

Symposium Papers

# **Nonpetroleum Vehicular Fuels III**

October 12-14, 1982

## **Symposium Papers**

# **Nonpetroleum Vehicular Fuels III**

**Presented**

**October 12-14, 1982**

**Arlington, Virginia**

**Symposium Chairman**  
**Thomas J. Joyce**

**Symposium Director**  
**Howard H. Elliott**

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## INTRODUCTION

The third in the series of symposia on nonpetroleum vehicular fuels was held by the Institute of Gas Technology on October 12-14, 1982, in Arlington, Virginia. As did the two previous symposia, Nonpetroleum Vehicular Fuels III provided a unique opportunity for the exchange of technical information on the production and utilization of nonconventional fuels such as natural gas, liquefied petroleum gas (LPG), hydrogen, and alcohol fuels. Participants included fuel suppliers, equipment and automobile manufacturers, researchers from academic and private research organizations, and United States and foreign government representatives. Among the subjects reviewed were -

- Worldwide activities to expand the use of fuels to replace gasoline and diesel fuel
- Technical developments in the use of gaseous fuels, including improved conversion equipment for compressed natural gas vehicles, the potential for using landfill gas, and the state-of-the-art of hydrogen utilization in the transport sector
- Research and development efforts to improve the performance of diesel cycle engines when using natural gas and alcohol fuels
- The experiences and problems encountered by organizations that have conducted field tests with the fuels
- The economic, regulatory, and environmental issues that will affect the acceptance of the fuels in the marketplace.

The papers in this volume have been reproduced with no technical and little or no editorial modification by IGT. The views expressed are those of the speakers.

Symposium Chairman,



Thomas J. Joyce  
President  
T. Joyce Associates, Inc.



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CANADIAN PROGRAMS TO INVESTIGATE AND  
ENCOURAGE ALTERNATE VEHICLE FUELS

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ABSTRACT

Canada's National Energy Program (NEP) has set targets for oil use in transportation by 1990. Projected fuel demands exceed this target; the difference provides an impetus to develop programs to encourage the use of alternate fuels. Policies, research and development, demonstrations and incentives are required to ensure effective alternate fuels use and to eliminate the institutional barriers which counter alternate fuel acceptability. Canada has effective policies in place; is providing over \$100 million in research and development funds; has created Federal-Provincial agreements to support demonstrations; and has allocated over \$40 million for incentive programs. These measures will encourage alternate vehicle fuels use and enable NEP goals to be met.



CANADIAN PROGRAMS TO INVESTIGATE AND  
ENCOURAGE ALTERNATE VEHICLE FUELS

INTRODUCTION

In the context of the problems associated with oil availability and price the Canadian Government in 1980 reviewed its energy goals and objectives and published the National Energy Program (NEP). This program established specific goals for Canada's energy sector and is the basis for the Canadian programs and incentives to encourage the use of alternative vehicle fuels.

To understand and fully appreciate the various programs, a quick résumé of the NEP and its 1982 "Update" as it pertains to the transportation energy sector follows.

NEP - The Problem and Goals

The supply and price of oil is heavily controlled by OPEC countries and Canada's dependence upon foreign oil was increasing to undesirable levels. For industries whose energy demands were being met by convention oil the unstable supply and price conditions created considerable uncertainty and restricted growth. Prices are being manipulated by the producing countries through changes in their production rate. The volatility of the Middle East situation is a constant threat to supply. The solution to this situation is to reduce one's dependence upon foreign oil as rapidly as possible. Canada has an abundance of energy resources which, with the necessary adjustments, incentives and development of sources of energy that are not crude oil based, could allow the country to become oil and energy self-sufficient. Security and independence from the world oil market became goals of the NEP.

