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To: Paul E. Farrel and Tracy Babbidge, DEP
From: Clean Cities of CT Coordinators
Date: 11/17/05
RE: On Road Fleets Portion of DEP's Diesel Planning Effort

The Clean Cities of Connecticut, including the Greater New Haven, Southwest Connecticut, Capital, and Norwich Clean Cities, are pleased to submit the attached memo to the DEP staff as a part of the DEP's efforts to develop the diesel mitigation plan pursuant to Special Act 05-07 to reduce the health risks from diesel pollution and to help the state meet federal air quality standards for diesel particulate matter. The purpose of the memo is to outline the opportunities and benefits of incorporating Alternate Fuel Vehicles into the state's Diesel Mitigation Plan. The information is based on our experience with implementing Alternate Fuel Vehicle programs in Connecticut for over a decade, as well as a wide range of national and international research that have documented the benefits associated with the use of Alternate Fuel Vehicles. The use of Alternative Fuel Vehicles is supported by numerous local, state and federal legislation and regulations, including the 1990 Clean Air Act Amendments, 1992 and 2005 Energy Policy Acts, and Connecticut Public Act 04-231 of 2004 (and its predecessors), and New Haven Code of General Ordinances, Chapter 29, Article III, Div.1, Sec. 29-56.

The memo, titled "Incorporating Alternate Fuel Vehicles into Connecticut's Diesel Mitigation Plan" contains background information on the Clean Cities program, a summary of Connecticut's AFV programs, highlights of current Alternate Fuel Vehicle fleets in Connecticut, highlights of other state alternate fuel vehicle programs and conclusions and recommendations for your consideration.

Incorporating Alternate Fuel Vehicles into Connecticut's Diesel Mitigation Plan.

Background

The Clean Cities program¹ is a Department of Energy voluntary program established by the 1992 Energy Policy Act to advance the nation's economic, environmental, and energy security by supporting local decisions to adopt practices that contribute to the reduction of petroleum consumption by on-road vehicles. Clean Cities carries out this mission through a network of volunteer coalitions across the USA. In October, 2005, the 88 Clean Cities reached the milestone of displacing an aggregate of more than 1 billion gallons of petroleum nationwide by implementing alternative fuels², AFVs, hybrid electric vehicles, fuel blends, and heavy-truck idle reduction applications to help reduce the nation's need for imported oil and improve air quality. The state of Connecticut has four "Clean Cities": Greater New Haven, Southwest Connecticut, Capital Area, and Norwich. The Clean Cities and its stakeholders participate as members of the national Clean Cities network and have access to federal funds that are appropriated exclusively for Clean Cities stakeholders.

According to the US Department of Energy, Connecticut is currently home to 1106 Compressed Natural Gas (CNG), 52 dedicated electric, and 648 Flexible Fuel Ethanol Vehicles³. The State is also home to 4 biodiesel stations (1-New Haven and 3-CT DOT), which dispense B20, a blend of 20% vegetable oil and 80% conventional diesel fuel. We estimate that the current AFV programs in the state are responsible for displacing approximately 75,000 gallons of diesel fuel annually⁴. The diesel displacement figures are based on the use of heavy duty natural gas vehicles in Fairfield Trumbull, Stratford and Norwich, the use of dedicated electric trolleys in New Haven, and the CTDOT's statewide use of B20.

While the 1992 Energy Policy Act defines numerous fuels as "alternative fuels", the most viable and widespread alternative fuels in use in Connecticut to date have been CNG and biodiesel. In the future, we see a potential to increase the use of these fuels as a short term and long term replacement for conventional diesel fuel. The increased use of advanced technology vehicles today will also help to pave the way towards the hydrogen fuel cell and hydrogen internal combustion engine vehicles in the future.

Natural Gas is a high-quality fuel that is a viable substitute for gasoline and diesel. Nearly 90% of the natural gas consumed in the US is from domestic sources, compared to less than 50% of the oil. Historically CNG, has been less costly than gasoline and diesel fuel on a per gallon equivalent basis nationwide. CNG vehicles demonstrate diesel-like performance with a 90% reduction in noise. They are virtually toxic-free and emit significantly fewer pollutants than diesel vehicles: 40% to 86% less PM and 38% to 58% less NOx for heavy duty natural gas transit buses, school buses, refuse trucks and utility vehicles. Moreover, production of natural gas avoids the pollution risks associated with the manufacture of diesel, such as crude oil spills, releases of toxic pollutants from refineries, and leaks from underground tanks into groundwater.

