SYNTHETIC FUELS

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Good Morning Ladies and Gentlemen. I am pleased to have the opportunity to be here and to share with you some of the findings of the recent studies on energy and particularly on synthetic fuels that have been conducted by the National Transportation Policy Study Commission, for which I served directing the Energy, Economic, Technology and Coal studies. What I'd like to do today is to very briefly describe some of the key findings in synthetic fuels, especially those that affect transportation. Because the NTPSC Final Report has been recently released and also because many of the underlying technical documents will be released shortly, I will try to keep my comments to brief findings and leave the technical back-up to the Final Report. Before I start, I would like to welcome the opportunity to thank the Transportation Research Board for having this opportunity and to the Conference Chairman, Edward Margolin, for receiving this invitation and for having the opportunity to be before you today.

There are two overriding themes that dominate the role of transportation of synthetic fuels, or more correctly energy and transportation. They are, one, energy and transportation play a dual role, that is to say, energy provides transportation needs for propulsion power, and the second portion of this dual role is that fuels and energy in general need transportation so that supply regions may be connected to demand regions. Especially for the newer synthetics, this is a crucial point since they must be developed and brought to the existing demand regions. The second major overriding point is that our energy problem or energy crisis or energy concerns will not be solved by one solution but by a multiplicity of many solutions, of which synthetics do occupy a role, but not the only role.

In addition to the two overriding themes addressed above, there are two key symptoms that characterize transportation today and in the near future. One, the conventional and proposed transportation technology is almost totally dependent on liquid fuels with little room in the foreseeable future, even through 2000, to be able to share that dependence with fuels in other forms. The second symptom, I should add, that most of the fuels are, of course, petroleum liquids, and that increasingly transportation will compete for liquid fuels with other end use sectors.

With these preliminary remarks in mind, I would now like to go through some key point findings and once again remind you that the back-up for much of them is in the many NTPSC reports. Therefore, for brevity, I'll try to keep the talk to highlights.

The first part of the problem is of course how we got where we are and what are the potential for changes. In brief, the consumption of petroleum by the American economy over the last 30 years has been undergoing a change whereby consumption has exceeded or is exceeding our ability to provide new domestic oil to our reserves. Thus the liquified fuel gap is being increasingly filled by imported fuels and those imported fuels cost, in addition to dollars, subsequent devaluation of the dollar, inflation, and loss of domestic jobs and domestic investment because the money has gone out of the country. The cost of this fuel has increased exponentially from almost nothing, to a skyrocketing take-off from the '73 period where in 1978-79 we're talking about 45-60 billion dollars as an oil bill. This is of course, a large sum of money which has a rather concerted impact on the U.S. economy. The transportation sector plays a key role as it is singly the largest consumer of petroleum and petroleum products.

We do not foresee, as I will show briefly later, any significant changes in terms of new transportation technology that will allow us to switch fuels with the notable exception of alcohol fuels and in post '85 of synthetic creation of petroleum fuels. In order to develop alternative fuels (synthetic fuels) that will perhaps displace some crude oil and at the same time allow our transportation sector to operate in an efficient manner, we have to look ahead to see what technologies are on the slate and where we can look for breakthroughs. These synthetic liquids may be alcohol fuels, liquid coal fuels, or oil shale. We note there is an increasing amount of competition of those liquids over time. Many new industries are using petroleum or petroleum dry products as chemicals; and transportation must compete for this petroleum.

A characteristic of synthetic fuels is that not all of them are at the same stage of development. For instance, there is ethanol derived from grains in the form of alcohol fuel that could be used in gasahol as a fuel extender and octane booster today, whereas many of the non-conventional synthetic oils derived from coal as well as shale crude are many years away. There is very little new domestic supply except alcohol fuels from the period now to '85. For coal derived liquids and shale, we are looking in the post '85 period and perhaps in the '90-'95 period for large amounts to be produced commercially. So our short term mobility is very dependent on conservation and alcohols.

In Table 1, I tried to sum up some of the characteristics facing the fuels industry with driving forces and constraints. An understanding of these forces and the constraints will better enable us to make a real estimate of what we have to do, what it will cost, where it will be, and when it will be feasible. The main driving force is depletion of domestic resources and the desirability for both security reasons and balance of trade to develop a domestic alternative. Of the constraining factors key once are capital, and the uncertainties associated with unknown environmental impacts.

