

Report No. S6

Petroleum Products National Totals

1. Definition of the Commodity Flow Data Gap

1.1. General Description

The general transportation logistics of the petroleum industry start with the initial gathering of crude oil in production fields for domestic sources and from marine terminals for foreign imports. The crude oil is then delivered to refineries or to long-term storage facilities such as the Strategic Petroleum Reserve (SPR). From these refineries, finished products are moved to markets throughout the nation.

Transportation of petroleum products is accomplished by a variety of land and marine-based modes. They include: pipeline, railroad tanker cars, tanker trucks, barges, and oceangoing tankers. On a volume basis, pipelines and marine vessels are predominately used in transporting petroleum, but trucks and railroad tank cars also have essential functions.

Shipments of petroleum products are in scope for the Commodity Flow Survey (CFS). However, there are significant discrepancies between CFS reported totals and those published by other government agencies. Furthermore, all ton-miles are suppressed from CFS tables, either because of high sampling variability in the estimates or due to poor response quality. Tonnage and value estimates are reported in the CFS 2002 publications for shipments of petroleum products captured by the CFS (see Table 1).

Table 1. Shipments of Petroleum Products, 2002 CFS

| Commodity | Ton (thou.) | Value (\$ million) |
|---|--------------------|---------------------------|
| SCTG 17 - Gasoline and aviation turbine fuel | 372,310 | \$88,767 |
| SCTG 18 – Fuel Oils | 176,511 | \$34,735 |
| SCTG 19 - Coal and petroleum products, N.E.C. | 41,518 | \$8,679 |
| TOTAL | 590,339 | \$132,181 |

Based on information from the Association of Oil Pipe Lines and other sources, pipeline companies transported 976 million tons of light petroleum products valued at \$232,630 million in 2002. These activities generated approximately 299,600 million ton-miles of movements. Compared to the values shown in Table 1, it is clear that CFS statistics on petroleum products are significantly underestimated. In fact, the 2002 CFS captured only about 60% by weight, or about 57% by value, of petroleum products transported by pipelines. Therefore, this is a significant CFS undercount area that requires further study.

1.2. Commodities involved in the data gap

1.2.1. SCTG codes

Petroleum products are included under the following two-digit SCTG codes:

- 17 - Gasoline and Aviation Turbine Fuel
- 18 - Fuel Oils
- 19 - Coal and Petroleum Products, N.E.C.

These are in-scope commodities for the 2002 CFS.

1.2.2. STCC codes

Under STCC coding, petroleum products are included in “29 - Petroleum or coal products”

1.3. Establishments involved in the data gap

1.3.1. NAICS codes

- 324 - Petroleum and Coal Products Manufacturing
- 486 - Pipeline Transportation

1.3.2. NAICS-SIC conversion issues

There are no major NAICS-SIC conversion issues.

2. Importance of the Data Gap

Petroleum products are vital commodities to our national security, economy, and mobility. Information on the petroleum products shipment is a building block that helps to form the basis for sound policy-oriented analyses for transportation investments.

2.1. Value and tonnage as a share of national shipments

Based on information obtained from the Association of Oil Pipe Lines, in 2002, a total of 481 billion ton-miles of petroleum products, both domestic production and imports, were shipped in the U. S. Among various modes of transportation, pipelines carry approximately 62% while waterways carry approximately 28% of the total petroleum products ton-mile movements. Motor carriers and railroads carry small amounts of the total ton-miles, approximately 6% and 4%, respectively.

2.2 Geographic concentration: dispersed versus concentrated, local versus long distance

Petroleum products shipments are transported long-distance via pipeline to various locations in the U.S. According to the *Pipeline Economics, Oil & Gas Journal*, the average pipeline shipment length is 307 miles. This journal also provides petroleum products movement data at a geographic level coarser than the extended FAF regions.

2.3 Importance to international trade

Imported petroleum product is a relatively small part of the total petroleum products supplied by the 144 operating refineries across 33 states in the U. S. On average, 2,390 thousand barrels per day of petroleum products were imported during 2002. On the other hand, a small amount of petroleum products (975 thousand barrels per day) was exported from the U.S. in 2002. The petroleum product supply averaged 19,761 thousand barrels a day in 2002. Approximately 7% of U. S. petroleum product supply is from imported petroleum products.

3. Data Sources

3.1. Coverage in CFS

The petroleum and coal products manufacturing industry is covered by the CFS 2002. However, ton-mile information is left out of the published CFS statistics. Furthermore, there are significant differences between CFS reported tonnage and value as compared to similar information from other data sources.

