CHAPTER V POLICY DECISION ANALYSIS - OBJECTIVE CRITERIA TO EVALUATE THE SYNTHETIC FUELS COMMERCIALIZATION PROGRAM

A. FOREWORD

The Synthetic Fuels Commercialization Program is aimed at achieving the social benefits of low cost sources of energy and reduced dependence on imported oil in a way that is consistent with the nation's environmental, economic, political, and socio-economic values. To the extent that such social benefits will not be realized through the normal investment decisions of the U.S. energy industry, federal intervention in the form of a subsidy or other incentives for synthetic fuels commercialization may be socially desirable.

The analysis described here brings together the many factors that influence the Synthetic Fuels Commercialization Program decision. Information on synthetic fuels economics, oil producers' cartel behavior, foreign oil prices, domestic energy supply and demand, and private sector investment behavior has been combined in this analysis to produce numerical measures of net social benefit. These measures of benefit reflect the opportunity costs of the resources that may be employed by the program while reflecting the nation's desires for low cost energy, protection against embargoes, and concern about environmental and socio-economic impacts.

A major purpose of this analysis was to provide a structure within which differing opinions with regard to information and social values could be compared. Necessarily, many of the inputs to this analysis are judgmental, and there are differences in opinion about the numerical values of many of the inputs. What this analysis provides, however, is a way of assessing the degree to which changes in such information or value assessment can affect the relative desirability of alternative synthetic fuels programs, including the option of no program. Identifying the inputs for which changes would have the greatest effect can help focus

discussion and debate onto the most crucial issues.

B. INTRODUCTION

The decisions addressed in this analysis are whether to have a Synthetic Fuels Commercialization Program and, if so, at what level. The problem is considered from the point of view of which program (including none) would be of greatest net benefit to the nation. As shall be seen, net benefit will include not only market transaction benefits and costs, but also externalities such as environmental degradation and risks of deliberate interruption of the supply of imports.

Although it is possible that the government will have to subsidize a nationally desirable program, the exact form of such subsidies is not treated in this analysis (see Volume III). Furthermore, the proper program mix among the various forms of synthetic fuels, i.e., shale oil, high Btu gas, synthetic crude from coal, etc. was not considered to be of primary concern in this analysis. In other words, the mix of plants is to be considered representative. The actual mix, should the program proceed, will be determined to a degree by the competitive bidding process in that industry will have to perceive a commercially viable project and this is impossible to replicate a-priori.

Finally, though uncertainty in such basic factors as future foreign oil prices, future demand, and the cost of synthetic fuel production will be treated directly, the effect on the decision of the possible adoption of other government programs such as the requirement of oil storage or the imposition of import quotas will be handled by determining how the relative desirability of the various Synthetic Fuel Commercialization Program levels would change against such a background.

C. APPROACH

In calculating net benefit, a decision analysis approach was employed since it balances the many factors that influence a decision by treating

the uncertain and dynamic effects of each alternative as well as the complex issue of representing national preferences. Information relevant to the decision is captured by modeling possible decision outcomes and assignment of probabilities. For example, this analysis relates corporate synthetic fuel expansion decisions to information available to the corporations on the cost of expansion, future demand, future synthetic fuel prices, and future foreign oil prices. However, even when this structure is adequately represented, uncertainty remains. This uncertainty is represented by assessed probability distributions on relevant variables. Finally, the preferences of the nation for various outcomes, for outcomes at different times, and for outcomes with various probabilities are specified and used in the evaluation of alternatives.

The result of this procedure is a comprehensive framework within which the net desirability of the Synthetic Fuels Commercialization Program can be evaluated, and within which the net effect on desirability of different states of information or preferences can be evaluated.

