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# COMMERCIALIZING ALTERNATIVE FUELS AND ADVANCED VEHICLE TECHNOLOGIES:

## The Government's Role

MAY 2002

Alternative fuels and advanced vehicle technologies can reduce air pollution and protect public health, while also improving national security by reducing U.S. dependency on petroleum. Currently, transportation accounts for over two-thirds of all petroleum used in this country. While still maturing, many alternative fuels and advanced vehicle technologies are now practical. The Environmental and Energy Study Institute and the Northeast Sustainable Energy Association hosted a briefing in which panelists shared experiences with their use of hybrid technologies and compressed natural gas (CNG), biodiesel and clean diesel fuels. The panelists concluded that the remaining challenges in establishing the widespread use and availability of these technologies are not technical, but rather are economic in nature. Federal, state and local governments can play a large role in overcoming this economic barrier by encouraging wide-scale adoption of alternative fuels and advanced vehicle technologies in government fleets. This would provide the market demand necessary to jumpstart these technologies by giving manufacturers the incentive to increase investment and hasten the achievement of economies of scale.

Transit buses provide a unique and exceptional entry point for promoting alternative fuels and advanced vehicle technologies because of their ownership by government entities, central refueling, prevalence in Clean Air Act 'non-attainment' zones and operation in fleets, which can more easily support new technologies through fleet-wide purchases. By strengthening federal support for clean government fleets, transit authorities can cover the additional upfront and operational expenses, enabling them to lead the nation in the transition to less polluting transportation technologies. Government at all levels should take full advantage of the opportunity presented by transit buses, and should further expand its efforts to promote alternative fuels and advanced vehicle technologies in related and larger sectors, such as the trucking industry. This strategy would not only allow the United States to benefit from these cleaner technologies now, but would ensure that these benefits continue to increase as commercialization and market penetration proceeds.

## CURRENT GOVERNMENT SUPPORT

Reauthorization of the Transportation Equity Act for the 21st Century (TEA-21), the federal transportation bill, presents a valuable opportunity to strengthen support for alternative fuels and advanced vehicle technologies. TEA-21 authorized 200 million dollars in funds for clean fuel vehicles through the clean fuels formula grant program. Unfortunately, funds have not been appropriated through this

### PANELISTS

**Ken House**

*Democratic Staff Director, House  
Transportation and Infrastructure  
Committee*

**Dana Lowell**

*Assistant Chief Maintenance Officer,  
MTA New York City Transit*

**Catherine Rips**

*Director of Resource Development,  
SunLine Transit Agency*

**John Van de Vaarst**

*USDA Beltsville Area Agricultural  
Research Service*

**Fred Cartwright**

*Program Director, Allison Electric  
Drives, Allison Transmission  
Division of General Motors*

**Art Guzzetti**

*Policy Director, American Public  
Transportation Association*

**Warren Leon**

*Executive Director, Northeast  
Sustainable Energy Association*

program as intended. Ken House, Democratic Staff Director of the House Transportation and Infrastructure Committee, describes this as a serious shortcoming because the goals of the program were not just to improve air quality, but also to “support the emerging technologies.” The Congestion Mitigation and Air Quality (CMAQ) program provides an additional avenue of funds for alternative fuels and advanced vehicle technologies and has the potential to serve an even larger role in the future.

The panelists concurred that emerging technologies deserve continued and increased government support because they work and are being used successfully across the United States. According to Art Guzzetti, policy director of the American Public Transportation Association, of the 75,000 transit vehicles used in the United States in the year 2000, 9.8 percent used alternative power, which is up from about 3 percent in 1993. Of the new buses purchased, about 34 percent use alternative power sources.

*“All alternative fuels are better than non-alternative fuels in the sense that they reduce oil imports, they reduce pollution, [and] they improve public health.”  
– Catherine Rips, Director of Resource Development, SunLine Transit Agency*

## CASE STUDIES

The expert panel provided an in-depth discussion of the successful adoptions of alternative fuels and advanced vehicle technologies. The purpose of these case studies is to convey the idea, as stated by Catherine Rips, director of Resource Development at SunLine Transit, that “all alternative fuels are better than non-alternative fuels in the sense that they reduce oil imports, they reduce pollution, [and] they improve public health.”

### CNG TECHNOLOGY: THE SUCCESS OF SUNLINE TRANSIT

Compressed natural gas (CNG) is the most widely used of the alternative fuel technologies. According to Guzzetti, CNG vehicles comprised 7.5 percent of the in-service transit vehicles in the United States during the year 2000, whereas all other alternative fuel vehicles combined accounted for only 2.3 percent of the transit vehicles in service.