3.2. Coverage in other data sources

The basic information for petroleum products production (e.g., imports, exports, and disposition at refineries) is based on information collected by EIA/DOE. Information relating to petroleum products imports and exports at ports can be supplemented by the *Annual Imports and Exports Waterborne Databanks*, prepared and maintained by the Maritime Administration (MARAD) Office of Statistical and Economic Analysis in the U.S. Department of Transportation.

National level petroleum products shipment information by transportation mode was based on *Shifts in Petroleum Transportation* published by the Association of Oil Pipelines annually. This report's modal information in ton-miles was based on several other data sources, including:

- Oil Pipelines: Annual Report (Form 6) of oil pipeline companies provided to the Federal Energy Regulatory Commission.

- Water Carriers: *Waterborne Commerce of the United States*, U.S. Army Corps of Engineers, Part 5, Table 2-2.
- Motor Carriers: *Petroleum Tank Truck Carriers Annual Report*, American Trucking Association, Inc. and *Petroleum Supply Annual*, U.S. DOE, EIA, Volume 1, Table 46.
- Railroads: *Carload Waybill Statistics*, Report TD-1, USDOT, Federal Railroad Administration and *Freight Commodity Statistics*, Association of American Railroads, Table A3.

3.3 Data quality

Data sources listed above are all government published statistics. They are expected to be reliable.

3.4 Other Issues

None.

4. Estimation Methods

4.1. General description of alternative methods

Petroleum products information collected by EIA provides a starting point for estimating petroleum products movements as required by the FAF. The origins of petroleum products include the SPR, domestic refinery production by state, and imports by Petroleum Administration for Defense (PAD) Districts¹. However, imports can be further disaggregated to the seaport level with information from MARAD. Destination information is provided by state level energy consumption by sectors.

4.2. Proposed method for estimating national totals

Ton-mile information presented by the Association of Oil Pipe Lines was used as the national totals. The average length of movements for pipeline, water carriers, trucks and railroad tanker cars can be estimated using information from data sources such as: the *Pipeline Economics, Oil & Gas Journal; Part 5 - National Summaries of*

¹ Petroleum Administration for Defense (PAD) Districts are geographic aggregations of the 50 States and the District of Columbia into five districts. These districts were originally defined during World War II for purposes of administering oil allocation.

Domestic and Foreign Waterborne Commerce of the 2002 Waterborne Commerce of the United States Waterways and Harbors; the Vehicle Inventory and Use Survey (VIUS) Database, and the Carload Waybill Database.

The tonnages of petroleum products moved by different modes of transportation can then be estimated based on the average line haul distances and ton-miles. The composite petroleum products wholesale price as published in Table 4 of the *Petroleum Marketing Annual* can be used to estimate the value of crude petroleum moved. Conversion factors such as density and other volume-to-weight relationships are based on information in Table C1 “General Conversion Factors” of the *International Energy Annual*.

Based on the proposed method, preliminary estimates of national petroleum products movement can be generated. These preliminary estimates are presented in Table 2.

Table 2: Preliminary national estimates for petroleum products

| | Ton-Miles (million) | Ton (thousand) | Value (\$ million) |
|--------------|--------------------------------|---------------------------|-------------------------------|
| Pipeline | 299,600 | 976,000 | \$232,630 |
| Water | 131,900 | 430,000 | \$88,921 |
| Highway | 29,400 | 640,000 | \$140,908 |
| Rail | 19,700 | 25,000 | \$5,392 |
| Total | 480,600 | 2,071,000 | \$467,851 |

4.3. Proposed method for estimating regional flows

No detailed origin-destination petroleum products movement data is published except at the PAD level. However, using additional information sources, the amount of petroleum products at the origin and destination can be “shared” to FAF regions. Specifically, the total petroleum products supplies at origins and demands at destinations can be estimated without much difficulty. The next step would be to distribute the petroleum products supplies and demands to each origin and destination pair.

Petroleum products computer networks, which represent actual pipeline, highway, rail, and waterway networks, will be prepared to route petroleum products through FAF regions. A “link origin-destination” methodology will be used to synthesize the origin-destination table based on the observed petroleum products traffic across PAD district boundaries. The assigned petroleum products flow, based on the synthesized origin destination matrices, will be consistent with statistics published in Tables 32, 33, 34, and 35 on Movements of Crude Oil and Petroleum Products in the *Petroleum Supply Annual*.

4.4. Expected quality of the estimates

The estimates are based on government data sources and, therefore, are expected to be reliable.

5. Other Issues

None.