Refinery Policy Study
Summary of Analysis

Office of Policy and Evaluation
Draft of April 16, 1980
Introduction

A major concern of the Department of Energy (DOE) is the assurance of a reliable supply of refined petroleum products to meet the demand of U.S. consumers and industries. Directly related to this concern is the Department's policy to support and preserve an efficient, competitive and viable domestic refining industry. Over the past year, DOE has examined a number of questions relating to the availability and cost of the refining services necessary to meet U.S. product demand after September 1981. Impending decontrol of crude oil and refined petroleum products (statutory authority lapses in September 1981) makes the review of Federal policies affecting the refining industry timely. The purpose of this summary is to present the Department's findings to date and its plans for future analysis. This summary does not directly address issues which may arise under the existing regulatory scheme prior to September 1981.

Background

Decontrol of crude oil prices and elimination of the entitlements program will, in the absence of countervailing policies, reduce the profitability of domestic refining. It will remove the cost advantage (now between $5 and $6/barrel) which domestic refiners enjoy over their foreign competitors, and eliminate the extra benefits given to small refiners. A changing mix of product demand and crude availability may require additional investments in refinery reconfiguration, yet reduced product demand will require either the shutdown of certain refineries or the operation of all domestic refineries at lower than optimal utilization rates. Questions will be raised as to whether the resulting pattern of refinery utilization represents an appropriate response to changing conditions. In addition, the availability to major refiners of large quantities of low cost crude oil is an issue which must be reviewed. Legislation has been introduced in the Senate which would place a fee on imported products and subsidize certain refinery investment. When such legislation is taken up for consideration it is likely that access to crude oil will also be discussed. To date, the Administration has not taken a position on this legislation.

Historically, the onshore domestic refining industry has benefitted from Government action. From 1959 to 1973 the oil import programs, established under authority of the Trade Expansion Act, encouraged investment in onshore refinery operations. Since 1973, refiners have benefitted from the presence of domestic price and allocation controls and the entitlements system. The costs of these actions may be measured in terms of economic inefficiency and higher prices to consumers. The U.S. and world energy situations have
changed dramatically since these policies were adopted. Higher prices, the insecure nature of many of the world's producing regions, and impending decontrol require an in-depth assessment of our domestic refinery policy and may warrant significant changes in that policy.

Issues

The following issues are central to formulation of a coherent refinery policy:

1. Should a tariff or import fee on refined petroleum products be imposed?

2. Should Federal subsidies (other than a tariff or import fee) be provided to encourage domestic refiners to upgrade existing refinery capacity or install new capacity to manufacture unleaded gasoline or to process low gravity and high sulphur crude oil?

3. Should the Federal Government adopt an explicit policy or program aimed at assisting small and independent refiners in achieving access to crude oil at competitive prices?

Analysis to Date

1. The Tariff Issue 1/

a. National Security

The primary rationale for an import tariff on petroleum products relates to national security. Some have alleged that an increased portion of additional product imports will come from the Middle East, which is planning to substantially increase export refining capacity. Though initially priced at low levels, these product exports and the tankers in which they are shipped will, in this view, eventually be cartelized as was OPEC crude oil. Furthermore, some believe

1/ The President has imposed a fee on the importation of crude oil and gasoline as part of the combination of actions which create the gasoline conservation charge. Crude oil importers are reimbursed entirely by gasoline producers and thus the gasoline conservation charge does not have any of the effects of a differential fee on product. This section addresses the question of imposing a fee on imported product which is greater than any contemporaneous fee on imported crude.
that increased product imports from Europe will also be subject to eventual monopoly pricing and instability owing to conflicts between Europe and the U.S. over energy and Middle East policies. Finally, refiners exporting products from the Caribbean are thought to be increasingly subject to sabotage and nationalization.

Import tariffs of various amounts would increase the share of refinery output domestically produced and reduce the share of refined products that is imported and hence vulnerable to external interruption. However, any reduction in product imports would be placed by an essentially equivalent amount of crude imports to feed the increased domestic refinery activity. On its face, therefore, it appears that the Nation's import vulnerability would remain the same. A concern frequently expressed is that a greater volume of product imports under free trade will deprive us of operational domestic refinery capacity needed in the event of world petroleum shortfalls. But the insecure petroleum supply is mainly crude oil from the Persian Gulf, not refined products. Shortfalls of crude, and therefore loss of refinery inputs, result in the availability of excess refining capacity throughout the world, including U.S. and Caribbean refineries.

