REPORT OF THE
JOINT SUBCOMMITTEE STUDYING

The Use of Vehicles Powered by Clean Transportation Fuels

TO THE GOVERNOR AND
THE GENERAL ASSEMBLY OF VIRGINIA

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CONTENTS

SUMMARY

This study was commissioned by the 1990 General Assembly through passage of House Joint Resolution No. 113 (HJR 113), sponsored by Delegate Arthur R. Giesen, Jr., of Waynesboro. HJR 113 specifically called on the subcommittee ". . . to study the emissions, economics, safety, and other benefits of clean transportation fuels as they relate to the purchase or lease of motor vehicles by state agencies, school divisions, and local transit authorities. . . ." Although the subcommittee heard limited testimony and gathered some information relating to other "alternative fuels" (motor fuels other than gasoline and diesel fuel), it concentrated its attention on five fuels: ethanol, methanol, propane (liquified petroleum gas or LPG), compressed natural gas (CNG), and reformulated gasoline. These same five fuels were prominent in Congressional debates that led to the passage of the federal Clean Air Act Amendments of 1990.

The subcommittee held seven meetings during which it considered information gathered by staff; testimony from experts in various aspects of motor fuel technology; the views of representatives of the natural gas and petroleum industries; and suggestions made by spokespersons for federal, state, and local government agencies. On the basis of this data, the subcommittee concluded that increased use of alternative fuels by government fleet vehicles is safe, desirable (because their use can benefit Virginia's air quality -- particularly in Northern Virginia, the Richmond-Petersburg area, and Hampton Roads), feasible (because use of selected alternative fuels may result in operational cost savings in the long term through lower fuel and maintenance costs), and attractive because their use may help reduce our dependence upon foreign-produced petroleum products.

The subcommittee feels that use of alternative fuels in government fleet vehicles is additionally desirable because it can serve (i) to acquaint the public with these fuels and their benefits and (ii) to eliminate the "chicken-and-egg" difficulty which results when alternative fuels are not generally available because vehicles to use them are not generally available and these vehicles are not generally available because of the difficulty of obtaining fuels for them. Government can serve a valuable and appropriate function in simultaneously creating markets for both alternative fuels and alternatively fueled vehicles.

The subcommittee recommends the passage of ten pieces of legislation (see Appendices I through X) aimed at (i) removing impediments to the use of alternative fuels (Appendices I, IV, VII, and IX), (ii) providing for pilot projects to demonstrate and further test these fuels (Appendices V and VI), (iii) providing incentives for Virginia production of alternative fuels (Appendices II, III, and VIII), and (iv) continuing examination of the ways in which alternative fuels may be used not only to improve air quality, but also to achieve long-term savings in government vehicle fleet operation costs (Appendix X). Several of these recommendations are focused on use of compressed natural gas. This is because of natural gas's low price (compared with gasoline or diesel fuel), safety, attractive emissions profile, availability from domestic sources, and beneficial impact on long-term vehicle maintenance costs. In many ways, natural gas is an ideal fuel not only for school buses, but also for other centrally-fueled fleet vehicles.

The subcommittee feels it is both desirable and feasible that Virginia's state government lead by example in promoting increased use of alternative fuels.

BACKGROUND AND SUBCOMMITTEE ACTIVITIES

CREATION AND SCOPE OF STUDY

This study was commissioned by the 1990 General Assembly through its passage of House Joint Resolution No. 113 (HJR 113), sponsored by Delegate Arthur R. Giesen, Jr., of Waynesboro. The resolution provided for a joint subcommittee of ten members (four from the House and three from the Senate plus the administrator of the Council on the Environment, the executive director of the Department of Air Pollution Control, and the executive director of the Department of Mines, Minerals and Energy) and required that the study's findings and recommendations be submitted to the Governor and the 1991 Session of the General Assembly. A copy of HJR 113 is included with this report as Appendix XI.

HJR 113 specifically called on the subcommittee ". . . to study the emissions, economics, safety, and other benefits of clean transportation fuels as they relate to the purchase or lease of motor vehicles by state agencies, school divisions, and local transit authorities. . . ." However, undertaking this task presupposed a definition -- or at least a list -- of "clean transportation fuels." In the context of HJR 113 and then-current debates involving proposed amendments to the federal Clean Air Act, these fuels were taken to be the following:

- Ethanol;
- Methanol;
- Propane (liquified petroleum gas or LPG);
- Compressed natural gas (CNG); and
- Reformulated gasoline.

Each of these fuels was found to possess different properties and inherent advantages and disadvantages as a motor fuel for government fleet vehicles. The subcommittee held seven meetings during which it considered information gathered by staff; testimony from experts in various aspects of motor fuel technology; the views of representatives of the natural gas and petroleum industries; and suggestions made by spokespersons for federal, state, and local government agencies. It investigated the relative costs and benefits of using alternative fuels in government fleet vehicles in order to make appropriate recommendations based upon criteria of (i) engine emissions, (ii) economy, (iii) safety, and (iv) other factors.

BASIC INFORMATION: FUELS

In order to formulate policy alternatives involving clean transportation fuels, the subcommittee considered some basic information about these fuels and their sources, operating characteristics, emissions, benefits, and liabilities. This data was by no means exhaustive, but provided the subcommittee base line data upon which to build during its deliberations.

ETHANOL. Ethanol is an alcohol fuel made from corn, grain, sugar cane, or other biomass. There are two broad types of ethanol fuels: neat ethanol fuels and ethanol blends. (Neat fuels are those which contain at least 85 percent alcohol).

The ethanol fuel with which the public is most familiar is gasohol, a blend of gasoline and alcohol. In the United States, the alcohol portion of this fuel is typically made from corn.

One of the advantages of ethanol fuels is that their alcohol components are made from domestically produced renewable resources. However, because of the relatively high cost of producing this alcohol, ethanol fuels typically require some form of tax preferments or other direct or indirect government subsidies.

Virginia has provided subsidies to producers of alcohol used in motor fuels since 1981 (see Virginia Code § 58-711). Beginning in fiscal year 1982, gasohol production in Virginia received a state subsidy of eight cents per gallon. This subsidy was scheduled to decline by two cents per gallon every two years before expiring in 1990. In 1984, however, the law was amended to extend the eight cents per gallon subsidy for two additional years, declining to six cents per gallon by 1987, four cents per gallon by 1989, and two cents per gallon in 1991 before expiring at the end of 1992. (See also "Report of the Coal and Energy Commission to the Governor and the General Assembly of Virginia," Senate Document No. 23, 1987.)

This subsidy program was replaced in 1986 (see Chapter 553 of the 1986 Acts of Assembly) by the Alcohol Fuel Production Incentive Program. This program provided to producers of the alcohol component of gasohol a subsidy of 60 cents per gallon from July 1, 1986, to June 30, 1988; 40 cents per gallon from July 1, 1988, to June 30, 1990; and 20 cents per gallon from July 1, 1990, to June 30, 1992. Unless the law (see § 58.1-2127.2) is amended prior to that time, Virginia's gasohol incentive program will expire on July 1, 1992. Virginia's payments under these two gasohol subsidy programs are summarized in the following table.

Payouts for the
Virginia Fuel Production Incentive Program

Fiscal Year	Amount (in $ millions)
1982	$ 1.1
1983	3.2
1984	5.7
1985	17.1
1986	37.6
1987	22.7*
1988	33.0
1989	21.8
1990	20.6
1991	11.5 (estimated)
1992	11.5 (estimated)
1993	0.4 (estimated)
TOTAL	$186.3

* Tax incentive payments replaced by grant payments to producers.

At the federal level, gasohol production is subsidized through an exemption from six cents per gallon of the 9.1 cent per gallon federal gasoline excise tax. Since one gallon of ethanol is mixed with 10 gallons of gasoline to make gasohol, there is, in effect, a federal gasohol subsidy of 60 cents per gallon. The federal government also provides an exemption from the federal special motor fuels tax of six cents per gallon for certain neat methanol and ethanol fuels derived from sources other than petroleum or natural gas. An exemption of 4.5 cents per gallon is provided for these fuels when derived from natural gas.

Most authorities agree that, in the absence of state and federal subsidies and incentive programs, the price of gasohol and other ethanol fuel blends will not be competitive with that for gasoline unless the price of crude oil rises to about $40 per barrel. Since the beginning of the Middle East Crisis in August, 1990, the current price of crude oil has fluctuated, roughly, between $25 and $32 per barrel.

Authorities disagree as to whether incentives (at least at the federal level) for production of alcohol as a motor fuel component are a net cost or net saving to the taxpayer. Some argue that it costs the federal government less to pay gasohol subsidies that it would cost the federal government to pay crop price supports in the absence of federal gasohol subsidies.

In addition to their relatively high cost, ethanol fuels suffer from other drawbacks as well. While higher in octane, ethanol fuels are generally lower in energy content than gasoline. Motorists using ethanol fuels generally are able to drive shorter distances than they could using the same amount of gasoline. Ethanol fuels are also more corrosive than gasoline; they absorb water and dislodge silt, making them more difficult to transport by pipeline; and ethanol-fueled vehicles are sometimes difficult to start in cold weather.