The major obstacles to the expanded use of CNG vehicles are their current higher cost compared to conventional diesel vehicles and the costs involved in establishing the infrastructure needed for refueling. Training and garage modifications to accommodate methane detection and ventilation systems may also be needed. Although these costs can be significant – for example the incremental cost of a CNG bus is approximately \$25,000 to \$40,000 more than a conventional diesel bus -- fleets can make a cost-effective

¹ DOE Clean Cities website: www.eere.energy.gov/cleancities/

² Alternative Fuel Data Center website: www.eere.energy.gov/afdc

³ (Source: DOE's Energy Information Administration's "Alternative Fuels Estimated Data 2000", <http://www.eia.doe.gov/cneaf/alternate/page/datatables/table4.html>).

⁴ Note: figure does not include displacement from gasoline powered vehicles.

transition to CNG by taking advantage of funding sources for alternative-fuel vehicle programs, such as Congestion Mitigation and Air Quality (CMAQ) grants, the US DOE State Energy Program (SEP) funds distributed through the national Clean Cities program, and federal and State tax incentives.

Biodiesel is a cleaner-burning version of diesel fuel made from natural, renewable sources such as vegetable oils rather than petroleum. Biodiesel may be used as a blend fuel (as low as 5% to 20% biodiesel) or as a single neat fuel (100% biodiesel). Studies indicate that B100 and biodiesel blends generate less PM than conventional diesel (55% less PM from B100 and 18% less PM from B20), but more nitrogen oxides (6% more NO_x with B100) than 100% petroleum diesel⁵ and 2-3% more NO_x with B20 (when engine tested by a dynamometer) than 100% petroleum diesel⁶. Recent tests by the National Renewable Energy Laboratory has shown a reduction in NO_x when the entire vehicle was tested under a load. Because biodiesel contains no sulfur, however, vehicles powered by this fuel can use advanced aftermarket emission control devices to further reduce harmful emissions.

Up until recently B100 biodiesel was as much as a dollar more than regular diesel fuel per gallon. In the last few months, due to federal legislation, the price of biodiesel has dropped to the same as regular diesel regardless of the blend percentage. Biodiesel blend fuels are increasingly popular because they can be used in conventional engines with few or no modifications.

Summary of Connecticut's AFV Programs.

Current AFV Incentives in Connecticut: In Connecticut, there are two grant programs which have primarily funded the purchase of AFVs in the state: the ConnDOT AFV program and the US DOE SEP. Since 1994, 21 entities have participated in the Connecticut Department of Transportation AFV program, which provides grants to local governments, and to private companies performing public services to purchase AFVs. This program has assisted in the purchase of 185 AFVs⁷ to date. Funding for this program is provided by federal CMAQ dollars and is available to cover 100% of the incremental cost of an AFV. Approximately \$1M has been available annually. We believe that this program could be more effective if it is expanded to at least partially cover the costs of related refueling infrastructure as is routinely done in our neighboring states of Massachusetts, Rhode Island, and New York. We also believe the funding should be available to private fleets. (Note that CMAQ funding is available to private entities in both New York and Massachusetts for AFV programs.)

In addition to the ConnDOT AFV Program, the national Clean Cities program provides grants through the State Energy Program (SEP) for AFV infrastructure and vehicle purchases, as well as idle reduction strategies. Clean Cities stakeholders throughout the US compete for approximately \$6M in annual funding provided by the US Department of Energy. Over the past three years, the Clean Cities of Connecticut have been awarded approximately \$400,000 in USDOE SEP grants.

Over the past several years, the Connecticut State Legislature has passed numerous incentives to purchase AFVs and to develop related refueling infrastructure. Currently, a *Corporation Business Tax credit* is available for 50% towards the construction of, improvements to, or equipment for any CNG, LNG, LPG (propane) refueling station or an electric vehicle recharging station; and the purchase and installation of equipment used in dedicated or dual fuel CNG, LNG, LPG or electric vehicle conversions. Corporations

⁵ *Biodiesel, The Clean Green Fuel for Diesel Engines*, US Department of Energy, 2000, <http://www.eere.energy.gov/cleancities/blends/pdfs/5450.pdf>.