There might be valid cause for concern if such a large portion of U.S. imports from insecure sources were in the form of products that the remaining insecure crude imports were exceeded by the amount of replacement crude available in an emergency, and if there were little or no spare refining capacity. Under current circumstances this is a highly unrealistic scenario. In 1978 for example, the U.S. imported 2,280.3 MBD of crude oil from the Persian Gulf, and only 14.0 MBD of products from that region. According to figures derived from the BP Statistical Review of the World Petroleum Industry, 1978, 19,365 MBD of crude oil refining capacity were unused out of a total world capacity of 79,155 MBD (capacity utilization rate of 76.8 percent) at the end of 1978. The comparable figures for the world excluding the U.S. and the Middle East were 14,765 MBD of unused capacity out of a total of 58,255 MBD (capacity utilization rate of 74.7 percent). During 1979, there continued to be substantial spare refining capacity, with EEC refineries working at 73 percent capacity compared to 66 percent in 1978 (The Oil Daily, Monday, March 24, 1980).

In numerous market conditions under a variety of supply interruption scenarios the Department has found that product import tariffs did not significantly improve, and in some cases worsened, our aggregate import situation. These interruptions were analyzed in terms of the immediate loss
of imports to the U.S. directly attributable to the interruption. Only in the rather unlikely events of a cutoff of all Caribbean product or all Caribbean product and Venezuelan crude exports, are the costs of an interruption substantially less with a tariff than without it.

The slight benefits from a product tariff materialize only during shortfalls, while the costs of a tariff are continuous. The effectiveness of tariffs to reduce import losses would be enhanced if they were applied equally to both crude oil and product imports.

b. Economic Efficiency

Estimates made by DOE indicate that higher crude prices resulting from crude oil decontrol and termination of the entitlements program will lower the national average refinery utilization rate by about 4-6 percent by 1982 in the absence of any other form of protection. This represents a reduction in total output of domestically refined products and a corresponding increase in product imports of about 750,000 b/d. (Total refined product demand in 1979, including imports, was 18.4 MMBD.) Part of this reduction will involve the shutting down of perhaps as many as 40 to 80 small, inefficient refineries, many of which came into existence as a result of the small refiner bias program.

One factor in reduced refinery utilization will be a growth of product imports from their current, low levels. Product imports have declined since 1973, both absolutely and as a percentage of total products supplied to domestic users. The United States imported 3,012 MBD of petroleum products in 1973, or 17 percent of products supplied. In 1979, the U.S. averaged imports of 1,805 MBD of products, less than 10 percent of products supplied.

Another factor affecting refinery use is that product demand will stabilize or decline. Based on current and projected world oil prices, end-use demand for refined petroleum products is expected to decline to about 18 MMBD by 1985; and to about 17 MMBD in 1990. Thereafter, demand is expected to continue to decline. A breakdown of this demand forecast by product is provided in Table I.
Table I

U.S. REFINED PRODUCT DEMAND
(Millions of Barrels Per Day)

<table>
<thead>
<tr>
<th>Year</th>
<th>Gasoline</th>
<th>Distillates</th>
<th>Residual Fuel</th>
<th>Total Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>1979</td>
<td>7.03</td>
<td>3.3</td>
<td>2.8</td>
<td>18.4</td>
</tr>
<tr>
<td>1985</td>
<td>6.0-6.6</td>
<td>3.4-3.9</td>
<td>2.7-3.1</td>
<td>17-19</td>
</tr>
<tr>
<td>1990</td>
<td>5.7-6.3</td>
<td>3.2-3.9</td>
<td>1.7-2.7</td>
<td>15.5-18</td>
</tr>
</tbody>
</table>

Table II presents DOE estimates of the effects of product import tariffs on refinery utilization. Also shown are the real resource costs of these tariffs. This represents the extra capital, labor and operating costs of refining products domestically that could be refined more cheaply in Canada, Europe, or the Caribbean.

