To take advantage of “hythane” fuel (about 80% natural gas and 20% hydrogen) which is much cleaner than natural gas alone. (Natural gas refueling stations just need to be equipped with gas extraction and compression equipment that is already commercial to extract hydrogen from some of the natural gas and to produce this blended fuel), and
 - To be completely powered by hydrogen fuel once the vehicle technology is ready. (Hydrogen will be largely made from natural gas – as it has been for the US space program for 40 years -- until it can be made economically from water using renewable energy – the 100% sustainable solution.)
 - In the much longer term, another form of methane may well be captured and used: the vast amount of methane stored in hydrates.

Natural gas, clean as it is, is still ultimately a deplete-able fossil fuel. Global natural gas supplies, according to the US Department of Energy, at today’s rates of use may last about 77 years. (Use

⁷ Three types of locations for natural gas refueling facilities may constitute the most efficient investments. Construction of refueling stations in the most urbanized areas may in most cases be the best investment since they permit rapid near term use of this clean fuel to power the school bus, delivery trucks, and especially the refuse and recycling truck fleets that circulate continuously there -- fleets that, today, are virtually all powered by diesel fuel and are the most significant concentrated sources of health threatening pollution impacting millions of New Jersey residents. Construction of fueling stations near waste transfer sites can also be efficient, enabling many refuse truck fleets to take advantage of their use. Finally, construction of refueling stations along the Interstate highways could be part of an East Coast clean fuel corridor for long haul trucks.

⁸ Use of hybrid electric technology, along with the use of natural gas fuel in vehicles, is the other most important area of innovation for making near and long term reasons. In the near term, it provides emission reduction benefits and extends the value of today’s petroleum-derived fuels. In light duty vehicles, combined with plug in options, it may extend the life of these fuels much further. In the long term transition to the hydrogen era, however, use of hybrid technology today is also valuable, since the refinement of these vehicles, involves the refinement of electric components that the all electric fuel cell vehicles will require.

of natural gas fuel in efficient hybrid electric vehicles may stretch this fuel's use somewhat.) But its near term value in producing clean air coupled with its the long term role in facilitating the transition to hydrogen make it a double winner.

II. A Shift from Diesel to Natural Gas Powered Refuse Truck Fleets: A Prime Transportation Strategy for Reducing Vehicle Emissions Today and for Increasing Greenhouse Gas Reductions over the Long Term.

In seeking to maximize the pollution and greenhouse gas reduction potential of natural gas fuel use in New Jersey, while all diesel heavy duty fleets present great opportunities, a prime target deserves to be the thousands of municipal and commercial waste hauling and recycling trucks that provide an essential service to every community in the State. There are several reasons why:

- First, they are one of the most concentrated sources of air pollution in every community. Unlike transit buses, they travel every residential street stopping and starting and pouring their emissions onto virtually every doorstep.
- Second, these trucks tend to be used for many years until their maintenance costs are no longer affordable. Their environmental performance and fuel efficiency tend to degrade over time.
- In addition, because of their stop and start duty cycle, they are amongst the heaviest users of diesel fuel getting barely 2.8 miles per gallon. A single refuse truck consumes about 8,900 gallons of increasingly costly diesel fuel a year.

Two of the Principal Associates with Energy Vision discovered the above characteristics of refuse and recycling fleets through an in-depth analysis (the first ever done) of New York City's commercial waste hauling fleets published in 2006. It is likely that our findings would be similar for New Jersey fleets and, hence, they may be useful for the State's planning purposes.

The fleets we studied had engines that appeared to be on average ten years old, and, once permitted, these trucks were under no pressure to upgrade their equipment to incorporate any of the considerable advances in emission controls that have been made over the last decade. Most of these trucks went into service when emissions standards were much less stringent. A heavy duty engine sold in 1997 was permitted to emit 5.0 grams of Nitrogen Oxides (NOx) a major contributor to health-threatening smog, whereas 2007 engines are targeted to meet a standard of 1.2 grams. A 1997 engine was permitted to emit .1 grams of particulate matter (PM), whereas the 2007 standard permits only .01 grams.