D. PREFERENCES

The net benefits of the program are divided into several components:

1. Economic Net Benefits

The economic net benefit of a program (relative to no program) is determined by computing the change in social surplus as a result of the program. Social surplus is the sum of consumer surplus and producer surplus (see Figure 24). Consumer surplus is the sum for the entire U.S. economy of the difference between what a commodity is worth to each consumer in the U.S. economy and what he pays for it. Correspondingly, producer surplus is the sum of the difference between what producers in the U.S. economy receive for the commodity and the amount they would have been just willing to sell it for. Thus, social surplus measures the net value to our society of any commodity, including energy. If a

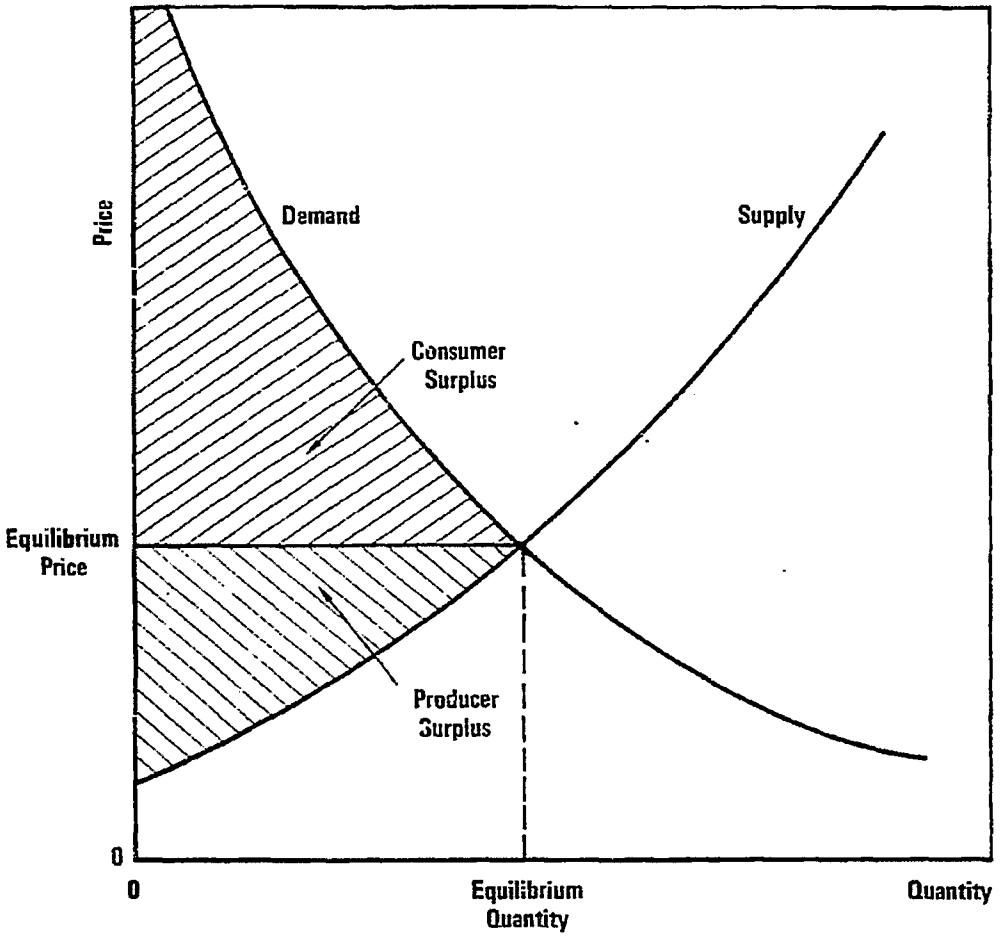

FIGURE 24

SOCIAL SURPLUS EQUALS CONSUMER SURPLUS
PLUS PRODUCER SURPLUS

program changes social surplus through its effects on supply or demand, the program will be credited or charged with the incremental change.