Table II

Refinery Capacity Utilization and Real Resource Costs Under Alternative Tariff Levels

<table>
<thead>
<tr>
<th>Per Barrel Tariff Level</th>
<th>Free Trade</th>
<th>1982 Projections</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$ .63</td>
<td>$ 1.00</td>
</tr>
<tr>
<td>Utilization Rates (Percent)</td>
<td>83-64</td>
<td>84</td>
</tr>
<tr>
<td>Real Resource Costs (Million of $/yr.)</td>
<td>$30</td>
<td>$50</td>
</tr>
<tr>
<td>Increments in Domestic Refinery Output (Thousands of bbls/day)</td>
<td>100</td>
<td>200</td>
</tr>
</tbody>
</table>
c. Consumer Costs

The costs of import tariffs to consumers are substantial. Since foreign refiners provide the marginal barrel of residual fuel to the U.S. market, and therefore set the price of all residual fuel in this country, residual fuel prices will increase by an amount equal to the tariff. The prices of other refined products will increase by an amount somewhat smaller than the level of the tariff because the marginal barrels of these products are produced in the U.S. at less than the cost of imported products plus the tariff.

A $2 tariff would cost consumers over $6 billion per year in transfers to refiners and, via tariff and corporate income tax revenues, to Federal, State, and local governments. Consumer costs would be $3 billion per year for a $1 tariff and $1.8 billion per year for a $.63 tariff.

d. Jones Act

The Jones Act requirement to use domestic tankers adds 70 to 80 cents per barrel to the cost of delivering refined products from the Gulf Coast to the East Coast. However, only those domestic refiners or other shippers that use Jones Act tankers bear this cost. A tariff or license fee imposed to offset Jones Act costs would increase product costs to all consumers and benefit all refiners even though such shipments represent less than 8 percent of U.S. daily product demand. The remaining 92 percent of U.S. product movements are by pipeline, truck or rail. A direct subsidy of 70 to 80 cents per barrel to those refiners and other petroleum shippers who are required to use Jones Act shipping would be less costly to consumers. A subsidy may be appropriate in this case because the Jones Act requirements have been imposed to enhance the national security. On the other hand, a subsidy to refiners who use Jones Act tankers may lead to demands for subsidies by shippers of non-petroleum products using Jones Act ships, and create a disincentive to new pipeline construction.

e. Protection for Small Refiners

A tariff does not provide protection for small inefficient refiners over the long-run. Following elimination of the entitlements program and the small refiner bias, a tariff will not protect small refiners from competition with large domestic refiners. Because large refiners (and some small refiners) are more efficient than many refiners that have received subsidies under the entitlements program, some of the least efficient refiners will eventually be forced out of the marketplace. Ultimately, an import tariff would result in higher returns to larger and more efficient on-shore refining operations, including those of the major integrated companies.
f. Employment and Balance of Payments

A tariff or fee on imported petroleum products will have only negligible effects on domestic employment and balance of payments. Petroleum refining is not a highly labor intensive industry. The DOE estimates that any increased domestic employment created in the refining industry by a product tariff would be offset by decreased employment in the remainder of the economy created by higher oil product prices. The balance of payments effect would similarly be very small as the reduction in product imports created by the tariff would be offset by a slightly greater (by volume) increase in crude oil imports. Since over 90 percent of the value of imported petroleum products is in the value of the crude oil from which they are manufactured, a negligible balance of payments impact would be expected.

g. Environment

The environmental impact of a product tariff would be neutral. Increased refining activity in the United States would create increased domestic emissions, but this would be offset by an increased volume of products being shipped through coastal waters. Product spills, which are environmentally more hazardous than crude oil spills, would thereby become more likely.

2. The Subsidy Issue

a. General Considerations

As noted above, U.S. demand for refined petroleum products is likely to remain stable or decline between now and 1990. DOE therefore estimates a continuing rise in available domestic refining capacity. Through 1981, planned additions to domestic capacity amount to 1.6 MMBD.

Despite declining net product demand, there may be a need for new refinery investment to handle changing product demand and crude oil availability. In the future, world crude oil production is expected to gradually increase in sulfur content and decrease in gravity. Price differentials among types and qualities of crude oil are already very substantial. This trend will require significant new investments in conversion and desulfurization capacity in order to meet changing product demand. Although the technology to refine heavier and higher sulfur crude oil is readily available, concern exists over whether refiners can afford to purchase this higher cost equipment quickly enough to satisfy the growing demand for light products, especially unleaded gasoline.
Some concern has been expressed that the market alone will not provide adequate incentives for necessary refinery reconfiguration. The current surplus of residual fuel oil is pointed to as an indicator that refiners cannot adapt to changing circumstances. Some allege that present and proposed Federal energy policies such as air quality regulations, coal conversion under the Fuel Use Act and the utility oil backout legislation, will further exacerbate refiners' ability to meet changing market conditions. Subsidies, it is claimed, would assist in ameliorating these external constraints.