We calculated that the 3,600 commercial hauling trucks we studied in NYC might well emit as much as 9,883 tons of PM and NOx a year together (which would be more than 118,500 tons of these two pollutants over the 12 year lifetime of these trucks). And, those estimates were conservative, since it is doubtful that many of the old trucks even perform up to their original emission design.

An excellent opportunity to achieve major reductions in the air emissions and greenhouse gases produced by municipal and commercial refuse fleets would be through a three-pronged program of regulation and incentives focused on achieving three goals:

1. Promoting retirement of the oldest trucks and engines;
2. In trucks that are too young to economically retire, undertaking measures to make the diesel engines burn more cleanly, through the use of bio-diesel fuel or aftertreatment particulate filters; and
3. Promoting fleet purchase of the cleanest available trucks -- those equipped with natural gas engines, which are more and more affordable with today's federal and state subsidies.

Air Pollution Reductions for Refuse Trucks: For a state whose leadership is ambitious to set the pace in reducing health-threatening emissions, the greatest opportunity lies in ensuring that when old diesel trucks are retired they are replaced with new state-of-the-art natural gas trucks.

Our research found that if NYC hauling companies could be encouraged to replace 28% of their trucks over a three year period with these new natural gas trucks, that would produce reductions in PM and NOx of almost 5,300 tons in three years. And the total reductions would continue to increase over the 12 year lifetime of these trucks. **The bottom line was that this pollution would be reduced enormously - by a factor of 25.**

We have also found, through the two national surveys we have done of innovation in the refuse truck sector in 2002 and 2006 that, as the benefits of natural gas use have been recognized, use of natural gas truck technology has begun to spread rapidly.

Our second national survey, *Greening Garbage Trucks: Trends in Use of Alternative Fuels: 2002 – 2005*, conducted by a member of Energy Vision's team, James Cannon, which looked at all possible alternative fuels and advanced technologies for the refuse hauling sector, found that, between 2002 and 2005, use of natural gas trucks doubled from 750 to 1,500 trucks and that the communities adopting this technology doubled from 26 to 57. Fleet operators were pleased with the performance of their trucks. Drivers were relieved by not having to breathe diesel fumes. And both drivers and the communities benefited from the much quieter operation of these trucks as well as their low pollution levels.

New natural gas engines have demonstrated .2 grams of NOx in the lab and will be certified by the United States Environmental Protection Agency as meeting the 2007 PM and NOx emission standards soon. These engines have also demonstrated their ability, as noted above, to meet the 2010 standard for NOx emissions. Since natural gas engines contain naturally lower levels of carbon (natural gas is 20% carbon compared to the more than 35 % carbon in petroleum) it is easier and less costly for natural gas engines to meet and sustain the required levels of particulate as well as NOx emissions.

New diesel engines must use aftertreatment to achieve the low emission levels required for 2007, making them dependent on the correct functioning and maintenance of this equipment, which will be hard to ensure as the equipment ages. Further, such equipment requires higher temperatures to burn off the particulates, and to achieve these temperatures requires burning more fuel -- lessening the fuel efficiency of diesel trucks. It will be much more complicated and expensive for diesel engines to meet the 2010 NOx standard – if, in fact, they are able to accomplish this in a commercially viable way.

While the pace of adoption of natural gas refuse truck technology has expanded rapidly on the West Coast, where more than 1,200 trucks are in operation, this shift has now begun on the East Coast. Community leaders in Smithtown, New York, where the Township in July 2006 mandated replacement of 22 old commercial diesel powered waste hauling trucks with new natural gas trucks, forecast that over the next seven years the Township would eliminate roughly 177 tons of NOx emissions and 15 tons of PM10 particulates (and would displace 2.5 million gallons of diesel fuel with a more domestically plentiful fuel.)

Smithtown undertook this project NOT for environmental but for economic reasons at first – believing that the soaring price of diesel fuel was threatening the Township’s economic outlook and finding they could get a reasonable fixed price contract for natural gas. The Township moved swiftly to capture the economic and environmental benefits. Its new fleet -- the first 100% natural gas refuse truck fleet on the East Coast -- went into service on January 2007 and is receiving kudos from the community. A quick 1 ½ hour trip can give New Jersey leaders a first hand look at the clean technology that this State could be taking advantage of today.

