

Feature Article

- *A Comparison of Selected EIA-782 Data With Other Data Sources*

A Comparison of Selected EIA-782 Data With Other Data Sources

by Theresa E. Hallquist

Introduction

The Petroleum Marketing Division (PMD) of the Energy Information Administration (EIA) collects information relating to petroleum market prices and volumes on the EIA-782 survey. One way PMD assesses the quality of these data is to compare the data with other sources. Large, irreconcilable differences among data series could indicate the need for improvement in survey design or implementation, or may be due to conceptual differences. For more detailed information on the EIA-782 survey, refer to the notes at the end of this article.

PMD compares its EIA-782 series of petroleum market prices and volumes with both internal and external data sources on an ongoing basis. The sources include:

- The Bureau of Labor Statistics (BLS) Consumer Price Index (CPI) data for retail prices of motor gasoline and No. 2 fuel oil
- Form EIA-821, "Annual Fuel Oil and Kerosene Sales Report," for volumes of distillate and residual fuel oil
- EIA's *Petroleum Supply Annual (PSA)* product supplied for volumes of distillate fuel oil, residual fuel oil, and motor gasoline
- Federal Highway Administration (FHWA) for volumes of motor gasoline.

Conceptual differences exist among the data sources. Thus, for some comparisons, PMD adjusted the data to more closely approximate EIA-782 survey conditions because of differences in coverage, definition, and units of measure. In these instances, explanations appear in the text. The reader can find a general description of each data source in the notes at the end of the article.

Price Comparisons

Generally, annual EIA-782A/B national prices were lower than BLS prices for both No. 2 fuel oil and motor gasoline. Differences in EIA-782A/B and BLS data collections that could account for lower EIA prices include:

- 1) The EIA-782A/B uses current volumes while BLS uses fixed volumes to compute monthly weighted average prices.
- 2) The BLS prices include taxes whereas EIA-782A/B prices do not. For this article, Federal and State motor gasoline taxes are deducted from the BLS prices. However, it is not possible to adjust for local taxes.
- 3) The EIA-782A/B prices represent all sales in the month, while BLS prices represent a point in time in the month.
- 4) The EIA-782A/B data represent an annual average price weighted by volume, whereas BLS annual prices represent a simple average of monthly prices.

Residential No. 2 Fuel Oil

Overall, differences between the series for No. 2 fuel oil price ranged from 1 percent to 6 percent (Table FE1 and Figure FE1). In 1987, the difference widened; possibly due to a change in fixed weights by BLS. The 1983 through 1986 BLS prices were calculated using a fixed weight based on consumer expenditures during 1972 through 1973. The 1987 forward prices were based on 1982 through 1984 consumer expenditures.

Another reason for discrepancy in the fuel oil prices is the focus on urban areas by BLS. The BLS prices are collected in urban areas while the EIA prices are collected in all areas, both urban and rural. EIA studies have shown that residential heating oil prices tend to be higher in urban areas. From 1992 through 1996, BLS prices have been about

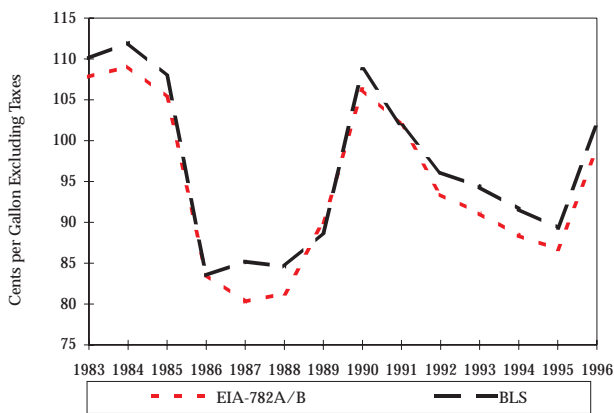
Table FE1. U.S. Residential No. 2 Fuel Oil Prices, 1983-1996
(Cents per Gallon Excluding Federal and State Taxes)