To illustrate, suppose that the synthetic fuel is sufficiently cheap that producers can produce the product at a cost below the price of foreign oil. Then even though synthetics may provide only a portion of total demand, the producer surplus from what they sell, evaluated at the prevailing foreign price, will accrue to the U.S. economy. If a synthetic fuel commercialization program increased the size of this producer surplus, the increase would be credited to the program.

2. Embargo Protection

The economic net benefit we have discussed is an appropriate measure of economic benefit under ordinary market conditions. However, given present international circumstances, any evaluation should consider the probability of an embargo that would limit oil imports and its associated economic consequences. To the extent that adopting a synthetic fuels program decreases (incrementally to other programs such as stockpiling) the probability or economic consequences to the United States of an embargo, the net benefit of the program should be credited with the change in expected embargo loss.

3. Environmental and Socio-Economic Net Benefits

The cost assessment of a synthetic fuels program should include the social consequences from air and water pollution, land disruption, and rapid regional growth. Since the cost of pollution control (compliance costs) should be largely incorporated in the firms' costs, the calculation of net benefits must take into account those generally non-quantifiable costs dealing with "residual" environmental effects and extraordinary socio-economic impacts.

Clearly the speed with which a commercialization program can be implemented will depend largely on the "good will" of the states, localities, and Indian tribes. If synthetic fuels commercialization is indeed

important to national energy objectives, the Federal Government may have to show some good will by helping the states and localities solve their problems.

These problems stem primarily from fiscal factors which inhibit their ability to raise and invest public capital on a lead-time basis (front-end funding) as a way to prevent or mitigate the adverse social impacts of rapid growth and "boom towns." These factors include revenue lags, self-imposed statutory constraints, inability to market bonds due to the substantial risks involved with synthetic fuels, exposure to extraordinary risk after bonding, and, in the case of Indian tribes, lack of access to the usual sources of revenue and credit. In view of the obvious problems that confront the states and localities, it may be desirable that the Federal Government extend credit on a "last resort" basis.

The credit strategy would put the risk burden on the Federal Government and would act as an incentive to states and localities not to overbuild and to install new administrative machinery for financing and managing growth. As such, it may be the most equitable and efficient solution to the lead-time financing problem when bonding is not feasible for institutional reasons (see Appendices D and E for a detailed explanation of socio-economic and environmental costs respectively).

4. Other Positive Benefits

Other contributions to the benefits can be assessed as needed. For example, if the government would be willing to pay a certain sum to achieve the results of a program in terms of international relations, this sum should also be a positive benefit of the program. These benefits might include demonstration to other nations of U.S. resolve to be a world leader in energy, or perhaps the economic benefit to other nations of a U.S. program. This benefit, of course, could also be viewed as a motivation for foreign participation in financing the program.

In establishing such other categories of benefit, it is important to avoid double counting, since many forms of benefits that appear new are already included in the original categories. For example, the "information" value of a program is already reflected in the economic net benefit through learning effects and reduced uncertainty in future synthetic fuels prices.

5. Time Preference

Once the economic net benefit of a program is computed for each year in the future, the present equivalent of this benefit over time is derived from the nation's time preference. A simple way to represent this preference is to compute the discounted net benefit by discounting the annual net benefits at the same interest rate. This is the approach taken (10 percent) in the present analysis.

6. Risk Preference

The analysis produces various discounted net benefits with corresponding probabilities for each program. By multiplying each case times its probability and summing over the cases one can calculate the expected discounted net benefit of each program. If the government (or any other body) chooses to compare programs on such an expected value basis, it is risk neutral. There is considerable belief that this is a correct governmental position on most decisions not involving large sums. However, other risk preferences expressing less willingness to take risk (at the expense of a loss in expected benefits) can be represented. Such representation is particularly important to describe the behavior of individual energy companies or the entire private energy sector when faced with the possibility of losses that are large compared with total assets. The ability to capture this effect allows the examination of when it would be advantageous for the government to encourage what would otherwise be very risky decisions on the part of the private sector.