The price differential between various crude oil qualities and product values is the primary economic incentive influencing refinery investment decisions. Gasoline price regulations have created disincentives to refinery investment because they have not provided for an adequate return on new equity investment.

This disincentive operates to some degree whether or not price controls are binding at any given moment, since refiners are constantly aware of the necessity to maintain substantial positive banks. The elimination of crude oil and product controls will allow price differentials and rates of return to respond to changing market conditions and thereby remove this constraint to refinery investment. As discussed below, increasing investment appears to be taking place in anticipation of decontrol.

b. Unleaded Gasoline

Prior to the recent decline in gasoline demand, there was considerable uncertainty whether refiners' octane supply capability would be sufficient to satisfy growing demand for high octane unleaded gasoline. DOE now anticipates that, by 1982, demand for unleaded gasoline will be 60 to 65 percent of total gasoline demand, which in turn is projected to be 6.5 to 6.7 MMBD. Thus, demand for unleaded gasoline in 1982 is estimated to be between 3.9 and 4.3 MMBD. There already exists sufficient refining capacity to manufacture approximately 4.0 MMBD of unleaded gasoline, while meeting current demand for leaded product. An additional 275 MBD of reforming capacity is currently planned or under construction, while imports of unleaded gasoline could contribute an additional 50 MBD by 1982. Based on the projected decline in gasoline demand, unleaded shortages should not occur by 1982. With the removal of existing regulatory disincentives, shortages of unleaded gasoline after 1982 are highly unlikely.

2/ When a refiner does not pass through the full amount of increased costs in increased prices, it is able to "bank" its unrecouped costs for recoupment later. Positive banks enable refiners to price in excess of their lawful ceiling price until the banks are exhausted.
c. Heavy Crude and the Resid "Glut"

Rising oil prices, current coal conversion legislation and the President's proposed utility oil displacement initiatives will cause a significant reduction in electric utilities' demand for oil (mostly for residual fuel oil) by 1985. Some industry spokesmen have suggested that a decrease in demand for residual fuel oil will cause or contribute to a glut in the domestic market for that product. At the same time crude oil available to U.S. refiners is gradually becoming heavier, which will result in a higher yield of resids, unless compensating changes are made in refinery configurations.

As noted above, a principal determinant of refinery investment is the price differential between refined products. In June 1978, the average refinery gate price differential between all grades of gasoline and all grades of resid was 15.7 cents per gallon. In December 1979, it was 30.2 cents per gallon, indicating that a relative surplus of resid has developed over this period. Many refiners have already responded to the current price differential and a large program of downstream refinery additions is currently underway. Between 575 and 800 MBD of additional capacity capable of upgrading heavy crudes or converting residual fuel oil into lighter products is currently planned or under construction. This is nearly half of the current refinery output of resid. Such investments are currently estimated to have an after tax internal rate of return of 16 percent per annum.

d. Sour Crude

Another major trend in the U.S. refining industry is the need to provide low sulfur products at a time when more high sulfur crude is available for processing. Planned additions to increase the desulfurization capability of domestic refineries currently amount to between 425 and 500 MBD. The increasing ability of domestic refineries to process sour crude is actually much higher than this figure as desulfurization is also accomplished through various other refining processes.

In addition, current high sulfur crude refining capacity is not being fully utilized and some sour crude could be substituted for sweet crude in existing facilities. Together with current spare desulfurization capacity and planned additions, lower product demand makes it highly unlikely that the Nation will face a shortfall of sour crude capacity.
The Crude Oil Access Issue

a. General

Governmental programs to reallocate supplies of crude oil have existed for years. They have been implemented to correct alleged competitive disadvantages between small and independent refiners and firms having preferential access to foreign and domestic crude oil. 3/

Current programs also reflect concern that refiners receive equitable access to crude oil. For example, the small refiner bias of the entitlements program began as a carryover of the special treatment accorded to small refiners under the Mandatory Oil Import Program of the 1960's. Since the inception of the small refiner bias there has been a proliferation of new refineries whose profitability rests in large part on that subsidy. Recently, DOE reduced the amount of the bias by approximately half, and adopted an amendment to the entitlements program which would have phased out the bias in conjunction with the phase-out of crude oil price controls by September 1981. As a result of a successful court challenge, the phase-out provision has not been enforced, but a rulemaking to reinstitute the phase-out will be instituted later this year. 4/ In addition, the current crude oil allocation regulations, through the supplier/purchaser freeze rule and the buy/sell program, are intended to assure that small and independent refiners have access to crude supplies.