Energy supply is perhaps the overriding concern of the National Energy Program. For a country that produces more energy than it consumes it is unfortunate that we have allowed ourselves to become heavily dependent upon oil importation. Canada, on a net basis, imports an average of 34,000 cubic meters of oil a day. It makes no sense for Canada to continue to rely on imported oil when we have the resources to become energy self-sufficient, thus the establishment of two fundamental goals - the elimination of imported oil by 1990 and a reduction of oil consumption in the residential, industrial and

transportation sectors of our economy. Figure 1 shows those targets and Figure 2 shows the National Energy Board (NEB) transportation fuel demand projections. The targets for oil use in transportation will increase slightly up to 1985 and the drop to 137,000 m<sup>3</sup> per day in 1990.

thousand m<sup>3</sup>/day

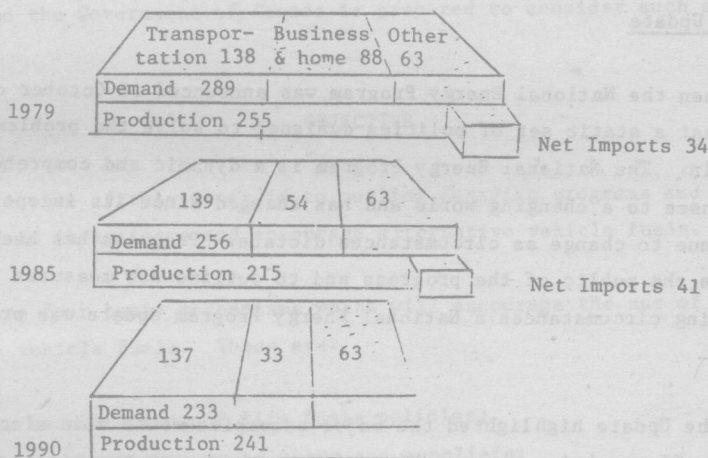


Figure 1. NEP OIL SUPPLY AND DEMAND PROJECTIONS

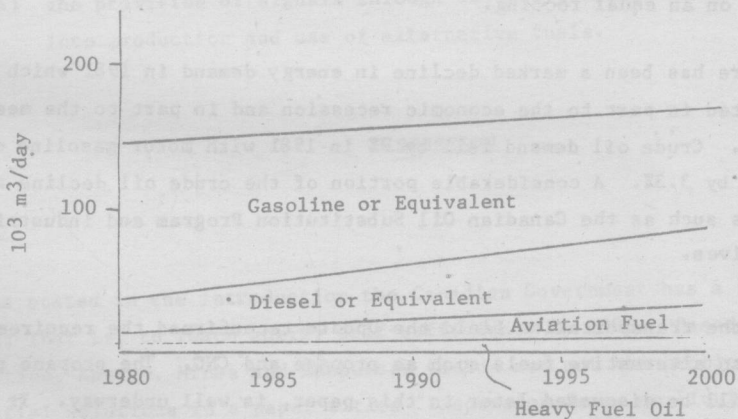


Figure 2. TRANSPORTATION FUEL DEMAND PROJECTIONS

(Based on Data Supplied to NEB)

The major importance of the National Energy Program with respect to energy demand is that the Government has established a very definitive policy statement, that of self-sufficiency by 1990. This establishment of a fully supported policy gives strength and direction to programs that have as their goal the reduction of oil consumption. This applies equally well to conservation programs as well as the use of alternate sources of energy.

#### NEP - Update

When the National Energy Program was announced in October of 1980 it was not just a static set of policies designed to solve the problems stated therein. The National Energy Program is a dynamic and comprehensive set of responses to a changing world and has changed since its inception and will continue to change as circumstances dictate. Progress has been made and to inform the public of the progress and to outline new measures in response to changing circumstances a National Energy Program Update was produced in early 1982.

The Update highlighted the major accomplishments made since the NEP, the major efforts being the reaching of agreement with the major oil and gas producing provinces, with the exception of Newfoundland, in reference to oil pricing, supply, taxation and incentive programs. The agreements have established a pricing policy for crude oil which is a more realistic price with respect to world prices. This of course will enable the alternatives, to compete on an equal footing.

There has been a marked decline in energy demand in 1981 which can be attributed in part to the economic recession and in part to the measures of the NEP. Crude oil demand fell by 7% in 1981 with motor gasoline demand falling by 3.3%. A considerable portion of the crude oil decline was due to programs such as the Canadian Oil Substitution Program and industrial initiatives.