Year	EIA-782A/B	BLS	BLS minus EIA-782A/B	BLS divided by EIA-782A/B
1983	107.8	110.1	2.3	1.02
1984	109.1	112.0	2.9	1.03
1985	105.3	107.9	2.6	1.02
1986	83.6	83.5	-0.1	1.00
1987	80.3	85.2	4.9	1.06
1988	81.3	84.6	3.3	1.04
1989	90.0	88.8	-1.2	0.99
1990	106.3	108.7	2.4	1.02
1991	101.9	101.8	-0.1	1.00
1992	93.4	96.1	2.7	1.03
1993	91.1	94.4	3.3	1.04
1994	88.4	91.6	3.2	1.04
1995	86.7	89.3	2.6	1.03
1996	98.9	101.9	3.0	1.03

BLS = Bureau of Labor Statistics

Sources: Energy Information Administration, *Petroleum Marketing Annual*, 1985-1996; Bureau of Labor Statistics, *Consumer Price Index Report*, 1983-1996.

Figure FE1. U.S. Residential No. 2 Fuel Oil Prices



Sources: Energy Information Administration, *Petroleum Marketing Annual*, 1985-1996; Bureau of Labor Statistics, *Consumer Price Index Report*, 1983-1996.

3 to 4 percent higher than EIA-782A/B prices. In addition, BLS prices are expected to be higher to the extent that there are any State or local taxes on home heating oil.

Motor Gasoline

For each grade of gasoline, the largest difference between the two series occurred in 1986, the year that showed the largest price decrease from the previous year (Table FE2). Alternatively, for each grade of gasoline, the smallest difference occurred in 1990, the year that showed the largest price increase from the previous year. This pattern was found most strikingly in premium motor gasoline when in 1986 the BLS price was 19 percent greater than the EIA-782A/B price. From 1994 through 1996, the price difference ranged from 5 to 10 percent for the different grades of motor gasoline. Midgrade motor gasoline prices were not collected until 1994.

Since BLS does not calculate an annual price, EIA computed a simple average of monthly prices to obtain the annual average price. Using a simple average may not be a fair comparison with volume-weighted annual average prices because of the effect of volume changes throughout the year. This may be especially true in years with sharp motor gasoline price swings such as in 1986 and 1990.

As the price of gasoline increases, greater disparity occurs between the EIA-782A/B and the BLS prices with the

Table FE2. U.S. Retail Motor Gasoline Prices, 1983-1996
(Cents per Gallon Excluding Federal and State Taxes)

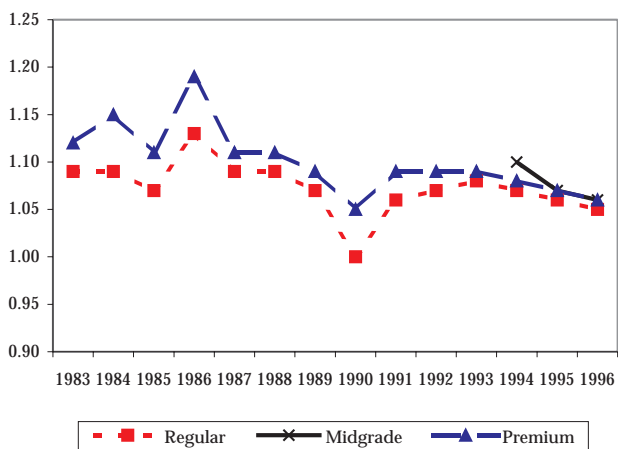
Grade and Year	EIA-782A/B	BLS	BLS minus EIA-782A/B	BLS divided by EIA-782A/B
Finished Motor Gasoline				
1983	96.4	105.0	8.6	1.09
1984	92.0	100.2	8.2	1.09
1985	92.4	99.5	7.1	1.08
1986	64.2	72.3	8.1	1.13
1987	68.4	73.9	5.5	1.08
1988	68.6	73.8	5.2	1.08
1989	77.3	82.7	5.4	1.07
1990	90.1	92.2	2.1	1.02
1991	81.3	88.0	6.7	1.08
1992	79.1	86.8	7.7	1.10
1993	75.8	83.8	8.0	1.11
1994	73.6	80.4	6.8	1.09
1995	76.6	82.4	5.8	1.08
1996	84.7	90.7	6.3	1.07
Regular Motor Gasoline				
1983	97.9	106.6	8.7	1.09
1984	93.2	101.6	8.4	1.09
1985	93.3	100.1	6.8	1.07
1986	63.6	72.0	8.4	1.13
1987	67.0	73.0	6.0	1.09
1988	66.1	72.1	6.0	1.09
1989	73.7	78.9	5.2	1.07
1990	87.2	86.9	-0.3	1.00
1991	78.1	82.4	4.3	1.06
1992	75.2	80.5	5.3	1.07
1993	71.7	77.2	5.5	1.08
1994	69.2	74.2	5.0	1.07
1995	72.5	76.6	4.1	1.06
1996	81.2	85.0	4.2	1.05
Midgrade Motor Gasoline				
1994	77.6	85.0	7.4	1.10
1995	80.7	86.3	5.6	1.07
1996	89.0	94.3	5.3	1.06
Premium Motor Gasoline				
1983	108.0	120.8	12.8	1.12
1984	101.8	117.0	15.2	1.15
1985	102.3	113.9	11.6	1.11
1986	74.6	88.5	13.9	1.19
1987	78.8	87.5	8.7	1.11
1988	79.4	88.2	8.8	1.11
1989	88.3	96.4	8.1	1.09
1990	100.1	105.3	5.2	1.05
1991	92.5	100.5	8.0	1.09
1992	91.5	99.4	7.9	1.09
1993	88.5	96.7	8.2	1.09
1994	86.3	93.5	7.2	1.08
1995	89.2	95.5	6.3	1.07
1996	97.0	103.3	6.0	1.06