⁶ *Biodiesel, The Clean Green Fuel for Diesel Engines*, US Department of Energy, 2000, <http://www.eere.energy.gov/cleancities/blends/pdfs/5450.pdf>.

⁷ *Analysis of DOT's AFV Program*, 2 Plus, Inc., 2002, <http://www.2plus.com/FY%202003%20Alt-Fuel%20Report.PDF>.

can also claim a tax credit for 10% of the incremental cost of a new dedicated CNG, LNG, LPG, or electric vehicle. Corporations purchasing a new hybrid with a U.S. Environmental Protection Agency fuel economy rating of at least 40 mpg, a new dedicated CNG, LPG, hydrogen, or electric vehicle; equipment used in dedicated or dual fuel CNG, LNG, LPG, or electric vehicle conversions; and equipment associated with a CNG or hydrogen filling or electric recharging station are exempt from state sales tax. Fuel taxes are also exempted on CNG and LPG Motor Fuels in Connecticut.

Recently, the federal government also passed a host of incentives that will help offset the cost of AFVs. Highlights of these incentives include a federal tax credit towards the purchase of new, dedicated AFVs up to 50% of the incremental cost; a tax credit towards the sale of alternative fuels; and a tax credit to the buyer of CNG refueling equipment up to \$30,000 per station. These tax incentives will be in effective after January 1, 2006.

We believe that the use of these tax incentive programs could be maximized if partnered with grants for AFV purchase and infrastructure development by both public and private fleets. Currently, in New York State, private fleets benefit from the state's AFV tax incentive program and grant programs in areas, such as New York City, that suffer from severe air quality problems.

Highlights of Current Alternate Fuel Vehicle Fleets in Connecticut

The use of diesel fuel is not a forgone conclusion for many communities across the state. Many communities want to invest in a long term solution by investing in AFVs, and not just cleaner diesel. The Clean Cities of Connecticut are working with fleets across the state to assist them in developing AFV programs, particularly where fueling infrastructure is already in place. One of the major goals of these communities is to contribute to our State and Country's energy independence from foreign sources of oil as well as to improve air quality.

Norwich: The City of Norwich began implementing its CNG school bus program in 1998. Today, the City of Norwich and Norwich Public Utilities operate a public access CNG fueling station and a fleet of 10 heavy duty CNG utility trucks, 21 light duty CNG vehicles, 3 hybrid-electric vehicles and 1 electric vehicle. Two additional heavy duty CNG trucks are currently on order. The entire Norwich Public Schools full size school bus fleet is a clean operation with 3 CNG school buses and 42 school buses that operate on ULSD with a combination of particulate filters and oxidation catalysts. In 2005 the Norwich CNG vehicle program displaced the equivalent of approximately 15,000 gallons of diesel fuel. Recently appropriated FTA funding in the amount of \$2.215M for an Advanced Technology Bus Rapid Transit System to serve Southeastern Connecticut will also displace a substantial amount of diesel fuel as components of the project are introduced in the next few years.

Fairfield County: In Fairfield County, the Towns of Stratford, Trumbull and Fairfield operate five heavy duty CNG vehicles, which are helping to displace approximately 28,000 gallons of diesel fuel annually. The Town of Fairfield has led the way by purchasing 28 light duty CNG vehicles and four CNG school buses. These three towns built refueling infrastructure by taking advantage of grants provided by the US EPA, US DOE, and private and local sources. In 2006, the City of Bridgeport and Santa Energy will develop the City's first public access CNG refueling station using both public and private funds under a unique, public-private partnership. Entities that have expressed interest in implementing a heavy duty CNG vehicle program include the City of Bridgeport, the Town of Trumbull Public Schools, the Town of Meriden, Town of Berlin, Town of Rocky Hill, and the City of Hartford. We believe that with additional funding available, additional towns will begin to deploy heavy duty CNG vehicles in the coming years.