3/ Preferential access in the case of domestic crude, has frequently been alleged to involve control of domestic production and pipeline transportation. In the case of foreign crude, preferential access has been alleged to arise from concessionary relationships between producing country governments and particular companies.

4/ It should be noted that the small refiner bias is an uneven method for compensating refiners for their differential access to crude oil. It provides benefits to refiners regardless of their crude ownership positions and provides greater entitlements benefits to small refiners, particularly those refineries below the 50 MBD crude run level. Under the current rule, the bias provides maximum benefits of $.96 per barrel for refiners under the 10 MBD level $.53 per barrel for refiners under the 30 MBD level and $.28 per barrel at the 50 MBD level. At the 100 MBD level, the bias is to reduce to a maximum 9 cents per barrel. The subsidy thereby encourages the operation of small and unsophisticated refineries.
Crude oil decontrol will result in the removal of both allocation protection and the explicit subsidies conferred by the small refiner bias. Any problems of differential access to foreign crude oil faced by firms after decontrol will result from two factors: differing prices for similar crudes which result from the pricing policies of various OPEC countries (including decisions by some countries to sell on the "spot" market); and supply interruptions, whether caused by direct U.S. Government action as in the case of the Iranian embargo, or by cutbacks by producing countries.

b. Price Differentials

The situation in Saudi Arabia typifies the first aspect. The Saudis have set their prices at levels substantially below those of other countries. Consequently, the Aramco companies—Chevron, Exxon, Mobil, and Texaco—incurred substantially lower crude oil acquisition costs than did many other companies in the world oil market. Under the present DOE price regulations and COWPS guidelines, these companies are compelled to flow through the benefits of the lower acquisition costs to their customers. This has resulted in their prices being lower than most of their competitors. DOE is currently examining the extent to which this price differential has enabled them to expand their market share.

A related problem is the recent substantial increase in spot prices relative to contract prices, which for a time seriously affected those companies that relied upon the spot market for significant quantities of their crude oil requirements. It is important to realize that, in the past, spot market prices were frequently at or below the level of contract prices. Therefore, a company could have achieved lower crude costs by relying upon the spot market.

c. Supply Interruptions

The second aspect of the problem involves unexpected supply interruptions. In principle, two types of supply interruptions can be distinguished—those resulting from U.S. Government actions and those resulting from foreign government actions.

5/ In the last two months spot prices have apparently begun to return to this historic relationship.
Either type of interruption can seriously impact some industry participants while leaving others relatively unaffected. In the case of a supply interruption due to a U.S. Government decision to embargo a particular crude source, the Government has some responsibility to assure that the burdens of the decision are shared equitably. But in practice it may be difficult to distinguish these situations. One approach would be enactment of legislation to extend the current buy/sell program on a contingency basis past the currently scheduled expiration date of September 1981, solely for the purpose of dealing with sudden interruptions. A possible shortcoming of this approach is that it may reduce the incentives for importing companies to diversify their sources of crude oil and to maintain inventories in anticipation of an interruption. This approach may also be unnecessary if sufficient crude oil is available from the Strategic Petroleum Reserve.

d. Agenda for Further Analysis

With respect to the crude oil access issue, the Department is currently engaged in a study to examine the potential effect of differential crude oil access on the competitive viability of independent refiners subsequent to decontrol. This study is currently expected to examine several policy options through three separate analyses:

1. Qualitative discussion of options and their national aggregate impacts (with product and geographic market-specific analyses to the extent possible).

2. Quantitative analysis of options on a national aggregate basis, possibly using a refining industry simulation model.

3. Quantitative case studies of competitive impacts in individual geographic product markets (probably gasoline only). Markets will be selected in which the relative competitive positions of current participants are likely to change markedly after decontrol and in the absence of any replacement programs in DOE. To the extent possible, conclusions from the case studies will be extended to markets not explicitly studied.