BLS = Bureau of Labor Statistics.

Midgrade Motor Gasoline Prices were not collected prior to 1994.

Sources: Energy Information Administration, *Petroleum Marketing Annual*, 1985-1996; Bureau of Labor Statistics, *Consumer Price Index Report*, 1983-1996.

Figure FE2. U.S. Retail Motor Gasoline Price Ratios (BLS divided by EIA-782A/B)



Source: Energy Information Administration, *Petroleum Marketing Annual*, 1985-1996; Bureau of Labor Statistics, *Consumer Price Index Report*, 1983-1996.

more expensive motor gasoline grades (Figure FE2). Premium motor gasoline prices are the most volatile of the grades. As prices go up, motorists using premium gasoline switch to regular or midgrade gasoline; and as prices go down, the opposite occurs. This swing in demand is not captured in the fixed-weighted price used by BLS. In addition,

BLS prices are expected to be higher since they include local taxes on motor gasoline.

Volume Comparisons

EIA-782C volumes were compared with volumes reported in the EIA-821, the *PSA*, and at the FHWA. In some cases, EIA-782C volumes were greater for distillate fuel oil, residual fuel oil, and motor gasoline; and in others, the volumes were less.

Distillate Fuel Oil

Volumes of distillate fuel oil were available from the EIA-782C, EIA-821, and *PSA* (Table FE3 and Figure FE3).

EIA-782C vs. EIA-821

From 1983 through 1992, the EIA-821 volumes were lower than the EIA-782C volumes. In contrast, from 1993 forward, the EIA-821 volumes were higher than the EIA-782C volumes as a result of changes to the EIA-782C in

Table FE3. U.S. Distillate Fuel Oil Volumes, 1983-1996
(Million Gallons)

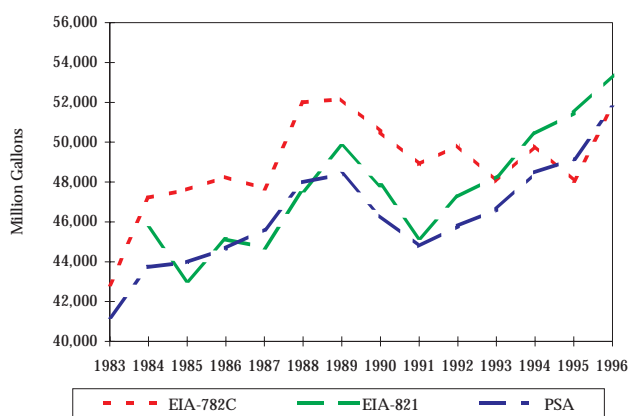
Year	EIA-782C	EIA-821	PSA	EIA-821 divided by EIA-782C	PSA divided by EIA-782C	EIA-821 divided by PSA
1983	42,856	NA	41,241	NA	0.96	NA
1984	47,210	45,672	43,731	0.97	0.93	1.04
1985	47,617	43,059	43,967	0.90	0.92	0.98
1986	48,252	45,124	44,677	0.94	0.93	1.01
1987	47,659	44,719	45,629	0.94	0.96	0.98
1988	51,997	47,577	47,985	0.91	0.92	0.99
1989	52,164	49,789	48,393	0.95	0.93	1.03
1990	50,513	47,827	46,305	0.95	0.92	1.03
1991	48,892	45,211	44,775	0.92	0.92	1.01
1992	49,835	47,262	45,791	0.95	0.92	1.03
1993	48,029	48,290	46,622	1.01	0.97	1.04
1994	49,828	50,424	48,477	1.01	0.97	1.04
1995	48,056	51,469	49,158	1.07	1.02	1.05
1996	51,753	53,379	51,731	1.06	1.03	1.03

