Measuring Dependence on Imported Oil

by C. William Skinner*

*U.S. dependence on imported oil** can be measured in at least two ways. The differences hinge largely on whether oil imports are defined as net imports (total imports minus exports) or as total imports. EIA believes that the net-imports definition gives a clearer indication of the fraction of oil consumed that could not have been supplied from domestic sources and is thus the most appropriate measure. With this issue of the* Monthly Energy Review*, the Energy Information Administration (EIA) introduces a revised table that expresses dependence on imports in terms of both measures.*

How dependent is the United States on foreign oil? How dependent are we on oil from the Persian Gulf or other sensitive areas? Do we import more than we produce domestically? Questions like these arise almost every day in the formation and analysis of energy policy. Since the oil embargo by Arab members of the Organization of Petroleum Exporting Countries (OPEC) in 1973-74, with its ensuing gasoline lines and sharp price increases, there has been a continuing concern about the vulnerability of the United States to oil supply disruptions. One facet of this vulnerability that is easily measured and reported is "import dependence," i.e., the percentage of oil used in the United States that must be imported. But, surprisingly enough, even using the same data on U.S oil trade and consumption, different parties compute and publicize different numbers for import dependence and, especially, for how the dependence has varied over the past two decades. How are the different measures defined? How do they compare? What are the sources of the differences? Which is the most meaningful measure? Why does it matter?

Imports...and Exports

Essentially all oil is consumed as refined products, from gasoline and heating oil to asphalt and petroleum coke. The total of refined products consumed, which the Energy Information Administration (EIA) measures as petroleum products supplied (Table 3.1, page 42 of this *Monthly Energy Review*), originates in a number of sources. In 1994, crude oil input to U.S. refineries (Table 3.2, page 47) accounted for about 78 percent of the total products supplied. The remainder came largely from imports of refined products (11 percent), liquids produced at natural gas processing plants (10 percent), and the volumetric gain at refineries as crude oil is refined into less dense products (4 percent).[1]

These figures present an apparent anomaly. Even though there are a number of other sources (ethanol, for example) that augment the stream of products supplied for domestic consumption, we have already accounted for 103 percent of the total. The anomaly arises because the United States also exports substantial quantities of refined petroleum products (in 1994, an amount equivalent to 5 percent of U.S. consumption) as well as crude oil. At present, exports of crude oil are restricted, and consist mainly of crude oil destined for the U.S. territories of Puerto Rico and the Virgin Islands, and barrel-for-barrel swaps (exported in one location, imported in another) across the Canadian border. From time to time, small amounts of crude oil from Alaska's Cook Inlet are also exported. With the recent movement of legislation to allow the export of crude oil from the Alaskan North Slope to destinations in addition to the U.S. territories, crude oil exports could increase substantially in 1996. Refined petroleum products can be exported without restriction and the quantities are normally much larger than the exports of crude oil. The particular products involved vary from season to season and from year to year, depending upon market conditions.

Measures of Import Dependence

There are four data series of particular interest in calculations of dependence on imported oil (Table 3.1, pages 42 and 43):

- ***Petroleum Products Supplied.*** This is an imperfect (but the best available) measure of total consumption of petroleum products in the United States (the 50 States and the District of Columbia). This series, or one that approximates it closely, is the denominator in all measures of import dependence. Petroleum products supplied in 1994 averaged 17,718 thousand barrels per day.

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**In this article, the term ''oil'' encompasses both crude oil and refined petroleum products.

- ***Total Imports (crude oil and petroleum products).*** This series measures gross imports of crude oil and petroleum products into the United States, including imports of products refined in the Caribbean territories from domestically produced crude oil. Total imports for 1994 were 8,996 thousand barrels per day.

- ***Total Exports (crude oil and petroleum products).*** This is a measure of all the crude oil and petroleum products leaving the United States. In 1994, total exports were 942 thousand barrels per day.

- ***Net Imports.*** This number (total imports minus total exports) is the net inflow of all oil into the United States. The 1994 value was 8,054 thousand barrels per day.