While there has been very limited experience in the United States with vehicles fueled with neat ethanol, since 1979 Brazil has had a national program of promoting ethanol fuels. Since the beginning of this program, over four million ethanol-fueled cars and trucks have been placed in service. By the end of the 1980's, over 90 percent of new vehicles in Brazil ran on ethanol. This trend began to reverse itself at the end of the last decade when the world price of crude oil again declined. When the price of oil dropped, the number of traditionally fueled vehicles in Brazil again began to increase. Most Brazilian ethanol is produced from sugar cane. U.S. tariffs operate to make the importation of Brazilian ethanol uneconomical.

METHANOL. Methanol, like ethanol, is an alcohol fuel. The principal difference is that methanol alcohol is made from coal or natural gas, while ethanol alcohol is made from corn, sugar cane, or other biomass. Like ethanol, methanol can be made from raw materials (coal or natural gas) which are readily available domestically. Also like ethanol, methanol cannot presently compete in price with gasoline unless subsidized. While some methanol blended fuels are available in a few locations in the United States, they are not readily available to the general public, and, where available, are either (i) more expensive than gasoline, (ii) subsidized in some manner, or (iii) being sold at a loss.

Neat methanol fuels are highly toxic, corrode tanks and pumps, require special handling, have a lower energy content than gasoline (thus requiring more fuel to go the same distance as gasoline), emit formaldehyde, are odorless and soluble in water (making spills and leaks harder to detect), and burn with an invisible flame (creating a possible explosion hazard). On the other hand, even given methanol's formaldehyde emissions, its total spectrum of emissions are an improvement of the emissions produced by gasoline: methanol has lower emissions of vapor, benzene, and other toxics, and possibly somewhat lower emissions of hydrocarbons.

Virginia has limited familiarity with methanol blend fuels in the form of coalahol, a blend of gasoline or diesel fuel and coal-derived liquids. This product is currently being sold in five locations in Southwest Virginia. As in the case of gasohol, vehicles designed to run on gasoline need no modifications to run on gasoline coalahol. Diesel vehicles need no modifications in order to run on diesel/coalahol. As an experimental project, Virginia coalahol is presently being sold for about one dollar per gallon, below the present cost of production.

In 1989 Virginia provided a tax incentive for coalahol. (See amendments to Virginia Code §§ 58.1-2101, 58.1-2105, and 58.1-2116, Chapter 701 of the 1989 Acts of Assembly.) Instead of the standard state tax of 17.5 cents per gallon on gasoline, for gasoline coalahol the law provides for a tax of three cents per gallon for the first three years of production, nine cents per gallon for the fourth year, 7.5 cents per gallon for the fifth year, 13.5 cents per gallon for sixth and seventh years, and 15.5 cents per gallon for the eighth and ninth years. Beginning with the tenth year of production, gasoline coalahol would be taxed at the same rate as gasoline. Similar tax reductions are provided for coalahol diesel fuel and coalahol aviation fuel. However, it is important to note that, in order to qualify for these lower tax rates, these coalahol blends must contain at least 20 percent coal-based liquids blended to meet fuel specifications. The coalahol presently being sold in Virginia does not meet these requirements, and is not likely to meet these requirements in the foreseeable future. Consequently, no Virginia coalahol presently is eligible for the reduced tax rates.

Various authorities put the world-wide number of vehicles operating on neat methanol fuels at between 800 and 1,000. Most of these are in California, which is developing a program aggressively promoting methanol fuels. Presently neat methanol fuels are not being produced in commercial quantities in the United States. California is negotiating with Canadian producers to make available the quantities of ethanol fuels which will be required to put the state's methanol program into operation. California authorities expect that Canadian-produced methanol fuels can be made available in California for about $1.45 per gallon.

PROPANE. Propane is a liquified gas made from petroleum. The public is most familiar with propane as a fuel for cooking appliances in recreational vehicles, camping stoves, back yard grills, and propane torches. As a motor fuel, propane produces a higher octane than gasoline; offers reductions in hydrocarbon, carbon monoxide, and nitrogen oxide emissions; and is less expensive than gasoline. On the other hand, compared to gasoline, propane is available from a limited number of suppliers, requires the use of pressurized tanks (which may not legally be taken through many tunnels), and necessitates special engine modifications. These modifications typically cost about $2,000 per vehicle. Because propane is heavier than air, in the event of a leak, propane gas will settle in pockets and can pose a significant explosion hazard.

In Virginia, the state motor fuel tax for propane is calculated on the basis of gallon equivalents based on the number of miles traveled and an imputed mileage for the vehicle using the propane fuel. The Fuels Tax Department of the Division of Motor Vehicles (see Bulletin No. 05) assumes straight trucks of three-quarters to one and one-half tons to achieve 12 miles per gallon, straight trucks of two to three tons to achieve eight miles per gallon, tandem trucks over two tons to achieve six miles per gallon, and tractor-trailer combinations to achieve four miles per gallon. Tandem trucks under two tons are treated as straight trucks. In Virginia, propane is taxed as a "special fuel" at the rate of 16.2 cents per gallon. In fiscal year 1989, a total of $255,528 in state motor fuel taxes on propane were paid to Virginia by 31 taxpayers.

COMPRESSED NATURAL GAS (CNG). To most Virginians, natural gas is something used to cook, heat homes, and generate electricity. Few people think of CNG gas as a motor fuel. Those who do think of it as a motor fuel at all are likely to confuse it with propane -- possibly because both fuels are carried in pressurized cylinders. However, unlike propane, CNG is a naturally occurring substance, is not refined or made from petroleum, and is maintained in a gaseous state from the point where it is extracted from the earth to the point where it is burned as a motor fuel.

On the environmental side, CNG-powered vehicles emit fewer hydrocarbons, toxics, and carbon monoxide than gasoline-powered vehicles. However, facilities for refueling CNG-powered vehicles are few, and, depending upon the configuration of the refueling facility, refueling can be very time consuming: refueling time can range from about two to five minutes to six to 14 hours. Although experiences of CNG-powered vehicles vary, some CNG-powered vehicles experience a five to 10 percent power loss in comparison to similar gasoline-powered vehicles. Because of the refueling peculiarities of CNG-powered vehicles, they are most frequently used in centrally-fueled vehicle fleets such as school buses or utility service vehicles. Some users of CNG-powered vehicles experience considerable reductions in the costs of vehicle maintenance, being able to operate vehicles longer between spark plug replacement and lubricant changes. Conversion of a gasoline-powered vehicle to burn CNG costs about $1,500 to $2,000 dollars -- about as much as conversion to propane.

Judging from the Commonwealth's motor fuel tax collections, Virginia's experience with CNG-powered vehicles is less than that with propane-fueled vehicles. In fiscal year 1989 only a single taxpayer paid Virginia motor fuel tax on CNG, and the amount was only $20,032. Unlike propane, CNG is taxed on a cubic foot basis. It is the policy of the Fuels Tax Department of the Division of Motor Vehicles to consider 100 cubic feet of CNG at a pressure of 14.73 pounds per square inch and 60 degrees Fahrenheit to be the equivalent of one gallon of liquid motor fuel. It is interesting to note that no federal motor fuel tax is imposed on CNG.

Vehicles powered with CNG have been available in the U.S. since the 1920's. About 30,000 CNG-powered vehicles are currently operating in the US. Most of these are dual-fueled vehicles capable of operating on either CNG or gasoline.

REFORMULATED GASOLINE. Of all the alternative motor fuels under serious discussion, reformulated gasoline is the least exotic. Its use would require little if any (i) retrofitting or conversion of existing vehicles, (ii) changes in the refining process or distribution system, or (iii) alteration in consumer habits. Reformulated gasoline would probably be only slightly more expensive than present gasoline. Although reformulated gasoline is not presently available in all areas of the country and in all grades of fuel, since the product requires little change in the refining and distribution system, this situation could change fairly quickly.

Environmentally, this product would produce lower hydrocarbon emissions, contain lower concentrations of carcinogens known as olefins and aromatics, and reduce the amount of pollution from vapor emissions. However, conversion from use of gasoline to reformulated gasoline would do nothing to reduce dependence on petroleum imports or mitigate pollution from the petroleum refining process. Additionally, reformulated gasoline cannot meet proposed aromatic and benzene emissions limitations contained in proposed amendments to the federal Clean Air Act. While reformulated gasoline may be the least exotic alternative fuel, it may have the fewest positive environmental impacts.

OXYGENATED FUELS. Gasohol, several methanol/gasoline blends, and two more exotic products called ETBE (ethyl tertiary butyl ether) and MTBE (methyl tertiary butyl ether) make up a group of fuel mixtures referred to as oxygenated fuels. As a group, these fuel blends have sufficient similarities to be considered together in strategies aimed specifically at reducing carbon monoxide pollution.

Carbon monoxide pollution tends to be a winter weather problem, while ozone pollution from photoreactive hydrocarbons tends to be a summer weather problem. Carbon monoxide pollution in some American cities (such as Denver, Colorado) is compounded by their location at high altitudes or in geological bowls or valleys which trap and concentrate carbon monoxide (CO).

When gasoline engines run cold, their combustion is often incomplete, resulting in increased CO emissions. Oxygenated fuels increase the combustion efficiency of gasoline engines and reduce CO emissions. The amount of this reduction depends on the engine, the temperature, and the oxygen content of the fuel. When run on oxygenated fuels, gasoline engines equipped with carburetors produce up to 33 percent lower CO emissions. These emissions are reduced from five to 20 percent in fuel-injected vehicles.