In the transportation field the Update reconfirmed the requirement to switch to alternative fuels such as propane and CNG. The propane program, which will be discussed later in this paper, is well underway. It has lived through the pains of program startup and is now showing dividends. Private sector response is growing and the infrastructure is expanding rapidly particularly in Ontario.

Compressed Natural Gas, on the other hand, is just starting out on the path to penetrate the transportation market. It is plentiful, technically presents no problems in spark ignition engines, has some range limitations, which are not insurmountable and represents a real opportunity. The NEP Update recognizing the typical "chicken and egg" situation that exists vis-a-vis CNG outlets and CNG vehicle conversion states that some form of direct assistance to speed the establishment of fueling stations may be required and the Government of Canada is prepared to consider such a program.

## OBJECTIVE

The objective of this paper is to outline Canadian programs and policies established to investigate and encourage alternative vehicle fuels.

There are four basic mechanisms which will encourage the use of alternative vehicle fuels. These are:

- (1) the establishment of firm fuels policies;
- (2) direct contributions to users and suppliers;
- (3) the funding of demonstrations to bridge the gap between the developed technology and its application due to institutional barriers, lack of economic confidence and/or lack of technical knowledge by potential users;
- (4) the provision of signals through extensive Research and Development into production and use of alternative fuels.

## DISCUSSION

### Policy

As stated in the introduction the Canadian Government has a firm policy in place; that is, to reach energy self-sufficiency by 1990. Based upon this direction, Energy, Mines and Resources Canada set out the problems and potential solutions in a paper titled "Discussion Paper on Liquid Fuel Options" published in September 1980. The title of the discussion paper is slightly misleading in that it considered the gaseous fuels, as well as the



liquid fuels. The intent of the discussion paper was to generate a meaningful dialogue among the fuel industry, the vehicle producers and government bodies. From this dialogue a more comprehensive fuels policy will be generated which will set the scenario for future fuels. Some factors considered in the paper included:

Resource Base - The resource base for the alternative fuel must be large enough to sustain the use of the fuel at a significant level over a significant timeframe.

Technology - The technology for the production and use of the alternative fuel must determine whether it is commercially proven or in the R&D stage.

Cost/Price Ratio - Consideration must be given to the actual cost of bringing the alternative fuel to the market place and to its required selling price, profit margin, tax levies, royalties, etc., to make it a viable competitive fuel.

Infrastructure - Compatibility with existing fuel infrastructure will certainly influence the extent and rate of market penetration. Some of the alternative fuels will require the establishment of complete infrastructure which will effect the introduction of said fuel.

User Convenience - The changes that the user will experience in adapting to the alternative fuel must be minimized. Vehicle performance, cold weather starting, fuel economy, range maintainability, and reliability must meet consumer expectations.

Safety - All aspects of safety, such as fire, occupational health, and explosion hazards, presented by alternative fuels, must be carefully considered and evaluated.

## Environmental -

### Impacts

Clean air and environmental integrity are the watchwords of today's society, thus the effects of alternative fuels and their emission on the environment must be fully documented and understood.

Alternative fuel and future degraded fuels policies are presently being formulated within EMR. The Discussion Paper certainly fulfilled its objectives and input was received from numerous concerned organizations. Evolving from the cost/pricing discussions was a requirement to develop a reference price for alternative fuels based upon such things as resource type, socio-economic effect, technology creation and transfer, oil displacement, refinery impact, energy content, etc. Consideration is being given to formulating such a reference price which will be important in alternative fuels implementation.

### Direct Contribution Programs

Canada has one major and two minor contribution programs in place and one under consideration that relate directly to alternative fuel use.

The Propane Vehicle Grant Program has been fully operational for one year and the interest in this program is increasing daily. This program provides a grant of \$400 per vehicle to commercial and agricultural organizations that convert their vehicles to operate on propane. Dual fuel systems are not approved for the government program. The program goal is to have 100,000 vehicles converted by 1985, which will displace an estimated 2,100 cubic meters of oil per day. As of August 31, 1982 11,164 vehicles have converted to propane use under the grant program. Figure 3 gives a breakdown by province of the conversions. Approximately 70% of program applications are received from Ontario where a combination of provincial and federal incentives have made propane an economic alternative to gasoline. Figure 4 shows the trend for conversions.