Sunline Transit Agency in Thousand Palms, California has been running CNG buses since 1994. During this time, they have realized savings in fuel, maintenance, operations, and hazardous waste disposal costs. These savings have helped to offset the higher initial cost of the CNG buses. Although some localities have encountered difficulties with converting to CNG, Rips stated, “we honestly believe that all of those problems can be corrected by just training your employees.” CNG requires specialized refueling stations, which means that converting to CNG requires considerable up-front investment in physical infrastructure.

### BIODIESEL TECHNOLOGY: GOOD NEWS FROM USDA

Biodiesel is a fuel made from soy or other vegetable oils that requires no modification of diesel engines. Biodiesel is a renewable energy resource because these oil yielding plants can be replanted year after year. Although it can be used alone, it is commonly blended with conventional diesel at the ratio of 20 percent biodiesel

– 80 percent conventional diesel. This blend, known as B-20, is the blend that has been approved in manufacturers’ warranties.

Emissions Reductions Achieved Using Biodiesel (B-20)	
Pollutant	Reduction
Unburned hydrocarbons	-30%
Carbon monoxide	-20%
Particulate matter	-22%
Sulfates	-20%
Ozone potential hydrocarbons	-10%
Polycyclic aromatic hydrocarbons (PAH)	-13%
Nitro-polycyclic aromatic hydrocarbons (NPAH)	-50%
Nitrogen oxides	-0%

(John Van de Vaarst, USDA)

According to John Van de Vaarst, deputy area director of USDA Beltsville Area Agricultural Research Service, besides the benefits to air quality, biodiesel also eliminates diesel fumes, causes less eye irritation, and helps to lubricate the engine. Biodiesel is also safe, as it has a higher flash point than petroleum-based diesel, meaning that biodiesel ignites at a higher temperature than does petroleum-based diesel. Because biodiesel is sulfur-free and can be blended with petroleum-based diesel, this fuel should prove useful in reducing the sulfur content of the nation’s diesel fuel.

The Beltsville Agricultural Research Center switched to biodiesel in 1999, using the B-20 blend with a fleet of 150 diesel vehicles. “There is no real disadvantage that we have been able to find by using biodiesel,” asserted Van de Vaarst. This fuel has been proven with over 30 million miles of use. The center has also used biodiesel in stationary uses, such as in their backup generator, and have encountered no decrease in reliability.

## HYBRID AND CLEAN DIESEL SUCCESS IN NEW YORK CITY TRANSIT

New York City Transit Authority had a total of 11 hybrid buses in 2001 and have accumulated over 400 revenue miles since September of 1998. Dana Lowell, assistant chief maintenance officer of MTA New York City Transit, describes their experience with hybrid vehicles as “very positive – for a brand new technology, [hybrid vehicles] have exceeded expectations.” These vehicles have realized significant emissions reductions, especially in particulate matter and nitrous oxides (NOx). New York City Transit has noticed increased fuel economy (at peak 16 percent greater than conventional diesel), and improved performance as they are quiet, have excellent acceleration, smooth braking, and do not roll back on hills. This technology is also favorable in that it requires little or no operator training and no investment in added infrastructure. By 2006, the New York City Transit Authority plans to have 390 hybrid buses in its fleet.

*“For a brand new technology, [hybrid vehicles] have exceeded expectations.”  
– Dana Lowell, Assistant Chief Maintenance Officer,  
MTA New York City Transit*

The most important feature of a hybrid vehicle is regenerative braking. Regenerative braking converts the energy from braking into electricity rather than wasting it as heat as is the case with standard vehicles. The electricity, which is stored in an onboard battery, is used to help power the vehicle. This results in less use of the diesel engine and diesel fuel. The rechargeable battery, which also can be recharged by the diesel engine, allows the engine to be smaller and to run at a more constant speed. The result is increased fuel efficiency and lower emissions. Hybrid technology can be utilized with other alternative fuel technologies, such as biodiesel.

Clean diesel refers to a variety of advanced technologies. New York City Transit used a combination of catalyzed exhaust filters and reduced sulfur diesel fuel. This allows for pollution reductions in total hydrocarbons, carbon monoxide, and particulate matter. New York City Transit currently runs over 1,000 filter-equipped buses. Lowell has noticed no loss of fuel economy and has achieved the same reliability in its filter-equipped fleet as in its conventional fleet.