Oxygenated fuels programs are in place in Denver, Albuquerque, and Phoenix. The Denver program has been able to reduce carbon monoxide emissions by twelve percent. Oxygenated fuels programs typically require use of oxygenated fuels only during the winter. Since oxygenated fuels do not contribute to the reduction of the kind of hydrocarbon emissions that typically produce smog in summer weather, some localities need to adjust their fuels according to the season.

BASIC INFORMATION: EMISSIONS AND POLLUTANTS

Motor fuels are chemically complex. Not only are many of the products of combustion of these fuels hazardous or polluting or both, but so are many of the components of the fuels themselves, even if unburnt. One version of the recently adopted federal Clean Air Amendments of 1990 contained a list of more than 180 "hazardous air pollutants." While the subcommittee did not discuss even a majority of these substances, the subcommittee did familiarize itself on four classes of emissions and pollutants associated with the various alternative clean transportation fuels. As in the case of data presented on the fuels themselves, this information was by no means comprehensive, but was intended to provide the subcommittee with the most essential basics.

CARBON MONOXIDE (CO). This is a colorless, odorless, and tasteless gas produced by incomplete combustion. It has 200-250 times more capability than oxygen of combining with hemoglobin to form carboxyhemoglobin, which interferes with the oxygen carrying capacity of blood, resulting in a state of tissue hypoxia. High CO concentrations in the air cause nausea, headache, and dizziness.

NITROGEN OXIDES (NOx). Oxides of nitrogen include nitric oxide (NO) and nitrogen dioxide (NO_2). Nitrogen oxides react in sunlight with ozone and hydrocarbons to form NO_2. This is an initial step in the creation of smog. The major portion of NOx produced is NO, usually comprising over 90 percent of the NOx. NOx can cause irritation of the eyes, nose, and throat. NO_2 causes inflammation of lung tissue which can lead to pulmonary edema and is more toxic than NO.

HYDROCARBONS. These are organic compounds of hydrogen and carbon, including paraffins, olefins, members of the acetylene series, alicyclic hydrocarbons, and aromatic hydrocarbons (usually referred to as "aromatics," such as benzene, naphthalene, and biphenyl). Some hydrocarbons result from combustion of fuel and become part of the "tailpipe emissions" from motor vehicles. Others are released into the atmosphere through evaporation of motor fuels themselves, either from vehicle fuel tanks or from storage tanks at filling stations and elsewhere. Some of these substances are themselves hazardous, and others (photoreactive hydrocarbons) pose a secondary difficulty because, in the presence of sunlight, they form ozone and combine with other pollutants to create smog.

PARTICULATES. The public is most familiar with particulates as soot -- especially the soot produced by diesel engines. Diesel particulates are of heightened concern because they are almost entirely respirable in size and can absorb other chemical substances, including carcinogens. Particulates carry these carcinogens into the lungs where they may leach to other regions of the body and cause damage to other organs.

BASIC INFORMATION: VEHICLE FLEETS

House Joint Resolution No. 113 directed the subcommittee to study clean transportation fuels ". . . as they relate to the purchase or lease of motor vehicles by state agencies, school divisions, and local transit authorities." Since many of the fuels under discussion were not available in many localities (and may not be generally available for a considerable time) and since at least some clean fuels lent themselves to large fleet operations, it proved helpful for the subcommittee to know which government vehicle fleets and transit systems were the most likely targets for any proposals the group might consider.

SCHOOL BUS FLEETS. Seven local school divisions operate school bus fleets large enough to be potentially meaningful for the present study:

School Division	Number of Buses
Fairfax County	1,301
Virginia Beach	522
Prince William County	480
Chesterfield County	443
Henrico County	287
Newport News	271
Roanoke County	180

School buses make good candidates for clean fuel technologies for at least two reasons: (i) they are typically centrally fueled (thus requiring only a single source of a fuel which may not be generally available) and (ii) many are gasoline powered (and, therefore, require fewer engine modifications to run efficiently on some alternative fuels -- particularly CNG). The subcommittee discovered, however, that an increasing proportion of new school buses are diesels.

GOVERNMENT VEHICLE FLEETS. Probably the three largest government vehicle fleets in Virginia (aside from those under the control of federal agencies) are (i) the Central Garage fleet controlled by the Virginia Department of Transportation (VDOT), (ii) the maintenance and construction vehicles controlled by the Equipment Division of VDOT, and (iii) the vehicle fleet controlled by the Equipment Maintenance Transportation Agency (EMTA) of Fairfax County.

Fleet	Number of Vehicles
VDOT Central Garage	2,800 (approximately)
VDOT Equip. Div.	1,900 (approximately)
State Police	1,762
Fairfax EMTA	4,400 (approximately)

Each of these fleets has somewhat different characteristics. The Central Garage fleet is composed entirely of passenger vehicles. Though some are vans, the vast majority are sedans. Unlike school buses, many Central Garage vehicles are refueled between the time they leave the garage and the time they return, making it difficult to apply technologies requiring a single fuel which may not be generally available to the public. About 400 Central Garage vehicles are replaced annually.

The bulk of the Equipment Division's vehicles are standard dump trucks. All its large trucks (including these dump trucks) are diesel powered, thus rendering their conversion to some clean fuel technologies more expensive.

Of the 1,762 vehicles operated by the Virginia State Police, 1,664 are passenger vehicles (866 marked patrol cars, 480 unmarked cars, and 318 criminal investigation division vehicles). The remaining 98 vehicles are of a variety of types ranging from vans to armored cars. The Department of State Police maintains 59 fueling facilities. However, especially in rural areas, many State Police vehicles are refueled at commercial filling stations, limiting their adaptability to clean fuels technologies not available to the general public.

About 40 percent of EMTA's vehicles are school division vehicles, most of which are buses. About 900 are passenger vehicles (including police cruisers). The remainder are various types of trucks, some of which are very heavy highway maintenance and public works vehicles. These vehicles are centrally maintained and serviced, but are under the day-to-day control of individual county agencies. Fairfax County maintains 55 fueling stations for these vehicles, limiting the advantages accruing from technologies relying on central refueling.

TRANSIT SYSTEMS. The total number of buses operated in Virginia by all the transit system is approximately 1,250. Four transit systems account for more than three-quarters of this total: (i) Washington Metropolitan Area Transit Authority (Metro), (ii) Greater Richmond Transit Company (GRTC), (iii) Peninsula Transportation District Commission (Pentran), and (iv) Tidewater Transportation District Commission (TRT).

Transit System	Number of Buses
Metro (total)	1,630 (approximately)
Metro (in Virginia)	430 (approximately)
GRTC	207 (approximately)
TRT	200 (approximately)
Pentran	110 (approximately)

Virtually all these transit buses are diesel powered, again rendering it difficult and expensive to adapt them to certain clean fuel technologies. At least in the case of Metro, which operates three garage/refueling facilities in Virginia alone, technologies which are dependent upon centralized refueling may be problematical. Pentran has held "very preliminary" discussions exploring the potential costs and benefits of converting at least a portion of its fleet to operate on CNG. Although it has no plans for conversion of its bus fleet to CNG fuel in the near future, TRT has received a grant from the federal Urban Mass Transit Administration for conversion of its pedestrian ferry operation (across the Elizabeth River between Portsmouth and Norfolk) from diesel engines to CNG-fueled engines.

FEDERAL LEGISLATION

The work of the subcommittee was carried on at the same time as Congress was debating the final form of what eventually became the Clean Air Act Amendments of 1990, signed into law by President Bush in late 1990. Through testimony by federal agency representatives and briefing by state agency representatives, the subcommittee tried to take into account the probable affect on Virginia of these changes in the federal law. This proved very difficult, and the final passage of the Clean Air Amendments so late in the year became one of the primary reasons for the subcommittee's request that its work be extended for an additional twelve months. It was not possible for the subcommittee to obtain either a complete text of the Act nor a substantial summary of the Act's Virginia-related provisions in time to include their impact on the Commonwealth in this report.

The federal legislation does provide for imposition of more stringent motor vehicle tailpipe emissions standards for nonmethane hydrocarbons, other hydrocarbons, nitrogen oxides, carbon monoxide, and particulates. Beginning in January, 1999, even more stringent emissions standards will be applied if certain "serious" or "extreme" nonattainment areas exceed ozone level standards. These latter standards would include not only tailpipe emissions, but also evaporative and refueling emissions. For Virginia, the Clean Air Amendments are likely to have their greatest impact in Northern Virginia (the most polluted of Virginia's three air quality nonattainment areas), where new and more stringent emissions standards will probably be felt most by the transit bus industry.

FINDINGS AND RECOMMENDATIONS

REMOVING IMPEDIMENTS TO THE USE OF ALTERNATIVE FUELS (Appendices I, IV, VII, and IX)

The subcommittee found that hardly any of Virginia's statutes or regulations were drafted with alternative fuels in mind. Promotion of alternative fuels will require not only changes in the law (both statutes and regulations), but also changes in purchasing practices and institutional thinking. The process is further complicated by a kind of "chicken-and-egg" difficulty that arises because alternative fuels are not generally available; the fuels are not generally available because vehicles to use them are not generally available; and these vehicles are not generally available because alternative fuels are not generally available. Government can serve a valuable and appropriate function in simultaneously creating markets for both alternative fuels and alternatively fueled vehicles.