Greenhouse Gas Reductions: While more data is needed on greenhouse gas emissions from heavy duty natural gas engines, data cited by officials at the US Department of Energy and by Cummins Westport, the largest maker of these engines, points to a 10 to 15 percent advantage in such emissions from using natural gas instead of diesel engines.

Adopting measures to stimulate or require purchase of new natural gas vehicles has two other important near and long-term advantages for this State in tackling greenhouse gas emissions in paving the way for use, as described above, of greenhouse gas-reducing biomethane fuel, of “hythane,” and ultimately of pollution-free hydrogen. New Jersey can greatly benefit by taking advantage of the many synergies between natural gas and hydrogen based systems as its Governor has now encouraged a long term planning horizon.

III. Government Incentives and Mandates for Promoting Alternative Fuels Use

For every transportation sector, the needs, possibilities, and incentives for change may vary. For commercial hauling fleet operators, who are in an economically precarious business, and who are at present being squeezed as the price of diesel fuel has risen and the costs of pollution controls are making diesel trucks thousands of dollars more expensive, we found a variety of potential approaches that may be useful to explore in New Jersey – approaches that would enable haulers to choose clean fuel trucks without suffering penalties and would make it easier for communities to make the case for alternative fuel trucks...for example:

1. Creating state economic incentives that would, in conjunction with the incentives provided under the 2005 Energy Policy and Transportation Acts, create a totally level playing field for haulers choosing to purchase and operate new natural gas rather than diesel trucks, e.g. covering all of the incremental costs of buying these more expensive trucks and possibly even of modifying their truck garages, and training their workers.
2. Advising commercial haulers about the substantial tax credits provided under the federal 2005 Energy and Transportation acts as well as about grant funds that may be available. They should also be advised about federal tax credits for diesel retrofits.
3. Establishing private sector partnerships with fuel suppliers that will leverage available government funding to provide refueling infrastructure.

4. Allowing trucks using cleaner fuels and engines to charge higher rates to customers for pickup
5. Lowering tipping fees at transfer stations for trucks with cleaner fuels and engines
6. Providing other privileges, such as advancing to the head of the queue for such fleets
7. Instituting an emissions inspection program for these vehicles
8. Developing a NOx trading mechanism that could provide funding for a natural gas program at multiple fleets by, for example, giving credits to a residential or commercial energy supplier.
9. Establishing mechanisms ensuring that old trucks retired from service go to truck dismantlers for parts reuse and that the old engines be broken down for reuse of their parts but not be resold.

Again, for each fleet sector in New Jersey, a focus on the most effective specific incentives or requirements is needed. This type of thinking is especially timely now – when, after 15 years of development of alternative fuels and advanced vehicles by forward-looking corporate innovators, such environmentally beneficial commercial choices are at last available.

IV: What about the Consequences of Not Taking Action Now?

While cleaner air and reduced greenhouse gases are vital goals for the State, the consequences of not aggressively pursuing these goals via a shift away from petroleum-derived fuels will involve more than sacrificing greatly needed progress in these two areas. Continued reliance on petroleum-derived fuels will impose a growing cost burden on the State and more.

Not only is New Jersey, like the US overall, in the dangerous position of depending on foreign sources for more than 60 % of the oil consumed here – almost 30% of it from a Persian Gulf region that is in turmoil and is less and less friendly to our interests, but competition is growing for access to global oil supplies as industrializing Asian nations lay claim to more and more of the most-rapidly dwindling of our fossil fuels. At present, not only is cost of concern but the specter of economically devastating supply disruptions is in the offing.

At a critical juncture in the history of New Jersey and of this country, it is our hope that recognition of the need to transition away from reliance on oil in transportation (where two-thirds of all US oil is used) and of the cleaner, renewable and ultimately carbon and pollution free fuel options that are right on the horizon will inspire the commitment and momentum that will make concrete and rapid progress toward a sustainable future a reality.

I thank you for the chance to offer this testimony and would be glad to provide further information if it would be useful.

For further information, please contact:

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