PSA = *Petroleum Supply Annual*.

NA = Data not available.

Sources: Energy Information Administration, *Petroleum Marketing Annual*, 1985-1996; *Fuel Oil and Kerosene Sales*, 1989-1996; *Petroleum Supply Annual*, 1983-1996.

Figure FE3. U.S. Distillate Fuel Oil Volumes



Sources: Energy Information Administration, *Petroleum Marketing Annual*, 1985-1996; *Fuel Oil and Kerosene Sales*, 1989-1996; *Petroleum Supply Annual*, 1983-1996.

January 1993. These changes were improvements in the coverage and implementation of procedural changes by the reporting companies to eliminate double counting of volumes sold.

EIA-782C vs. PSA

For the most part, the product supplied volumes of distillate fuel oil in the *PSA* were lower than the EIA-782C vol-

umes. Product supplied in the *PSA* is an estimate of the volume of petroleum products supplied for domestic consumption. It is calculated by adding and subtracting volumes as they are moved into and out of the distribution stream. Sales volume data from the EIA-782C reflect the transfer of product title from a seller to a buyer for a price and reflect only delivered sales into those States where the products are expected to be locally consumed. These definitional differences contribute to the differences that exist between the sales and supply volumes.

Motor Gasoline

Volumes of motor gasoline were available from the EIA-782C, FHWA and *PSA* (Table FE4 and Figure FE4).

EIA-782C vs. PSA

The *PSA* motor gasoline volumes were generally lower than the EIA-782C volumes. One reason the pre-1993 *PSA* volumes were lower than EIA-782C volumes was that double counting occurred on the EIA-782C. To reduce double counting, respondents to the EIA-782C are asked to exclude sales to any company that is not a local distributor, local retailer, or end user. In 1993, changes to the EIA-782C were made to improve the frame and to reduce the problem of double counting.

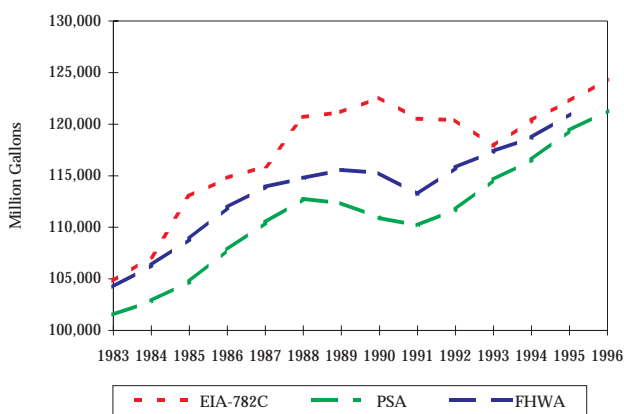
Table FE4. U.S. Motor Gasoline Volumes, 1983-1996
(Million Gallons)

Year	EIA-782C	PSA	FHWA	PSA divided by EIA-782C	FHWA divided by EIA-782C
1983	104,801	101,518	104,231	0.97	0.99
1984	107,180	102,877	106,331	0.96	0.99
1985	113,014	104,721	108,877	0.93	0.96
1986	114,788	107,832	111,934	0.94	0.98
1987	115,908	110,464	113,931	0.95	0.98
1988	120,696	112,776	114,774	0.93	0.95
1989	121,165	112,336	115,558	0.93	0.95
1990	122,574	110,911	115,275	0.90	0.94
1991	120,524	110,185	113,196	0.91	0.94
1992	120,407	111,716	115,810	0.93	0.96
1993	117,886	114,612	117,377	0.97	1.00
1994	120,361	116,529	118,704	0.97	0.99
1995	122,247	119,400	120,987	0.98	0.99
1996	123,904	121,294	NA	0.98	NA

PSA = *Petroleum Supply Annual*. FHWA = Federal Highway Administration. NA = Data not available.