The subcommittee recommends four pieces of legislation (see Appendices I, IV, VII, and IX) aimed at addressing some of the impediments to increased use of alternative fuels:

- A bill to grant the State Corporation Commission discretionary authority to deregulate the sale of natural gas used as a motor fuel (Appendix I);

- A joint resolution requesting VDOT to amend its regulations to permit alternatively fueled vehicles (subject to prudent safeguards and limitations) to use highway tunnels under VDOT control (Appendix IV);

- A bill to require that regulations of the Virginia Board of Education not unreasonably limit use of alternative fuels in school buses Appendix VII); and

- A resolution requesting the State Corporation Commission to identify and remove impediments to the use of compressed natural gas as a motor fuel (Appendix IX).

Experience in other states and testimony before the subcommittee has shown that as long as sales of natural gas used as a motor fuel are subject to the same regulations as other sales of natural gas, neither the natural gas industry nor filling stations will move in the direction of making natural gas available as a realistic choice for use as a motor fuel. The State Corporation Commission recommended legislation to the subcommittee as a logical first step in a longer process of separating what is sometimes called "VNG" (vehicle natural gas) from the traditional natural gas market. The total process of disentangling these two uses of natural gas will take some time, and must be pursued cautiously in order to ensure that no inappropriate burden is placed on natural gas rate payers by the separation of the VNG market. The subcommittee has also recommended a joint resolution requesting the State Corporation Commission to work cooperatively with concerned parties to look further into this situation and make further recommendations as they deem appropriate.

When present VDOT tunnel regulations were drafted, the development of vehicles (particularly buses) fueled by compressed natural gas was, quite frankly, not envisioned. While, in the short term, VDOT can accommodate demonstration projects and individual cases through the issuance of special permits, long-term public interest in the encouragement of use of alternative fuels requires that these regulations be amended to provide for tunnel use by alternatively fueled vehicles (subject to prudent safeguards). VDOT has agreed to the need to make these changes.

At least three Virginia school divisions (Chesterfield County, Fairfax County, and Virginia Beach) have expressed interest in converting at least a portion of their school bus fleets to CNG. Virginia's natural gas industry has been eager to assist these school divisions in providing fueling facilities and technical assistance. However, the subcommittee has received comments from school officials that there has been some hesitation on the part of state education agencies to proceed aggressively in this area. The subcommittee feels that, as an important component of Virginia's alternative fuels policy, Virginia Department of Education regulations -- at the very least -- should not unreasonably interfere with the use of alternative fuels for school buses.

PROVIDING FOR ALTERNATIVE FUELS PILOT PROJECTS
(Appendices V and VI)

The subcommittee found that, in encouraging the use of alternative fuels, there is a "chicken-and-egg" difficulty which results when alternative fuels are not generally available because vehicles to use them are not generally available and these vehicles are not generally available because of the difficulty of obtaining fuels for them. The subcommittee feels that government can serve a valuable and appropriate function in simultaneously creating markets for both alternative fuels and alternatively fueled vehicles through a series of pilot projects, the best candidates for which are (i) school buses and (ii) VDOT's fleet vehicles. Accordingly the subcommittee recommends two pieces of legislation (see Appendices V and VI) aimed at encouraging such pilot projects.

- A joint resolution requesting VDOT to undertake alternative fuels pilot projects (Appendix V); and

- A joint resolution requesting the Virginia Board of Education generally to promote the use of alternative fuels by school buses (Appendix VI); and

On its own initiative, VDOT conducted a study of the costs and benefits of using alternative fuels in its fleet vehicles. In testimony before the subcommittee, VDOT expressed a preference for use of CNG (over other alternative fuels studied) and its willingness to undertake further pilot project testing of these vehicles. Virginia's gas industry agreed to work with VDOT in selecting appropriate projects and arranging for fueling facilities. The subcommittee felt it was desirable that at least one of these VDOT pilot projects be conducted in each of Virginia's three air quality nonattainment areas: Northern Virginia, the Richmond-Petersburg area, and Hampton Roads

As mentioned earlier in this report, the subcommittee felt there to be a need for the Virginia Department of Education to be more aggressive in not only permitting, but actually promoting and seeking out pilot projects for using CNG (or other alternative fuels) for school bus fleets. The subcommittee received information on successful CNG school bus projects in Pennsylvania, Colorado, Texas, and elsewhere.

Dr. Robert Mulvin, superintendent of schools for the Harbor Creek School District in Harbor Creek, Pennsylvania, testified before the subcommittee that, in 1981, his district converted forty school buses to operate on CNG and constructed a combination quick-fill and slow-fill fueling facility (including three compressors) for a total cost of $154,000. He estimated that undertaking the same project today would cost approximately $192,500. He reported that his school district had experienced reduction both in fuel costs and also in bus operating costs.

INCENTIVES FOR VIRGINIA PRODUCTION AND USE OF ALTERNATIVE FUELS (Appendices II, III, and IX)

The subcommittee found that, in promoting the use of alternative fuels, there is a need not only for removing impediments to use of these fuels, but also for incentives for there production and use. Presently Virginia has in place two alternative fuels incentive programs: the gasohol production incentive program and the coalahol program. The gasohol program is scheduled to expire on July 1, 1992, and the coalahol incentive program has never become operational. In order to qualify for lower tax rates, coalahol blends must contain at least 20 percent coal-based liquids blended to meet fuel specifications. No form of economic incentive is presently provided by the Commonwealth to induce school divisions to convert the school bus fleet to use of CNG or to induce transit system operators to convert transit buses to use any form of alternative fuel. The subcommittee recommends three pieces of legislation (see Appendices II, III, AND VIII) aimed at providing incentives in these areas.

- A bill reducing the coal liquids requirement for coalahol (Appendix II);

- A bill permitting Literary Fund loans for constructing natural gas fueling facilities for school buses (Appendix III); and

- A joint resolution memorializing Congress to provide funding for alternatively fueled transit buses (Appendix VIII).

The recommended legislation would cut the coal liquid component requirement for coalahol from 20 percent to 10 percent, thus providing a tax preference for this fuel which, hitherto, although provided for in law, has not become operational because coal liquid contents of these fuels have ranged, roughly, from 10 to 15 percent. This measure could have economic benefits for Virginia's coal industry similar to those which the gasohol incentive program has had for Virginia agriculture.

Section 8 of Article VIII of the Constitution of Virginia establishes the state Literary Fund and provides that it may be used by the General Assembly "for public school purposes, including the teachers retirement fund." The Literary Fund is administered by the Board of Education. The Constitution's language does not prohibit the use of the Literary Fund for making loans for school bus fuel farms. Such loans would be administered by the Board of Education in the same manner as other Literary Fund loans. Cost differentials between CNG and conventional fuels could provide a considerable incentive to school divisions for conversion of the bus fleets.

CONTINUING THE STUDY OF ALTERNATIVE FUELS

The subcommittee would have liked to be able more fully to take provisions of the federal Clean Air Act Amendments of 1990 into consideration in preparing this report, however, Congressional debate on the measure did not conclude until the fall of 1990, and neither a detailed summary nor a complete text of the final bill were available to the subcommittee in time for their consideration prior to preparation of this report. Additionally, the subcommittee feels it is important for them to be able (i) to continue its consideration of issues and proposals brought to its attention in 1990, (ii) to monitor the implementation of those of its recommendations which may be approved by the Governor and 1991 General Assembly, (iii) to continue to work cooperatively with the State Corporation Commission, other affected state agencies, industries, groups, and individuals in order to improve the availability and expand the use of clean transportation fuels in Virginia. A draft joint resolution (Appendix X) is recommended to provide for this continuation.

Respectfully submitted,

Arthur R. Giesen, Jr. (Chairman)

Daniel W. Bird, Jr. (Vice Chairman)

Keith J. Buttleman

Robert L. Calhoun

Wallace N. Davis

O. Gene Dishner

Franklin P. Hall

Alan E. Mayer

Glenn B. McClanan

Emilie F. Miller

APPENDIX I

RECOMMENDED LEGISLATION

GRANTING THE STATE CORPORATION COMMISSION
DISCRETIONARY AUTHORITY TO DEREGULATE
SALE OF NATURAL GAS USED AS A MOTOR FUEL

D 11/16/90 Wambold T 11/28/90 smw

SENATE BILL NO. ..... HOUSE BILL NO. .....

A BILL to amend and reenact §§ 13.1-620 and 56-265.1 of the Code of Virginia and to amend the Code of Virginia by adding a section numbered 56-232.2, relating to regulation of certain corporations.

Be it enacted by the General Assembly of Virginia:

1. That §§ 13.1-620 and 56-265.1 of the Code of Virginia are amended and reenacted and that the Code of Virginia is amended by adding a section numbered 56-232.2 as follows:

§ 13.1-620. Special kinds of business.--A. If any corporation is to conduct the business of a bank or trust company, that shall be stated in the articles of incorporation and the corporation shall not have power to conduct other business except as may be related to or incidental to the banking or trust company business.

B. If any corporation is to conduct the business of an insurance company, that shall be stated in the articles of incorporation and the articles shall further set forth the class or classes of insurance the corporation proposes to undertake and the corporation shall not have power to conduct other business except as may be related to or incidental to the insurance business.

C. If any corporation is to conduct the business of a savings and loan association or an industrial loan association, that shall be stated in the articles of incorporation and the corporation shall not have power to conduct other business except as may be related to or

incidental to the stated business.