The import dependence measure that has been published in the *Monthly Energy Review* for many years (Table 1.8, page 15) is

$$\frac{\text{Net Imports}}{\text{Products Supplied}} \times 100 \text{ percent.}$$

For 1994, this calculation yielded a value of 45.5 percent.

1994: 8,054 / 17,718 = 45.5 percent

That number represents the net inflow of foreign oil as a percentage of total oil consumption. By this measure, U.S. dependence has never reached 50.0 percent on an annual basis, peaking in 1977 at 46.5 percent. Calculating dependence in this way implicitly assumes that differences among petroleum products are not significant in terms of overall dependence, e.g., that exports of petroleum coke offset imports of lighter products that are more in demand. There is a further implicit assumption that, in the event of a disruption in imports, exports would not continue unabated.

A measure of import dependence used by some analysts is

$$\frac{\text{Total Imports}}{\text{Products Supplied}} \times 100 \text{ percent.}$$

Calculated this way, dependence in 1994 was 50.8 percent.

1994: 8,996 / 17,718 = 50.8 percent

Using this definition of dependence gives more dramatic results and allows statements such as "...last year for the first time the country imported most of its oil...."[2]

With total imports in the numerator rather than net imports, not only is the computed dependence higher due to the quantity of exports, but also comparisons in dependence over a number of years can be substantially distorted due to changes in export patterns. For example:

- Suppose that, for reasons of local economics, there is an increase in the amount of crude oil swapped by refiners across the Canadian border. Each country ends up with exactly the same amount of oil and net imports to the United States remain unchanged, yet U.S. total imports rise and "dependence" computed by this measure rises also. Is the United States really more dependent on foreign oil under these conditions?

- Alaskan North Slope crude oil is shipped to the Virgin Islands for refining and the products are returned to markets on the east coast. Suppose that transportation and refining economics shift so that the Virgin Islands refinery uses foreign crude oil instead, and the Alaskan crude oil goes to the gulf coast to replace a corresponding quantity of imports. Dependence measured by net imports would stay the same, but dependence measured by total imports would decline, *even though exactly the same quantities of domestic and foreign oils end up in the United States.*

- Last year the United States imported 58 thousand barrels per day of motor gasoline from Venezuela and Brazil and exported about the same amount to Mexico.[3] Suppose, instead, that Mexico's needs had been satisfied directly from Venezuela and Brazil. U.S. net imports would have been the same, but total imports would have been 58 thousand barrels per day less. Would the United States really be less dependent on imported oil?

As these examples illustrate, the most appropriate measure of this country's actual dependence on foreign oil is one based on the *net requirements for imports*, or total imports minus exports, rather than on total imports alone.

Trends

Prior to the 1990's, the peak year for dependence on imported oil, by almost any measure, was 1977 (Table 3.1, pages 42 and 43). Exports were limited at that time and, as shown below, there was little difference in the measures of import dependence (mbd = thousand barrels per day):

1977	
Total Imports	8,807 mbd
Total Exports	243 mbd
Net Imports	8,565 mbd
Products Supplied	18,431 mbd

(Total Imports) / (Products Supplied) = 47.8 percent

(Net Imports) / (Products Supplied) = 46.5 percent

By 1991, however, exports had grown to over a million barrels per day, and it began to matter significantly whether they were taken into account in computations of import dependence:

1991	
Total Imports	7,627 mbd
Total Exports	1,001 mbd
Net Imports	6,626 mbd
Products Supplied	16,714 mbd

(Total Imports) / (Products Supplied) = 45.6 percent

(Net Imports) / (Products Supplied) = 39.6 percent

By 1993, neglecting exports led to the conclusion that our dependence on foreign oil was at a record high of 50.0 percent, a conclusion that drew substantial news coverage. The less dramatic conclusion, when dependence was viewed in the perspective of net inflow of oil, was that

dependence was increasing but had not yet reached the levels of the late 1970's:

1993

Total Imports	8,620 mbd
Total Exports	1,003 mbd
Net Imports	7,618 mbd
Products Supplied	17,237 mbd