Sources: Energy Information Administration, *Petroleum Marketing Annual*, 1985-1996; *Petroleum Supply Annual*, 1983-1996; Federal Highway Administration, *Highway Statistics*, 1983-1996.

Figure FE4. U.S. Motor Gasoline Volumes



Sources: Energy Information Administration, *Petroleum Marketing Annual*, 1985-1996; *Petroleum Supply Annual*, 1983-1996; Federal Highway Administration, *Highway Statistics*, 1983-1996.

Downstream blending is another reason that EIA-782C volumes were greater than PSA volumes. Blending of fuel ethanol, methanol, methyl tertiary butyl ether (MTBE), and other blend stock with gasoline often occurs downstream from the refineries. Prior to 1993, this was included in the EIA-782C volumes but not in the PSA volumes. Since 1993, the published PSA motor gasoline volumes have included downstream blending. As a result, there was

a smaller percent difference between the series, 7 percent in 1992 to 3 percent in 1993. In 1995 and 1996, the difference between EIA-782C and PSA volumes narrowed to 2 percent.

EIA-782C vs. FHWA

The EIA-782C motor gasoline volumes were always greater than the FHWA motor gasoline volumes. Through 1993, the FHWA volumes were reported by wholesale distributors to State motor fuel tax agencies which compile data on gasoline taxes collected. As a result, tax avoidance caused undercounting. In 1994, the point of Federal tax collection was moved upstream from the last wholesale sale to the terminal rack. With fewer taxpayers to monitor, this change made enforcement of tax laws easier. The result is more accurate reporting of the FHWA volumes. Hence, there is no longer a large disparity between the two series. In 1994 and 1995, the difference between EIA-782C and FHWA volumes is 1 percent.

Residual Fuel Oil

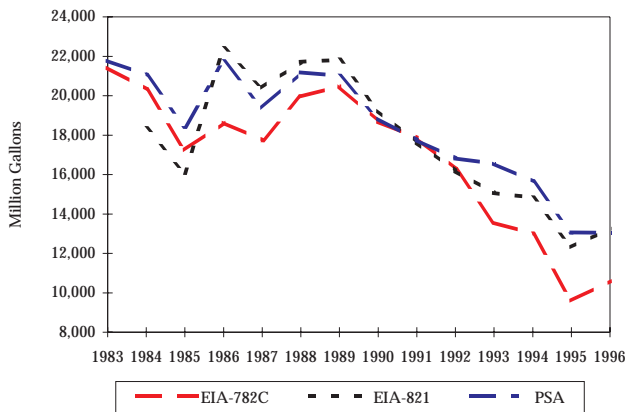
Volumes of residual fuel oil were available from the EIA-782C, EIA-821, and PSA (Table FE5 and Figure FE5).

Table FE5. U.S. Residual Fuel Volumes, 1983-1996
(Million Gallons)

Year	EIA-782C	EIA-821	PSA	EIA-821 divided by EIA-782C	PSA divided by EIA-782C	PSA divided by EIA-821
1983	21,427	NA	21,781	NA	1.02	NA
1984	20,332	18,348	21,050	0.90	1.04	1.15
1985	17,243	16,070	18,431	0.93	1.07	1.15
1986	18,638	22,408	21,744	1.20	1.17	0.97
1987	17,736	20,414	19,383	1.15	1.09	0.95
1988	19,946	21,719	21,180	1.09	1.06	0.98
1989	20,486	21,829	21,003	1.07	1.03	0.96
1990	18,677	19,233	18,838	1.03	1.01	0.98
1991	17,856	17,632	17,750	0.99	0.99	1.01
1992	16,273	16,199	16,822	1.00	1.03	1.04
1993	13,555	15,064	16,559	1.11	1.22	1.10
1994	12,995	14,825	15,649	1.14	1.20	1.06
1995	9,596	12,318	13,058	1.28	1.36	1.06
1996	10,610	13,257	13,041	1.25	1.23	0.98