D. If any corporation is to conduct the business of a railroad or other public service company, that shall be stated in the articles of incorporation and a brief description of the business shall be included. Otherwise the corporation shall not have the power to conduct a public service business or to exercise any of the privileges of a public service company. No corporation shall be organized under this chapter for the purpose of conducting in this Commonwealth more than one kind of public service business except that the telephone and telegraph businesses or the water and sewer businesses may be combined, but this provision shall not limit the powers of domestic corporations existing on January 1, 1986. No corporation organized under this chapter to conduct the business of a public service company shall have general business powers in this Commonwealth. Corporations organized under this chapter to conduct the business of a public service company may, however, conduct in this Commonwealth other public service business or nonpublic service business so far as may be related to or incidental to its stated business as a public service company and in any other state such business as may be authorized or permitted by the laws thereof. Nothing in this subsection shall limit the powers of such corporation in respect of the securities of other corporations.

E. If one or more of the purposes set forth in the articles of incorporation is to own, manage or control any plant or equipment or any part of a plant or equipment within the Commonwealth for the conveyance of telephone messages or for the production, transmission, delivery or furnishing of heat, light, power or water, including heated or chilled water, or sewerage facilities, either directly or

indirectly, to or for the public, the Commission shall not issue a certificate of incorporation unless the articles of incorporation expressly state that the corporation is to conduct business as a public service company.

F. Whether or not classified elsewhere in the Code as public service companies the following businesses are not required to incorporate as public service companies: household goods carriers, petroleum tank truck carriers, bottled gas companies, taxicab companies, community television companies, charter party carriers, restricted parcel carriers, sight-seeing carriers, ~~and~~ companies excluded from the definition of "public utility" by § 56-265.1 (b) (4) and compressed natural gas filling stations .

G. A water or sewer company that proposes to serve more than fifty customers shall incorporate as a public service company. A water or sewer company shall not serve more than fifty customers unless its articles of incorporation state that the corporation is to conduct business as a public service company. The two preceding sentences shall not apply to a water or sewer company incorporated before and operating a water or sewer system on January 1, 1970; however, as to any water or sewer system serving more than fifty customers, upon application to the Commission by a majority of the customers or by the company, a hearing may be held after thirty days' notice to the company and the system's customers or a majority thereof, and the Commission may order such, if any, improvements or rate changes or both as are just and reasonable. Upon ordering into effect any rate changes or improvements found to be just and reasonable, the water or sewer system shall remain subject to the Commission's regulatory authority in the same manner as a public utility for such reasonable

period as the Commission may direct.

§ 56-232.2. Regulation of compressed natural gas service.--The Commission may forbear from regulating and prescribing the rates, charges, and fees for the provision of retail compressed natural gas service provided by corporations other than public service corporations. Wholesale compressed natural gas sales provided by public service corporations shall continue to be regulated by the Commission to the same extent as are services provided by other public utilities under this chapter. The Commission may adopt regulations implementing this statute.

§ 56-265.1. Definitions.--In this chapter the following terms shall have the following meanings:

(a) "Company" means a corporation, an individual, a partnership, an association, a joint-stock company, a business trust, a cooperative, or an organized group of persons, whether incorporated or not; or any receiver, trustee or other liquidating agent of any of the foregoing in his capacity as such; but not a municipal corporation or a county.

(b) "Public utility" means any company which owns or operates facilities within the Commonwealth of Virginia for the generation, transmission or distribution of electric energy for sale, for the production, transmission, or distribution, otherwise than in enclosed portable containers, of natural or manufactured gas or geothermal resources for sale for heat, light or power, or for the furnishing of telephone service, sewerage facilities or water. Provided that the term "public utility" shall not include any of the following:

(1) Any company furnishing sewerage facilities, geothermal resources or water to less than fifty customers. Any company

furnishing water or sewer services to ten or more customers and excluded by this subdivision from the definition of "public utilit for purposes of this chapter nevertheles shall not abandon the water or sewer services unless and until approval is granted by the Commission or all the customers receiving such services agree to accept ownership of the company.

(2) Any company generating and distributing electric energy exclusively for its own consumption.

(3) Any company (A) which furnishes electric service together with heating and cooling services, generated at a central plant installed on the premises to be served, to the tenants of a building or buildings located on a single tract of land undivided by any publicly maintained highway, street or road at the time of installation of the central plant, and (B) which does not charge separately or by meter for electric energy used by any tenant except as part of a rental charge. Any company excluded by this subdivision from the definition of "public utility" for the purposes of this chapter nevertheless shall, within thirty days following the issuance of a building permit, notify the State Corporation Commission in writing of the ownership, capacity and location of such central plant, and it shall be subject, with regard to the quality of electric service furnished, to the provisions of Chapters 10 (§ 56-232 et seq.) and 17 (§ 56-509 et seq.) of this title and regulations thereunder and be deemed a public utility for such purposes, if such company furnishes such service to 100 or more lessees.

(4) Any company, or affiliate thereof, making a first or direct sale, or ancillary transmission or delivery service, of natural or manufactured gas to fewer than ten commercial or industrial customers,

which are not themselves "public utilities" as defined in this chapter, for use solely by such purchasing customers at facilities which are not located in a territory for which a certificate to provide gas service has been issued by the Commission under this chapter, provided, that such company shall comply with the provisions of § 56-265.4:5.

(5) Any company which is not a public service corporation and which provides compressed natural gas service at retail for the public.

(c) "Commission" means the State Corporation Commission.

(d) "Geothermal resources" shall mean those resources as defined in § 45.1-179.2.

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APPENDIX II

RECOMMENDED LEGISLATION

REDUCING THE COAL LIQUID CONTENT REQUIREMENT FOR SYNTHETIC FUELS

D 1/15/91 Wambold T 1/16/91 smw

SENATE BILL NO. ..... HOUSE BILL NO. .....

A BILL to amend and reenact § 58.1-2101 of the Code of Virginia, relating to motor fuel and special fuel taxes.

Be it enacted by the General Assembly of Virginia:

1. That § 58.1-2101 of the Code of Virginia is amended and reenacted as follows:

§ 58.1-2101. Definitions.--As used in this chapter, unless the context clearly shows otherwise, the term or phrase:

"Aircraft" means any kind of vehicle designed or used for untethered navigation or flight in the air.

"Anhydrous ethyl alcohol" means ethyl alcohol or ethanol of at least 198.5 proof.

"Assessment" means a written determination by the Department of Motor Vehicles of the amount of taxes owed by a taxpayer. Assessments made by the Department of Motor Vehicles shall be deemed to be made when a written notice of assessment is delivered to the taxpayer by the Department of Motor Vehicles or is mailed by certified or registered mail to the taxpayer at his last known address.

"Aviation consumer" means any person who uses in excess of 100,000 gallons of aviation special fuel in any fiscal year.

"Aviation fuel" means either a motor fuel or special fuel designed for use in the operation of aircraft, and sold or used for that purpose.

"Bonded aviation fuel" means aviation special fuel held in bonde storage under United States Customs Law and delivered into the fuel supply tank of aircraft operated by certificated air carriers on international flights.

"Bulk storage" means a storage of fuel for redistribution in bulk quantities by tank truck, tank car or transport truck.

"Bulk user" means any person who maintains bulk storage facilities solely for the purpose of fueling aircraft or motor vehicles owned, leased or operated by him.

"Commissioner" means the Commissioner of the Department of Motor Vehicles.

"Dealer" means and includes the following persons, required to be licensed as a dealer pursuant to § 58.1-2135:

(a) A person who imports, or causes to be imported, into the Commonwealth any motor fuel for use by or distribution or sale and delivery to another in the Commonwealth.

(b) A person who imports, or causes to be imported, into the Commonwealth any motor fuel for his own use in any container other than the usual tank or receptacle connected with the engine of the motor vehicle which will consume such motor fuel during its operation.

(c) A person selling over one-half million gallons of motor fuel in any calendar year who elects to be licensed as a dealer.

(d) A person who maintains and operates a bulk storage within the Commonwealth who receives motor fuel by tank car, barge, pipeline delivery, common or contract carrier or self-owned equipment from another point within the Commonwealth.

(e) A person who produces, refines, manufactures or compounds an motor fuel in the Commonwealth for use, distribution or sale and

delivery in the Commonwealth.

(f) A person who produces, refines, manufactures or compounds motor fuel in the Commonwealth for his own use.

The term "dealer" shall not include a railroad company purchasing motor fuel for use in its railroad business and not for use in motor vehicles on the highways of the Commonwealth. The Commissioner may designate dealers as limited dealers or jobbers, but the designation by the Commissioner of a dealer as a limited dealer or jobber shall not of itself deprive the limited dealer or jobber of the right to refunds to which they would have otherwise been entitled under the provisions of subdivision 3 of subsection B of § 58.1-2111.

"Denatured alcohol" means alcohol made unfit for human consumption according to a formula approved by the Federal Bureau of Alcohol, Tobacco and Firearms.

"Department" means the Department of Motor Vehicles, acting directly or through its duly authorized officers and agents.

"Exemption certificate" means a serially-numbered certificate approved and issued by the Commissioner, which is to be affixed on bulk storage facilities of resellers and bulk users of special fuel for the purpose of exempting fuel delivered therein from the special fuel tax due to the nonhighway use of such special fuel.