New Haven: The New Haven Transit District currently operates a fleet of four electric trolleys serving downtown New Haven. Those trolleys currently operate on circulator routes running 8 hours a day, six

days a week. The project is a true public/private operation. Participating in the project are: Greater New Haven Transit District, City of New Haven (three departments), Greater New Haven Clean Cities Coalition (Project Manager), New Haven Savings Bank, United Illuminating Co, Town Green District, CT DOT (Local Office) and New Haven Parking Authority who are members of the New Haven Electric Trolley Committee. The City of New Haven paid the 20% match for capital cost of the trolleys. The circulator is free to the public to ride. Operating costs are covered by United Illuminating, New Haven Savings Bank and the Greater New Haven Transit District. We estimate that this project is helping to eliminate 10,000 gallons of diesel fuel annually. The Greater New Haven Clean Cities Coalition procured \$1.5 million for the trolley project through federal earmarks. The New Haven Coalition also applied for and received a SEP Grant to fund a CNG station for the New Haven Public Works Department. The city is in the process of determining the number of CNG vehicle to be purchased. In 2005 the Greater New Haven Transit District supported by the Greater New Haven Clean Cities Coalition will be expanded to include a fuel cell demonstration vehicle using funding earmarked specifically for this purpose. The program is a \$28 to \$32 million program with phase one currently funded by a \$3.5 million federal Earmark.

Hartford: The Hartford Coalition has had success with its 78 light duty AFVs, a mix of CNG and Bifuel Ethanol vehicles. The Connecticut Center for Advanced Technology and the Coalition are seeking to develop a “Hydrogen Roadmap” for emerging transportation and stationary power systems. Capital Clean Cities of Connecticut has begun collaboration with the Connecticut Center for Advanced Technology and the Coalition to accelerate the implementation of this planning effort.

Highlights of Other State Alternate Fuel Vehicle Programs

Experience in other states suggests that AFVs can be successfully implemented while significantly impacting regional air quality. According to numerous organizations that track trends in the alternative fuel industry, currently there are 7600 CNG transit buses operating in US fleets and approximately 1000 CNG powered refuse trucks⁸. Approximately one in four new transit buses purchased nationwide are powered by CNG. Two of Connecticut’s closest neighbors, New York and Massachusetts, have made a strong commitment to purchase heavy duty CNG vehicles and to facilitate the introduction of alternative fuels by governments and businesses operating in the state. In 2001, New York Governor George Pataki signed Executive Order 111 requiring 100% of new light duty vehicles purchased by the state to be alternative fuel or hybrid by 2010. EO111 also calls for the state to reduce emissions and petroleum use from all medium and heavy duty vehicles⁹. Towards this end, the state has entered into a public-private partnership to develop CNG vehicle refueling stations at NYDOT facilities statewide. To date, New York has developed over 60 CNG refueling stations, many of which are also open to the general public. Today, there are over 6800 CNG vehicles in operation in New York State, including over 1000 heavy duty CNG buses operated by the MTA and various private bus operators in New York City and Long Island. The use of clean fuel vehicles in the New York Metro area is one of three key strategies (including traffic signalization and trip sharing) that the region is employing to bring the region into Clean Air Act compliance for NOx attainment.

The Commonwealth of Massachusetts has also shown a commitment to the increased use of AFVs by passing legislation that will provide significant incentives to purchase and utilize AFVs in the state¹⁰. SB 2716 and various companion bills mandate that 5% of all new vehicles purchased by state agencies and at least 50% of all vehicles in the state fleet are hybrid or AFVs by the year 2010. The legislation also directs the state to issue \$10 million in bond funds to establish an *Energy Independence Fund* grant

⁸ Data provided by INFORM, Inc., www.informinc.org, 2005.

⁹ *New York State Executive Order 111*, 2001, <http://www.nyserda.org/programs/pdfs/exorder111.pdf>.

¹⁰ Commonwealth of Massachusetts, Senate Bill 2176, 2005, <http://www.mass.gov/legis/bills/senate/st02/st02176.htm>

program to cities and towns to purchase alternative fuel or hybrid vehicles, and help regional transit authorities construct refueling stations for such vehicles owned by area communities or the state. This legislation has passed both houses in the state and is expected to be signed by the Governor later this year. Massachusetts is currently home to approximately 1000 CNG vehicles, including 100 CNG transit buses.

California and Texas also have made a significant commitment to the AFV market by providing a variety of carrots and sticks related to the use of AFVs, including: funding for technology research and development; funding for vehicle deployment and infrastructure development; mandated use of alternative fuel, clean fuel, and vehicle retrofits in areas with significant air quality programs; training on the use and operation of AFVs; operator incentives such as green parking and single occupant HOV lane access for alternative fuel and hybrid vehicles; and recognition for fleets that have adopted AFV programs.