## MILITARY APPLICATION OF HYBRID TECHNOLOGY

Improved fuel economy is an important attribute for the military. According to Fred Cartwright, program director of Allison Electric Drives of the Allison Transmission Division of General Motors, “seventy percent of the bulk tonnage required to support a military fleet during time of war is fuel related ... This translates to \$600-700 per gallon of diesel fuel during time of war.” Besides improved fuel efficiency, hybrid technology offers two other advantages for a military vehicle. For short periods of time, the vehicle can operate in ‘stealth’ mode, turning off its engine and relying only on the rechargeable battery for power. Secondly, because the engine is connected to a generator, the vehicle can generate its own electricity to operate electronic equipment. The battery allows the electronic equipment to be used even when the engine is off. According to Cartwright, military officials have stated that the hybrid technology is the future for military

vehicles. However, Cartwright points out that they are relying on “commercial off-the-shelf” technology, which is “a big challenge” because the availability of hybrid systems is dependent on the emerging market. Promoting the commercialization of hybrid technology will have direct military benefits, as the cost of hybrid technology will decline and the quality of hybrid technology will increase. Implementing hybrid technology for military use can also facilitate their adoption in other heavy vehicle sectors, such as trucking.

## GOVERNMENT IS NEEDED TO FACILITATE COMMERCIALIZATION

Hybrid, clean diesel, compressed natural gas (CNG), and biodiesel technologies have shown themselves to be functional and are operating successfully across the country. However, “technological advance will not get us to [using] these new vehicles,” asserted Warren Leon, executive director of the Northeast Sustainable Energy Association. The way forward is to educate consumers, vehicle purchasers, and policymakers to support these technologies, continued Leon. Lowell agreed with him, saying that “where the money needs to be put right now is for commercialization.” One of the challenges in implementing these new technologies is their higher cost. However, because these are emerging technologies, costs will decline as economies of scale are achieved and their market penetration increases to military and trucking applications. Lowell gave the example of New York City Transit Authority’s initial purchase of 10 hybrid buses in 1998, when the unit cost was almost \$500,000. In the 2002-2003 fiscal year, New York City Transit Authority will receive an additional 325 hybrid buses at only \$385,000 per bus. The panelists encouraged policymakers

and public officials to support these alternative fuels and advanced vehicle technologies despite their higher initial costs. Although these technologies may be more expensive, they bring higher benefits in the form of better public health, less pollution, and increased national security.

Lowell emphasized that it will be important to “provide funding for further research and deployment of hybrid and other clean fuel technologies” in the reauthorization of TEA-21. This funding will provide the demand needed for industry to invest in these technologies, which will improve the quality and lower the cost of these technologies and pave the way for widespread use of alternative fuels and advanced vehicle technologies. Furthermore, some of the new technologies require up-front investment in the form of specialized refueling stations or training programs. Once a transit authority makes these investments, other fleets will be able to adopt the technology. Sunline Transit, for example, built public access CNG pump stations allowing other local fleets to convert to CNG as well. Sunline also helped to develop a CNG training program for mechanics, which is now being taught in eight community colleges in California.

It is important that TEA-21 and other transportation policies should be technology neutral. “Each fuel has its own special niche” stated Rips. Lowell expressed concern that the U.S. Environmental Protection Agency’s regulatory certification framework does not currently recognize the benefits of hybrid technology. Lowell is strongly in favor of technology neutrality and urged policymakers to “ensure that hybrid and clean diesel technologies are eligible for ‘Alternative Fuel’ incentive funding under TEA-21 reauthorization.”

To achieve the goal of wide-scale adoption of alternative fuels and advanced vehicle technologies, commercialization will have to expand beyond the transit market. Once the transit sector has paved the way, the trucking industry should follow, and the government should be proactive in supporting the adoption of these technologies by other industries.

## CONCLUSION

Supporting alternative fuels and advanced vehicle technologies in the TEA-21 reauthorization presents a unique opportunity for policymakers to work with the private sector to redefine transportation in this country. As public sector demand for these technologies continues to grow, the private sector will increasingly augment its ability to supply them. In this way, switching to alternative fuels and advanced vehicle technologies will become progressively easier and less expensive. This process will lead to a permanent improvement in American transportation in the form of improved public health, lower air pollution, and improved national security. However, this will only occur if the government provides leadership by expanding its support for alternative fuels and advanced vehicle technologies in TEA-21 reauthorization.

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Special thanks to  
The Energy Foundation  
and The John Merck Fund  
for their support  
of this briefing.