"Fuel" or "fuels" means all combustible gases and liquids used or suitable for use in an internal combustion engine or motor for the generation of power to propel motor vehicles or aircraft. The terms shall include both motor fuel and special fuel.

"Highway" means every way or place of whatever nature open to the use of the public for purposes of vehicular travel in the Commonwealth, including the streets and alleys in towns and cities.

"Jobber" means any person who receives motor fuel by tank car, barge, pipeline, common or contract carrier or in self-owned equipment from a point within Virginia who has not qualified to pay the motor fuel tax directly to the Commonwealth, if such person complies with all of the applicable provisions of this chapter.

"Licensee" means any person licensed by the Commissioner pursuant to § 58.1-2135.

"Limited dealer" means any person maintaining and operating a bulk storage within the Commonwealth who receives motor fuels from a duly licensed dealer from a point within Virginia, if such motor fuel is delivered to another point in Virginia by tank car, barge, pipeline, common or contract carrier or self-owned equipment. In any case where the term "dealer" is used in this chapter such term shall be deemed to include the term "limited dealer" except where the context clearly indicates otherwise.

"Liquid" means any substance which is liquid at temperatures in excess of sixty degrees ~~F.~~--Fahrenheit and a pressure of 14.7 pounds per square inch absolute.

"Motor fuel" means all products commonly or commercially known, advertised, offered for sale, sold or used as gasoline, including casinghead or natural gasoline. The term shall include all other types of additives when such additives are mixed or blended into gasoline, regardless of their classifications or uses.

"Motor vehicles" means all vehicles, engines, machines or mechanical contrivances which are propelled by internal combustion engines or motors and upon which or by which any person or property is or may be transported or drawn upon a public highway.

"Reseller" means any person, other than a "supplier," who sell

or delivers special fuels into a fuel supply tank of an aircraft or motor vehicle other than an aircraft or motor vehicle owned or operated by such person.

"Special fuel" means all "fuels," including fuel used in any type of aircraft, rocket or similar device, other than motor fuels as are subject to the tax imposed by Article 2 (§ 58.1-2104 et seq.) of this chapter.

"Supplier" means any person who sells or delivers special fuel to a "reseller" or "bulk user" for resale or use in any motor vehicle or aircraft. The term includes any person who imports special fuel into the Commonwealth, for use in a motor vehicle or aircraft owned or operated by such person, other than in the usual tank or receptacle connected with the engine of the motor vehicle or aircraft in which the special fuel is to be consumed.

"Synthetic motor fuel" means motor fuel containing at least ~~twenty~~-ten percent coal-based liquids blended to meet fuel specifications.

"Synthetic special fuel" means fuel containing at least ~~twenty~~-ten percent coal-based liquids blended to meet specifications.

"Use" means the actual consumption or receipt of fuel by any person into an aircraft or motor vehicle.

"User" means any person who (i) does not maintain storage facilities for fueling aircraft or motor vehicles and (ii) owns or operates any aircraft or motor vehicle having a gross weight in excess of 5,000 pounds which is propelled by special fuels and is licensed under the laws of the Commonwealth.

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APPENDIX III

RECOMMENDED LEGISLATION

PERMITTING LOANS FROM THE LITERARY FUND FOR NATURAL GAS FUELING FACILITIES FOR SCHOOL BUSES

D 12/11/90 Wambold T 12/14/90 1jl

SENATE BILL NO. ..... HOUSE BILL NO. .....

A BILL to amend and reenact § 22.1-146 of the Code of Virginia, relating to loans from the Literary Fund.

Be it enacted by the General Assembly of Virginia:

1. That § 22.1-146 of the Code of Virginia is amended and reenacted as follows:

§ 22.1-146. Power of Board to make loans from Fund for erection, etc., of school buildings and fueling facilities for school buses.--The Board of Education is authorized to make loans or, subject to the approval of the General Assembly, loan interest rate subsidy payments from the Literary Fund to the school boards of the several school divisions making application therefor in the manner prescribed by law for the purpose of (i) erecting, altering or enlarging school buildings in such school divisions or (ii) for constructing and equipping school bus fueling facilities supplying compressed natural gas or other alternative fuels. For the purpose of this section, "alternative fuels" means motor fuels other than gasoline and diesel fuel.

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APPENDIX IV

RECOMMENDED LEGISLATION

REQUESTING THE VIRGINIA DEPARTMENT OF TRANSPORTATION TO AMEND ITS REGULATIONS TO PERMIT REASONABLE USE OF TUNNELS BY ALTERNATIVELY FUELED VEHICLES

D 12/14/90 Wambold C 12/19/90 jds

HOUSE JOINT RESOLUTION NO.....

Requesting the Department of Transportation to amend certain regulations.

WHEREAS, in response to the need to reduce motor vehicle emissions which contribute to pollution of the atmosphere and in compliance with recently passed federal clean air legislation, increased efforts are being made to make available motor vehicles which operate on fuels other than gasoline and diesel fuel; and

WHEREAS, many of these vehicles are powered by fuels which, under present regulations of the Department of Transportation, cannot be permitted passage through tunnels under the Department's control; and

WHEREAS, some of these fuels can safely be permitted passage through such tunnels in quantities required to power alternatively fueled vehicles if certain prudent safeguards are observed; and

WHEREAS, it is desirable that tunnel regulations of the Department of Transportation carefully weigh both the desirability of accommodating alternatively fueled vehicles and the need zealously to protect the safety of traffic using Virginia's highway tunnels; now, therefore, be it

RESOLVED by the House of Delegates, the Senate concurring, That the Department of Transportation is requested, in consultation with appropriate technical experts in the field, to review its regulations relating to use of tunnels by vehicles powered by fuels other than

gasoline or diesel fuel. The Department is further requested to make necessary amendments to such regulations in order to ensure that those regulations (i) keep abreast of changes in motor fuel and motor vehicle technology and (ii) permit use of tunnels by alternatively fueled vehicles, subject to prudent limitations and conditions appropriate to protect the public health, safety, and welfare.

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APPENDIX V

RECOMMENDED LEGISLATION

REQUESTING THE VIRGINIA DEPARTMENT OF TRANSPORTATION TO UNDERTAKE ALTERNATIVE FUEL PILOT PROJECTS

D 1/15/91 Wambold T 1/16/91 kmk

SENATE JOINT RESOLUTION NO.....

Requesting the Virginia Department of Transportation to undertake certain alternative fuel pilot projects.

WHEREAS, use of domestically produced motor fuels other than gasoline and diesel fuel may have significant benefits not only to the environment, but also to the nation's economy and security; and

WHEREAS, state agencies can perform a useful function in connection with alternative fuels by conducting pilot projects to gain data on and experience with these fuels and also to increase their familiarity to and acceptance by the general public; and

WHEREAS, because one of the primary benefits of alternative fuels is their impact on air pollution caused by motor vehicles, it is appropriate that alternative fuel pilot projects be conducted in the three regions of the Commonwealth with the most significant air pollution difficulties: Northern Virginia, the greater Richmond area, and the Hampton Roads area; and

WHEREAS, among the largest vehicle fleets operated by state government is the central garage fleet of approximately 2,800 vehicles controlled by the Virginia Department of Transportation; now, therefore, be it

RESOLVED by the Senate, the House of Delegates concurring, That the Virginia Department of Transportation be requested to undertake three pilot projects involving alternative motor fuels: one project

in Northern Virginia, one in the greater Richmond area, and one in th Hampton Roads area. In choosing a fuel or fuels for such projects, the Department shall limit consideration to those which are produced in the United States, which address the air pollution difficulties of the region in which the project is to be conducted, whose use by government fleets is economically feasible, and which can be used in passenger vehicles presently equipped with conventional gasoline engines.

After eighteen months of such projects' operation, the Department shall report on fuel cost savings, maintenance cost savings, air quality benefits, and other results of these projects to the Governor and the General Assembly as provided in the procedures of the Division of Legislative Automated Systems for processing legislative documents.

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APPENDIX VI

RECOMMENDED LEGISLATION

REQUESTING THE VIRGINIA BOARD OF EDUCATION TO PROMOTE THE USE OF ALTERNATIVE FUELS BY SCHOOL BUSES

D 12/11/90 Wambold C 12/14/90 jds

HOUSE JOINT RESOLUTION NO.....

Requesting the Board of Education to promote the use of alternative fuels for school buses.