Conclusions and Recommendations

In summary, Connecticut has a strong history of implementing AFV programs throughout the state using a variety of resources from the private sector, and local, state and federal governments. The increased use of AFVs, particularly CNG vehicles, will help the state reduce the health risks from diesel pollution and to help the state meet federal air quality standards for diesel PM. Specifically, the use of CNG vehicles has the potential to decrease NOx emissions by over 60% and PM emissions by 90% compared to the most advanced diesel technologies. Current CNG heavy duty engines meet the EPA 2007 standards for NOx and PM and will meet the 2010 standards in 2007. Further, new economic models, such as TIAX, show that heavy duty CNG vehicles are cost competitive, and may even cost less than the most advanced diesel technologies, beginning in 2010.

The State has an opportunity, through the development and implementation of the Diesel Mitigation Plan, to further strengthen its commitment to the use of AFVs by employing a variety of strategies, including a combination of mandates and incentives. We believe the implementation of the following strategies will help decrease NOx and PM pollution, decrease noise, reduce the reliance on petroleum products, and pave the way for the introduction of advanced technologies as they are developed:

Short Term:

- 1) In the implementation of the ConnDOT AFV CMAQ program, ConnDOT should amend the rules to:
 - a. allow all private companies to be eligible to apply for funds,
 - b. allow eligible entities to apply for costs of related refueling infrastructure where need can be demonstrated, and
 - c. allow eligible entities to apply for costs of certified AFV conversions and alternative fuel engine repowers. Private companies should be required to co-fund projects with state and federal tax incentives wherever possible.
- 2) In the implementation of Best Available Control Technology (BACT) retrofit programs administered by the DEP or other agencies (such as the Dominion settlement), the DEP should encourage and accept applications for CNG vehicles, where CNG vehicles are defined as a BACT. The definition of CNG as a BACT would not preclude other technologies from meeting the requirements, but clearly indicates that CNG, because of its inherent clean air benefits, is considered a BACT. This approach would be consistent with what the California Air Resources Board has done in with its fleet requirements in California. For example, in 2004, the US EPA awarded the Town of Trumbull, CT a \$60,000 grant to demonstrate the feasibility of repowering a Town recycling truck. A complete report on the project will be available at the end of 2006.

- 3) In the deployment of its vehicle fleet, the Governor, by Executive Order, should require that all state fleet vehicles capable of operating on an alternative fuel, such as bi-fuel CNG vehicles and flex fuel vehicles, must operate on the alternative fuel wherever possible.
- 4) The State should allow single occupant AFVs that meet the state definitions and hybrid vehicles with MPG over 40 miles per gallon to be allowed access to the High Occupancy Vehicle Lanes throughout the state.
- 5) The State should put in place a committee that is headed by the State Economic Development Agency that would include interested groups such as business organizations, CT Clean Cities, municipal, state agencies and colleges/universities to take advantage of pool of talent this state has to reduce mobile source emissions, decrease our dependence on foreign oil while making a business case for it. The group would be organized to tap in the funding sources that are just now materializing in the 2005 Energy Policy Act and new Transportation Bill and other related federal programs.
- 6) Require all State Agencies to change their stated or implied definition of “Energy” to mean not only stationary source uses, but to include mobile source energy uses.

Mid-term/Long Term:

- 1) The State should establish a dedicated grant program for cities, towns, and private companies to purchase alternative fuel or hybrid vehicles, and to construct refueling stations for such vehicles, and to upgrade maintenance facilities as required.
 - a. Funding should weigh petroleum displacement benefits along with NOx and PM reduction.
 - b. High fuel use fleets, such as transit buses and refuse trucks, should be targeted as a priority for use of the funds. Fleets with high exposure to children, such as school buses, should also be a priority.
- 2) The State should establish free or reduced rate “green parking” zones for AFVs that meet the state definitions and hybrid vehicles with MPG over 40 miles per gallon at MetroNorth stations and other state-owned park and ride facilities throughout the state.
- 3) The State should evaluate the feasibility of implementing a compressed CNG vehicle program in the State fleet, including CT Transit. Included in the evaluation should be the potential to develop a public private partnership for CNG infrastructure development statewide, as has been done in New York and Massachusetts. The implementation of the plan should follow its completion.
- 4) The State should establish a research and development program that supports the development of advanced transportation technologies and related business activities within the state.
- 5) The Legislature should consider “Energy Independence” legislation similar to that being passed by our neighboring states to further advance the use of domestic alternative fuels.
- 6) Create the Connecticut part of the I-95 Corridor as an Alternative Fuel Corridor.