(Total Imports) / (Products Supplied) = 50.0 percent

(Net Imports) / (Products Supplied) = 44.2 percent

EIA projects a greater dependence in 1996,[4] with net import dependence reaching a record high but still well under the 50-percent mark:

1996

Total Imports	9,721 mbd
Total Exports	1,027 mbd
Net Imports	8,694 mbd
Products Supplied	18,129 mbd

(Total Imports) / (Products Supplied) = 53.6 percent

(Net Imports) / (Products Supplied) = 48.0 percent

In the longer term, EIA forecasts that net import dependence will grow to about 58 percent by 2005 and remain at that level through 2010.[5]

Legislation to allow the export of Alaskan North Slope crude oil has been passed by both houses of Congress and, at this writing, is awaiting conference committee action. If such exports materialize, the Alaskan oil will presumably flow to the Far East and be replaced in the United States by an equivalent amount of imports. If, for example, 1 million barrels per day of Alaskan crude oil were exported in this fashion in 1996, dependence as measured by net imports would remain unchanged, but neglecting the exports while counting the corresponding rise in imports would lead to the alarming conclusion that import dependence had skyrocketed to almost 60 percent:

1996

Total Imports	10,721 mbd
Total Exports	2,027 mbd
Net Imports	8,694 mbd
Products Supplied	18,129 mbd

(Total Imports) / (Products Supplied) = 59.1 percent

(Net Imports) / (Products Supplied) = 48.0 percent

Other Possible Measures

If the purpose of an import dependence indicator is to show what fraction of the oil needed to support the U.S. economy must be secured from foreign sources, certain refinements could be made to give a slightly more accurate picture. One such refinement would be to add to the net import figure the net amount withdrawn from stocks and used to help satisfy demand during the period in question, or subtract the net quantity added to stocks (both commercial stocks and the Strategic Petroleum Reserve). This adjustment would be made on the theory that, had stocks been held constant, that much more (or less) imported oil would have been required. On an annual basis, such a refinement would make little difference, since the net change in stocks over the period of a year is relatively small. (The largest annual net change in the past decade was a stock build of about 200 thousand barrels per day in 1986.) When computing import dependence on a monthly basis, however, the stock adjustment can make a substantial difference. The stock-change adjustment to net imports is conceptually sound and the data to make it are readily available. The real question is whether the small difference in annual figures would be worth making the indicator somewhat more complex and difficult to understand.

Conclusions

The most appropriate measure of U.S. dependence on foreign oil is the one that gives the clearest indication of the percentage of oil consumption that could not have been provided from domestic sources. Using total imports as a percentage of consumption (petroleum products supplied) can make the dependence appear unduly large and can especially distort comparisons over time when export patterns have changed. Using net imports in the numerator of the calculation yields a more meaningful indicator of import dependence. For purposes of comparison, the *Monthly Energy Review*'s newly revised Table 1.8 (page 15) expresses import dependence in terms of both total imports and net imports. However, EIA uses only the net-imports definition in its own forecasts and analyses. A somewhat more precise, but more complex, indicator would result from adjusting net imports for stock withdrawals or additions. This latter indicator would be particularly informative for the monthly figures.

Notes

[1]Energy Information Administration, *Petroleum Supply Annual 1994, Volume 1*, DOE/EIA–0340(94)/1 (Washington, DC, May 1995), Table 1.

[2]Brad Knickerbocker, ''Will Congress Heed Public on Energy?'' *The Christian Science Monitor*, July 11, 1995, p. 13.

[3]*Petroleum Supply Annual 1994, Volume 1*, Tables 21 and 28.

[4]Energy Information Administration, *Short-Term Energy Outlook, Third Quarter 1995*, DOE/EIA–0202(95/3Q) (Washington, DC, August 1995), Table 6.

[5]Energy Information Administration, *Annual Energy Outlook 1995, with Projections to 2010*, DOE/EIA–0383(95) (Washington, DC, January 1995), Table A11.

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