PSA = *Petroleum Supply Annual*. FHWA = Federal Highway Administration. NA = Data not available.
Sources: Energy Information Administration, *Petroleum Marketing Annual*, 1985-1996; *Fuel Oil and Kerosene Sales*, 1989-1996; *Petroleum Supply Annual*, 1983-1996; Federal Highway Administration, *Highway Statistics*, 1983-1996.

Figure FE5. U.S. Residual Fuel Oil Volumes



Sources: Energy Information Administration, *Petroleum Marketing Annual*, 1985-1996; *Fuel Oil and Kerosene Sales*, 1989-1996; *Petroleum Supply Annual*, 1983-1996.

EIA-782C vs. PSA and EIA-821

The *PSA* and the EIA-821 residual fuel oil volumes were generally greater than the EIA-782C volumes. Since the EIA-782C is a sales survey, it excludes residual fuel oil imported by the end user. Thus, some imported volumes, especially imports by electric utilities, were included in the *PSA* and the EIA-821 volumes but not in the EIA-782C volumes, contributing to a large difference among the series. This is especially notable in 1986 when imports of residual fuel oil to electric utilities increased, spurred by residual fuel oil prices decreasing faster than natural gas prices. In 1986, imports of residual fuel oil as a percent of product supplied rose to 47 percent, compared with 42 percent in 1985. During that time, EIA-782C residual fuel oil volumes show an 8 percent increase while *PSA* volumes show an 18 percent increase. In addition, 1986 EIA-821 sales of residual fuel oil to electric utilities as a percent of total sales rose from 34 percent to 42 percent.

As stated earlier, to reduce double counting, respondents to the EIA-782C are asked to exclude sales to any company that is not a local distributor, local retailer, or end user. In 1993, changes to the EIA-782C were made to improve the frame and to reduce the problem of double counting. In the case of residual fuel oil, respondents may be excluding too many sales. This may also explain the differences among the series ranging from 11 to 36 percent from 1993 through 1996.

Summary

One method of evaluating the quality of petroleum market prices and volumes is to compare PMD data with other sources. Differences among data sources may indicate the need for improvement in survey design or implementation or may simply be due to conceptual differences of data collection.

The EIA-782C, the *PSA*, and the FHWA have all undergone changes in survey design or implementation which have improved published data. Changes to alleviate the problem of double counting on the EIA-782C were implemented in January 1993. A detailed description of these changes may be found in the May 1993 *Petroleum Marketing Monthly (PMM)* feature article, "Changes to the Form EIA-782C, 'Monthly Report of Petroleum Products Sold Into States for Consumption.'" Also, changes made to the *PSA* to include downstream blending of motor gasoline were implemented as of January 1993 with adjustments published for 1992 volumes. Furthermore, in 1994, more accurate reporting of FHWA volumes occurred when the point of Federal tax collection changed from the last wholesale sale to the terminal rack. This has made tax law enforcement easier because there are fewer taxpayers to monitor.

Notes

Data Sources

The Form EIA-782A, "Refiners'/Gas Plant Operators' Monthly Petroleum Product Sales Report," collects monthly price and volume data at the State level for 14 petroleum products for various retail and wholesale marketing categories. It is a census of refiners and gas plant operators. The frame is updated on an ongoing basis using surveys such as the Form EIA-810, "Monthly Refinery Report;" the Form EIA-816, "Monthly Natural Gas Liquids Report;" and industry trade publications. Currently, 133 companies respond to the EIA-782A survey.

The Form EIA-782B, "Resellers'/Retailers' Monthly Petroleum Product Sales Report," is sent to a scientifically selected sample of motor gasoline resellers and distillate, propane, and residual fuel oil resellers and retailers. The Form EIA-863, "Petroleum Product Sales Identification Survey," makes up the sampling frame of dealers for the EIA-782B. Dealers selling in more than four States or having 5 percent or more of all sales in a State are selected with

certainty. The remaining dealers on the frame are stratified by geographic area and product, by type of sale, by urban/rural designation, and by volume of product sales. The sample includes approximately 3,500 companies.