WHEREAS, three portions of Virginia are classified as air quality nonattainment areas: Northern Virginia, the Richmond-Petersburg area, and Hampton Roads; and

WHEREAS, within these three areas, the most significant form of air pollution is ozone/smog pollution caused, in large measure, by motor vehicle exhaust; and

WHEREAS, among the strategies available to the Commonwealth for improving air quality in these three regions is use of alternative fuels -- fuels other than gasoline and diesel fuel -- in motor vehicles; and

WHEREAS, pioneering projects in Pennsylvania, Texas, Louisiana, Colorado, New York, and elsewhere have shown that using certain alternative fuels, such as compressed natural gas, in fleet vehicles not only reduces air pollution, but may also reduce long-term vehicle operating costs; and

WHEREAS, it is highly desirable that the Commonwealth, in its management of government-owned vehicle fleets, set an example for the general public by using alternative fuels in its fleet vehicles wherever practicable; and

WHEREAS, use of alternative fuels, such as compressed natural

gas, in school buses would not only contribute to an improvement of air quality and possibly reduce long-term operating costs of school bus fleets, but also serve as a demonstration to the general public of the practicability and desirability of using alternatively fueled vehicles; and

WHEREAS, the policies, procedures, and regulations of the Department of Education hitherto have not encouraged the use of alternative fuels, such as compressed natural gas, by school bus fleets; and

WHEREAS, it is highly desirable that the policies, procedures, and regulations of the Department of Education be promptly adjusted and amended as necessary aggressively to promote the use of alternative fuels, such as compressed natural gas, by school bus fleets wherever practicable; now, therefore, be it

RESOLVED by the House of Delegates, the Senate concurring, That the Board of Education is hereby requested by all reasonable means to encourage school divisions, wherever economically and otherwise practicable, to use compressed natural gas or other alternative fuels for school buses; and, be it

RESOLVED FURTHER, That the Board of Education is requested to set standards, not inconsistent with those of the federal Department of Transportation and the National Fire Protection Association, for (i) school bus engines powered by compressed natural gas or other alternative fuels and (ii) equipment and installation of equipment used to convert school buses powered by gasoline or diesel engines to use of compressed natural gas or other alternative fuels; and, be it

RESOLVED FURTHER, That the Board of Education is requested to ensure that none of its policies, procedures, or regulations limits

the authority of any local school division to enter into agreements with a local gas distribution company or other entity to supply compressed natural gas or other alternative fuels for use by the local school division's school buses; and, be it

RESOLVED FURTHER, That the Board of Education is requested to solicit from the several school divisions, proposals for pilot projects involving either (i) conversion of existing school buses to use of compressed natural gas or other alternative fuels or (ii) replacement of conventionally fueled school buses with vehicles using compressed natural gas or other alternative fuels; and, be it

RESOLVED FINALLY, That the Board of Education, in cooperation with the Department of General Services, is requested to assist local school divisions in placing and pooling orders for (i) school buses and school bus engines powered by compressed natural gas or other alternative fuels and (ii) equipment and installation of equipment used to convert school buses powered by gasoline or diesel engines to use of compressed natural gas or other alternative fuels.

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APPENDIX VII

RECOMMENDED LEGISLATION

REQUIRING THAT VIRGINIA BOARD OF EDUCATION REGULATIONS SHALL NOT UNREASONABLY LIMIT USE OF ALTERNATIVE FUELS IN SCHOOL BUSES

12/11/90 Wambold T 12/13/90 jds

SENATE BILL NO. ..... HOUSE BILL NO. .....

A BILL to amend and reenact § 22.1-177 of the Code of Virginia, relating to pupil transportation regulations of the Board of Education.

Be it enacted by the General Assembly of Virginia:

1. That § 22.1-177 of the Code of Virginia is amended and reenacted as follows:

§ 22.1-177. Regulations.--The Board may make regulations relating to the construction, design, operation, equipment, and color of public school buses and shall have the authority to issue an order prohibiting the operation on public streets and highways of any public school bus which does not comply with such regulations. Any such order shall be enforced by the Department of State Police.

No regulation of the Board shall unreasonably limit the authority of any local school division to purchase and use school buses using compressed natural gas or other alternative fuels or convert its school buses to use compressed natural gas or other alternative fuels.

2. That an emergency exists and this act is in force from its passage.

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APPENDIX VIII

RECOMMENDED LEGISLATION

MEMORIALIZING CONGRESS TO PROVIDE FUNDING FOR ALTERNATIVELY FUELED TRANSIT BUSES

D 12/12/90 Wambold C 12/18/90 rbc

HOUSE JOINT RESOLUTION NO.....

Memorializing Congress concerning use of alternative fuels by transit buses.

WHEREAS, the recently enacted Clean Air Act Amendments of 1990 impose increasingly stringent emissions standards on transit buses; and

WHEREAS, while it may be possible to meet the short-term bus emissions standards imposed by this legislation through use of so-called "clean diesel" technology, meeting the more stringent long-term standards will probably require the use of alternative fuels by transit buses; and

WHEREAS, in order to use alternative fuels, it will be necessary for transit systems either to convert the engines of existing buses or purchase new vehicles designed and built specifically to be operated on alternative fuels; and

WHEREAS, whatever the impact of this technological change on the environment and the health of the population, the transition from diesel-fueled to alternatively fueled transit buses will impose an additional and considerable financial burden on transit systems and the state and local governments upon which those transit systems depend; and

WHEREAS, particularly in the cases of Northern Virginia and Hampton Roads, Virginia, much of the need for and ridership of mass

transit systems are caused by the presence in these areas of high concentrations of federal military and civilian agencies; and

WHEREAS, in the coming year, Congress will be debating legislation to reauthorize the federal highway program -- legislation whose passage is vital to every state in the nation and every sector of the economy; and

WHEREAS, it is imperative that the final version of this reauthorization legislation continue major federal financial participation in highway and transportation programs throughout the country; and

WHEREAS, it is equally indispensable that the federal government make a greater financial commitment specifically to dealing with worsening urban and suburban traffic congestion, rising need for and costs of mass transit operations, and the variety of costs borne by state and local governments as the result of federal mandates such those contained in the Clean Air Act Amendments of 1990; now, therefore, be it

RESOLVED by the House of Delegates, the Senate concurring, That the United States Congress is hereby memorialized to approve legislation to reauthorize the federal highway program and provide for meaningful federal financial participation in the costs of converting and replacing transit buses in order to operate on alternative fuels; and, be it

RESOLVED FURTHER, That the Clerk of the House of Delegates transmit copies of this resolution to the Speaker of the United States House of Representatives, the President of the United States, and the members of the Virginia delegation to the United States Congress that they may be apprised of the sense of the General Assembly in this

matter.

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APPENDIX IX

RECOMMENDED LEGISLATION

REQUESTING THE STATE CORPORATION COMMISSION
TO IDENTIFY AND REMOVE IMPEDIMENTS TO
THE USE OF COMPRESSED NATURAL GAS AS A MOTOR FUEL

12/11/90 Wambold T 12/13/90 jds

RDF 1/9/91 Wambold C 1/9/91 ljl

HOUSE JOINT RESOLUTION NO.....

Requesting the State Corporation Commission to identify and remove certain impediments to the use of compressed natural gas as a motor fuel.

WHEREAS, natural gas is attractive as a fuel for centrally fueled fleet vehicles in that it has been shown to be (i) safe, (ii) domestically available in adequate quantities, (iii) clean-burning (producing relatively low levels of environmentally damaging missions), and (iv) available at costs that compare favorably with traditional motor fuels such as gasoline and diesel fuel; and

WHEREAS, although natural gas has been widely used in other countries as a motor fuel for many years, until recently, relatively little natural gas has been used as a motor fuel in the United States; and

WHEREAS, pioneering projects in Pennsylvania, Texas, Louisiana, Colorado, New York, and elsewhere have shown that use of compressed natural gas in fleet vehicles contributes to a reduction in air pollution and is not only economical, but also may reduce long-term vehicle operating costs; and

WHEREAS, the low emissions produced by use of natural gas as a motor fuel and many of its other characteristics combine to make it particularly attractive for use by centrally fueled fleet vehicles; and

WHEREAS, the policies, statutes, and regulations to which Virginia's natural gas industry has been subject, while appropriate for the traditional uses of natural gas, in some instances may serve as impediments to the development of a market for natural gas as a motor vehicle fuel; and

WHEREAS, it is desirable that as many of these impediments, whose removal is consistent with protecting the interests of natural gas rate payers and the general public, be eliminated so that natural gas may freely and fairly compete with other motor fuel alternatives to gasoline and diesel fuel; now, therefore, be it

RESOLVED by the House of Delegates, the Senate concurring, That the State Corporation Commission be requested to work cooperatively with local school divisions, institutions of higher education, local governments, transit companies, state agencies, and Virginia's gas industry to identify and, to the extent consistent with protecting interests of natural gas rate payers and the general public, to remove regulatory and other impediments to the use of compressed natural gas as a motor fuel for vehicles. The State Corporation Commission is further requested to recommend to the Governor and the General Assembly changes in state law which may be appropriate or necessary in facilitating the use of natural gas as a motor fuel.

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APPENDIX X

RECOMMENDED LEGISLATION

CONTINUING THE PRESENT STUDY

11/16/90 Wambold C 12/20/90 ljl

HOUSE JOINT RESOLUTION NO.....

Continuing the Joint Subcommittee Studying the Use of Vehicles Powered by Clean Transportation Fuels.

WHEREAS, through the passage of House Joint Resolution No. 113, the 1990 Session of the General Assembly established a joint subcommittee to study the use of vehicles powered by clean transportation fuels; and

WHEREAS, the work of the subcommittee was far ranging and involved several technically complex issues; and

WHEREAS, the deliberations of the subcommittee coincided with Congressional consideration and ultimate passage of voluminous and complex amendments to the federal Clean Air Act; and

WHEREAS, although the subcommittee was able to make several legislative recommendations to the Governor and the 1991 Session of the General Assembly, many issues remain to be addressed; now, therefore, be it

RESOLVED by the House of Delegates, the Senate concurring, That the Joint Subcommittee Studying the Use of Vehicles Powered by Clean Transportation Fuels is hereby continued. The subcommittee shall (i) continue its consideration of issues and proposals brought to its attention in 1990; (ii) monitor the implementation of those of its recommendations approved by the 1991 General Assembly; (iii) consider the opportunities for further action by the Commonwealth within the

framework of recently enacted federal legislation; and (iv) continu to work cooperatively with the State Corporation Commission, other affected state agencies, industries, groups, and individuals in order to improve the availability and expand the use of clean transportation fuels in Virginia.