The second direct contribution program is a government interdepartment program whereby Energy funds are transferred to various government departments who agree to convert vehicles to operate on either propane or Compressed Natural Gas (CNG). This program has two major objectives:

to convert 8,000 Government vehicles (about a third of the Government's administrative vehicle fleet) to propane or CNG by 1985 and reduce the Government's oil usage; and

to gather operating information on propane and CNG and to instill confidence in the commercial vehicle user in the use of these alternates as transportation fuels.

	<u>Vehicles Converted</u>	<u>%</u>
New Brunswick	21	.2
Prince Edward Island	2	negligible
Québec	494	4.5
Ontario	7,426	67.3
Manitoba	384	3.5
Saskatchewan	449	4.1
Alberta	1,576	14.2
British Columbia	680	6.2
Yukon	1	negligible
	<hr/> 11,033 <hr/>	<hr/> 100.0 <hr/>

Figure 3. VEHICLES CONVERTED BY PROVINCE  
SEPTEMBER 1981 TO AUGUST 1982

To date the program is well on target with 600 conversions in 1981 and 1,500 scheduled for 1982.

The third contribution program involves the allocation of \$1.3 million to assist the conversion of 1,500 vehicles to CNG. Six hundred dollars will be provided to each vehicle operator, commercial or private individual, who converts to CNG. Unlike the Propane Grant Program, vehicles converted to operate on CNG will be permitted to retain their gasoline systems. This is due to the limited range of CNG and lack of refilling stations. Participants under this program will be required to maintain a simple vehicle operation log book to enable EMR to create a data base for CNG use in vehicles.

September '82

12,000

10,000

8,000

6,000

4,000

2,000

0

Applications\*

Vehicles

Oct 81

Dec 81

Feb 82

Apr 82

Jun 82

Aug 82

\*Note: One application may include up to 24 vehicles.

Figure 4. PROPANE VEHICLE GRANT PROGRAM APPLICATIONS AND VEHICLES



Both the Propane and CNG Grant Programs received additional incentives from some of the Provinces through tax incentives on the alternative fuels or the addition of Provincial Grants. The Province of British Columbia is providing a \$200 grant to vehicle operators who switch to CNG, thus conversion in British Columbia receives up to \$800 in government assistance.

The Province of Ontario has removed its 7% sales tax on new propane vehicles, either factory built or dealer converted, dual fuel or dedicated propane fuel. Thus a commercial vehicle operator purchasing a new dedicated propane vehicle in Ontario will receive a \$400 Federal Grant plus he will save the 7% sales tax, the sum of both of these almost offsets the incremental cost of the propane equipment. The operator starts to benefit immediately from the price differential between propane and gasoline.

Many provinces have also removed the road tax from alternative fuels which gives added financial incentive. In Ontario the removal of road tax along with the relatively low base price for propane results in a price differential of between 15¢ and 20¢ a litre energy equivalent between propane and gasoline. One local police department in Ontario reported saving \$2,500.00 on fuel costs alone last year.

The program under consideration is designed to offer assistance to CNG refueling stations to help offset the large compressor capital expense. The Alberta Canada Oil and Gas Agreement included a provision by which Alberta will contribute Market Development Incentive Payments for use in opening up new gas markets east of Alberta. The transport market is certainly new and the creation of CNG refueling stations will fall under this particular program. This program will create the necessary refueling potential that has been lacking and has held back vehicle conversions.

#### Demonstrations

In many instances technology and innovation associated with conservation and renewable energy has already been researched and developed. However, the application of these technologies to real-life situations is hindered by institutional barriers and lack of user acceptance. To overcome this problem the Government of Canada has concluded joint funding agreements with most provincial governments and the two territories under the Federal-Provincial Program for the Demonstration of Conservation and Renewable Energy. This