The Form EIA-782C, "Monthly Report of Prime Supplier Sales of Petroleum Products Sold for Local Consumption," is sent to all prime suppliers of any of the selected products on that form. A prime supplier is a firm that produces, imports, or transports any of the selected petroleum products across State boundaries and local marketing areas and sells the product to local distributors, local retailers, or end users. They are selected with certainty due to their small number and the size of their sales volume. Currently, 212 firms respond to the EIA-782C survey.

Data collected on the Forms EIA-782A, EIA-782B, and EIA-782C are published in the *Petroleum Marketing Monthly (PMM)* and the *Petroleum Marketing Annual (PMA)*, which are prepared by the Petroleum Marketing Division.

Data collected by EIA's Petroleum Supply Division are published in the *Petroleum Supply Monthly (PSM)* and the *Petroleum Supply Annual (PSA)*. The Petroleum Supply Division uses the Petroleum Supply Reporting System (PSRS) for data collection. The PSRS is composed of a family of data collection survey forms, data processing systems, and publications systems. Detailed data on refinery and natural gas plant operations, bulk terminal and pipeline stocks, petroleum products imports, and movements of petroleum products among Petroleum Administration for Defense (PAD) districts are collected monthly. Figures for product supply originate from Forms EIA-810, "Monthly Refinery Report;" EIA-811, "Monthly Bulk Terminal Report;" EIA-812, "Monthly Product Pipeline Report;" EIA-813, "Monthly Crude Oil Report;" EIA-814, "Monthly Imports Report;" EIA-816, "Monthly Natural Gas Liquids Report;" and EIA-817, "Monthly Tanker and Barge Movement Report." Aggregate export data obtained from the Bureau of the Census are also included in computations for the *PSA*.

The *PMA* and the *PSA* may contain revisions of the data published in the *PMM* and the *PSM*, respectively, due to late submissions or revisions to the monthly data.

The Form EIA-821, "Annual Fuel Oil and Kerosene Sales Report," collects data on the sales to end users of distillate fuel oil, residual fuel oil, and kerosene. The data are used to determine the level of sales by end-use category and product at the State, regional, and national levels. The EIA-821 includes sales and adjusted sales volumes. Adjusted sales volumes are based on the EIA-821 sales vol-

umes but have been adjusted to equal product supplied volumes published in the *PSA*. For this article, only EIA-821 sales volumes are used for comparison. The sampling frame for the EIA-821 is derived from the EIA-863. The EIA-863 is a quadrennial census used to collect information on size, type, and geographic location of firms selling petroleum products. Outlets selling diesel fuel, however, are not specifically included in the EIA-863 survey. To compensate for this shortage, data from the Federal Highway Administration (FHWA) of the U.S. Department of Transportation replace EIA-821 data for on-highway diesel sales. The sample size is approximately 4,000.

The Highway Statistics Division of the FHWA collects information related to highway transportation. Sales volumes of motor gasoline are published on a calendar year basis and are a cumulative tabulation of gross gallons of gasoline reported by wholesale distributors to State motor fuel tax agencies. The FHWA collects information on finished motor gasoline, with no distinction made among motor gasoline grades. The data include gasoline for both highway and non-highway use. The FHWA includes gasoline but excludes exports, fuels for military use, dealer transfers, and special fuels such as diesel and liquefied petroleum gases.

The Bureau of Labor Statistics (BLS) publishes retail price data in the monthly publication *NEWS*. These retail prices are collected monthly by BLS representatives in the urban areas, and support the development of the Consumer Price Index (CPI). The CPI uses fixed volume weights and serves as a statistical measure of change over time in the prices of goods and services bought by urban consumers. It measures the percent change in consumers' expenditures on a fixed list of items whose values and qualities do not change over time. Pump prices are collected in approximately 85 urban areas across the country and include all taxes directly associated with the purchase and the use of the items. The 85 areas cover 39 States and the District of Columbia. For this article, a U.S.-total-weighted Federal and State tax provided by the FHWA is deducted from BLS prices. Local taxes are not deducted.