Table 2, also from the National Transportation Policy Commission report, shows a quick and dirty production of some of the fuels. The total plant capital costs are quite large exclusive of the necessary transportation and infrastructure to move the fuel products to the factories. We are talking about billions of dollars. The key question that affects transportation both as a user of fuel as well as a mover of fuel is where we can expect the fuels to develop - what regions of the country - certainly transportation will play a key role here. And since coal is one of the key fuels for utility boilers perhaps it will free up some crude oil for transportation. Coal may also be used as a major feedstock for production of synthetic fuels.

The following is a quick glimpse of the Transportation Commission's report of some of the key regions where the coal is deposited. Using the coal regions, we have projected the major commodity flows we feel will be occurring as these fuels come on line over time and try to fill the need for liquid fuels.

The interregional transport of western synthetics in 2004 will include shipments from large development in the west of synthetic crude, synthetic gas from the Northern Great Plains, and the Rocky Mountain region. The report depicts the growth of synthetics all over the country. As a consequence of both the declining reserves of domestic petroleum fuel as well as a necessity to develop synthetics to fill the gap there is the imperative need for a transportation structure that will take these fuels

and move them to where they enter into our existing distribution system. One of the key parts of the distribution cycle is the refining system to convert principal synthetics like coal into liquids, bring those liquids to refineries, and refine them into the products that service the traditional fuel markets. Transportation is of course a large proportion of this network.

Now if we move over time - 25 years - in our projections we will see in Chicago by 2000 a vast change to meet the East North Central demand for gasoline. Other refinery regions will be called in to help, including the Gulf Coast, the West North Central and the West Coast Port Regions. A variety of sources of the feedstock for the liquid synthetic fuels, reflecting the dwindling conventional domestic crude, will service the refinery regions. A lot of coal derived crude will be moved from Appalachia, the Great Plains, and the Rocky Mountains to the Chicago region and finally wind up as refined products to meet the East North Central demand. This means additional hook-ups and pipelines in regions where there are no pipelines at present, and thus the necessary transportation structure in pipe, barge, rail and truck, to meet the demand. So, indeed transportation will play a key role in making the synthetic dream come true.

I would like to highlight some of the key trends and findings and comment briefly on them. First, is that fuel for transportation or transportation needs for energy will depend mostly on liquid fuels as a primary source, as well as other liquids like alcohols and other synthetics. The availability of an adequate supply is going to depend on an effective development of commercial synthetic facilities, a rapid commercialization of alcohol facilities, a maximum utilization of coal for use in industry and as a substitute for our liquids for transportation, and our treatment of rather high efficiency fuel vehicle economy standards.

Although we are seeing a lot more conservation in the transportation sector, hence a decline in the rate of consumption of liquid fuels, the demand is still substantial due to the growth in size of population, particularly the driving age portion of the population. We will see a slight increase in growth of total motor fuel usage. Part of that fuel however, will be diesel. There will be many constraints on this supply as well as on the demand from environmental, safety or pricing regulations.

I urge you to read the NTPCS report, and in particular, the energy chapter and the forecast chapter. The supporting documents are numerous and it is expected that they will be available some time in the future through NTIS. Thank you very much.

Synthetic Fuels Industry

Driving Forces

- Depletion and cost escalation of conventional domestic energy supplies
- Shortages of environmentally acceptable fuels
- Constraints imposed on alternative energy systems
- The presence of existing fuel distribution systems
- A seemingly chronic negative imbalance in foreign trade and payments accounts
- National security
- Governmental incentives.

Constraining Forces

- Technological and economic factors
  - Product costs/markets (interfuel competition)
  - Status of technology and technological risk
  - Financial risk
  - Capital availability
- Environmental and social factors
  - Air quality
  - Water quality
  - Land reclamation
  - Social dislocation
- Availability of resources
  - Energy resources
  - Water resources
  - Land/site availability
  - Skilled work force
- National, state, and local policies.

Table 1

PRELIMINARY PROJECTIONS

	PRODUCTION IN QUARD/YR		NO. OF PLANTS		TOTAL PLANT CAPITAL COSTS (BILLION $)	
PRODUCT	1998	2004	1998	2004	1998	2004
CRUDE						
Total	1.746	10.833	9	55	15.8	98.1
Gr. Plains	1.720	10.800	9	55	15.6	97.8
Rocky Mts.	.026	.033	1	1	0.2	0.3
LNG						
Total	.415	1.382	5	17	3.5	11.9
Gr. Plains	.413	1.314	5	16	3.5	11.3
Rocky Mts.	.002	.068	1	1	0.1	0.6
SHALE						
Rocky Mts.	1.270	4.233	6.6	22	2.5	8.4
TOTAL	3.431	16.448	21	94	21.8	110.4

NOTE: Costs in 1975 constant $

Table 2