The membership of the subcommittee shall continue as constituted in 1990; any vacancy shall be filled in the same manner as the original appointment.

The subcommittee shall complete its work in time to submit its findings and recommendations to the Governor and the 1992 Session of the General Assembly as provided in the procedures of the Division of Legislative Automated Systems for processing legislative documents.

Implementation of this resolution is subject to subsequent approval and certification by the House/Senate Joint Rules Committe The Committee may withhold expenditures or delay the period for the conduct of the study.

The indirect costs of this study are estimated to be $13,675; the direct costs of this study shall not exceed $9,000.

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APPENDIX XI

HOUSE JOINT RESOLUTION NO. 113 OF 1990
(COMMISSIONING THE PRESENT STUDY)

HOUSE JOINT RESOLUTION NO. 113

Establishing a joint subcommittee to study the use of vehicles powered by clean transportation fuels.

Agreed to by the House of Delegates, March 9, 1990
Agreed to by the Senate, March 7, 1990

WHEREAS, the federal Clean Air Act requires state and local governments to develop state implementation plans to comply with the antipollution requirements of the Act; and

WHEREAS, strict standards for mobile source emissions will come into effect in 1991 and following years; and

WHEREAS, domestic supplies of and feedstocks for clean transportation fuels are abundant in the United States, particularly in Virginia; and

WHEREAS, use of these fuels can expand economic development in Virginia, reduce our growing dependence on energy imports, act to balance our trade deficit, and improve national energy security; and

WHEREAS, the quality of life for the citizens of Virginia can be enhanced by the development of clean transportation fuels; now, therefore, be it

RESOLVED by the House of Delegates, the Senate concurring, That a joint subcommittee is hereby established to study the emissions, economics, safety, and other benefits of clean transportation fuels as they relate to the purchase or lease of motor vehicles by state agencies, school divisions, and local transit authorities. The joint subcommittee shall consist of ten members to be appointed as follows: four members of the House of Delegates at large, appointed by the Speaker; three members of the Senate at large, appointed by the Senate Privileges and Elections Committee; the Director of the Department of Mines, Minerals and Energy or his designee; the Executive Director of the Department of Air Pollution Control or his designee; and the Administrator of the Council on the Environment or his designee. The Secretary of Transportation, the Secretary of Public Safety and the Secretary of Natural Resources shall provide assistance to the joint subcommittee on request.

The joint subcommittee shall complete its study in time to submit its findings and recommendations to the Governor and the 1991 Session of the General Assembly as provided in the procedures of the Division of Legislative Automated Systems for the processing of legislative documents.

The indirect costs of this study are estimated to be $13,675; the direct costs of this study shall not exceed $9,900.

APPENDIX XII

TABLES

ALTERNATIVE FUEL CHARACTERISTICS: PROS AND CONS

ALTERNATIVE FUELS
PROS AND CONS IN A NUTSHELL

Electric vehicles

Advantages: No exhaust or evaporative emissions from the vehicle itself, could be recharged during off-peak hours.

Disadvantages: High vehicle cost, limited range, limited speed, slow acceleration, lack of air conditioning, shift of pollution from vehicles themselves to generating plants, need for increased generating capacity, need to replace batteries, environmental dangers associated with battery disposal.

Compressed natural gas (CNG)

Advantages: Reduced exhaust emissions (particularly hydrocarbons), no evaporative emissions, low fuel cost, abundant domestic fuel supplies, lighter than air (no puddling in event of leaks), reduced vehicle maintenance costs, ease of transportation by pipeline, no groundwater contamination from leaking underground storage tanks (LUST).

Disadvantages: Reduced power, limited range, increased vehicle weight (particularly in bi-fuel vehicles), long refueling time (in the absence of compressors required for quick-fill refueling), lack of fueling stations, high cost of conversions and fueling station construction, public apprehensions as to safety, multiplicity of state and federal regulations, limitations on tunnel use.

Propane (liquified petroleum gas or LPG)

Advantages: Reduced exhaust emissions, no evaporative emissions, low fuel cost, not subject to the kind of state an federal regulations applicable to the natural gas industry.

Disadvantages: Limited range, increased vehicle weight, small number of fueling stations, high cost of conversions, higher explosion danger than CNG, supply shortages (at least in the short term), public apprehensions as to safety.

Ethanol

Advantages: Reduced exhaust emissions (carbon dioxide and benzene), higher octane and oxygen content than gasoline, producable from renewable resources (typically grain or industrial wastes and byproducts).

Disadvantages: High fuel costs (either to the consumer or to the taxpayer), pipeline transportation difficulties, corrosive, greater LUST contamination danger, supply difficulties in short term.

Methanol

Advantages: Reduced evaporative emissions, possible exhaust emission reductions (hydrocarbons).

Disadvantages: Highly toxic, formaldehyde emissions, higher cost and lower energy content than gasoline, not presently available from domestic producers, corrosive, greater LUST contamination danger, water soluble (increasing difficulty of leak detection), burns with invisible flame (creating a possible explosion hazard), incompatibility with some existing engines (depending on cosolvents).

Pros and Cons of Alternative Fuels

Fuel	Advantages	Disadvantages
Methanol	❑ Familiar liquid fuel ❑ Vehicle development relatively advanced ❑ Organic emissions (ozone precursors) will have lower reactivity than gasoline emissions ❑ Lower emissions of toxic pollutants, except formaldehyde ❑ Engine efficiency should be greater ❑ Abundant natural gas feedstock ❑ Less flammable than gasoline ❑ Can be made from coal or wood (as can gasoline), though at higher cost ❑ Flexfuel "transition" vehicle available	❑ Range as much as 50% lower without larger fuel tanks ❑ Would likely be imported from overseas ❑ Formaldehyde emissions a potential problem, especially at higher mileage, requires improved controls ❑ More toxic than gasoline ❑ 100% methanol has nonvisible flame, explosive in enclosed tanks ❑ Costs likely somewhat higher than gasoline, especially during transition period ❑ Cold starts a problem for 100% methanol ❑ Greenhouse problem if made from coal
Ethanol	❑ Familiar liquid fuel ❑ Organic emissions will have lower reactivity than gasoline emissions (but higher than methanol) ❑ Lower emissions of toxic pollutants ❑ Engine efficiency should be greater ❑ Produced from domestic sources ❑ Flexfuel "transition" vehicle available ❑ Lower CO with gasohol (10 percent ethanol blend) ❑ Enzyme-based production from wood being developed	❑ Much higher cost than gasoline ❑ Food/fuel competition at high production levels ❑ Supply is limited, especially if made from corn ❑ Range as much as 1/3 less without larger fuel tanks ❑ Cold starts a problem for 100% ethanol
Natural Gas	❑ Though some is imported, likely North American source for moderate supply (1 million barrels per day or more gasoline displaced) ❑ Excellent emission characteristics except for potential of somewhat higher nitrogen oxide emissions ❑ Gas is abundant worldwide ❑ Modest greenhouse advantage ❑ Can be made from coal	❑ Dedicated vehicles have remaining development needs ❑ Retail fuel distribution system must be built ❑ Range quite limited, need large fuel tanks with added costs, reduced space (LNG range not as limited, comparable to methanol) ❑ Dual fuel "transition" vehicle has moderate performance, space penalties ❑ Slower refueling ❑ Greenhouse problem if made from coal
Electric	❑ Fuel is domestically produced and widely available ❑ Minimal vehicular emissions ❑ Fuel capacity available (for nighttime recharging) ❑ Big greenhouse advantage if powered by nuclear or solar ❑ Wide variety of feedstocks in regular commercial use	❑ Range, power very limited ❑ Much battery development required ❑ Slow refueling ❑ Batteries are heavy, bulky, have high replacement costs ❑ Vehicle space conditioning difficult ❑ Potential battery disposal problem ❑ Emissions for power generation can be significant
Hydrogen	❑ Excellent emission characteristics—minimal hydrocarbons ❑ Would be domestically produced ❑ Big greenhouse advantage if derived from photovoltaic energy ❑ Possible fuel cell use	❑ Range very limited, need heavy, bulky fuel storage ❑ Vehicle and total costs high ❑ Extensive research and development effort required ❑ Needs new infrastructure
Reformulated Gasoline	❑ No infrastructure change except refineries ❑ Probable small to moderate emission reduction ❑ Engine modifications not required ❑ May be available for use by entire fleet, not just new vehicles	❑ Emissions benefits remain highly uncertain ❑ Costs uncertain, but will be significant ❑ No energy security or greenhouse advantage

Source: Office of Technology Assessment, 1990

APPENDIX XIII

Joint Subcommittee Members

Arthur R. Giesen, Jr. (Chairman)

Daniel W. Bird, Jr. (Vice Chairman)

Keith J. Buttleman

Robert L. Calhoun

Wallace N. Davis

O. Gene Dishner

Franklin P. Hall

Alan E. Mayer

Glenn B. McClanan

Emilie F. Miller

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and
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