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Products

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PREFACE

In 1991 the United States International Trade Commission initiated its current *Industry and Trade Summary* series of informational reports on the thousands of products imported into and exported from the United States. Each summary addresses a different commodity/industry area and contains information on product uses, U.S. and foreign producers, and customs treatment. Also included is an analysis of the basic factors affecting trends in consumption, production, and trade of the commodity, as well as those bearing on the competitiveness of U.S. industries in domestic and foreign markets.¹

This report on refined petroleum products covers the period 1993 through 1997. Listed below are the individual summary reports published to date on the energy, chemicals, and textiles sectors.

<i>USITC publication number</i>	<i>Publication date</i>	<i>Title</i>
Energy and Chemicals:		
2458	November 1991	Soaps, Detergents, and Surface-Active Agents
2509	May 1992	Inorganic Acids
2548	August 1992	Paints, Inks, and Related Items
2578	November 1992	Crude Petroleum
2588	December 1992	Major Primary Olefins
2590	February 1993	Polyethylene Resins in Primary Forms
2598	March 1993	Perfumes, Cosmetics, and Toiletries
2736	February 1994	Antibiotics
2739	February 1994	Pneumatic Tires and Tubes
2741	February 1994	Natural Rubber

¹ The information and analysis provided in this report are for the purpose of this report only. Nothing in this report should be construed to indicate how the Commission would find in an investigation conducted under statutory authority covering the same or similar subject matter.

PREFACE—*Continued*

<i>USITC publication number</i>	<i>Publication date</i>	<i>Title</i>
Energy and Chemicals—<i>Continued</i>:		
2743	February 1994	Saturated Polyesters in Primary Forms
2747	March 1994	Fatty Chemicals
2750	March 1994	Pesticide Products and Formulations
2823	October 1994	Primary Aromatics
2826	November 1994	Polypropylene Resins in Primary Forms
2845	March 1995	Polyvinyl Chloride Resins in Primary Forms
2846	December 1994	Medicinal Chemicals, except Antibiotics
2866	March 1995	Hose, Belting, and Plastic Pipe
2943	December 1995	Uranium and Nuclear Fuel
2945	January 1996	Coal, Coke, and Related Chemical Products
3014	February 1997	Synthetic Rubber
3021	February 1997	Synthetic Organic Pigments
3081	March 1998	Explosives, Propellant Powders, and Related Items
3082	March 1998	Fertilizers
3093	March 1998	Adhesives, Glues, and Gelatin
Textiles and apparel:		
2543	August 1992	Nonwoven Fabrics
2580	December 1992	Gloves
2642	June 1993	Yarn
2695	November 1993	Carpets and Rugs
2702	November 1993	Fur Goods
2703	November 1993	Coated Fabrics
2735	February 1994	Knit Fabric
2841	December 1994	Cordage
2853	January 1995	Apparel
2874	April 1995	Manmade Fibers

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ABSTRACT

This report addresses trade and industry conditions for refined petroleum products for the period 1993-97 and, in some cases, January-June 1998.

- The petroleum refining industry is a globalized industry. Major U.S. petroleum companies have holdings throughout the world, and major foreign petroleum companies operate wholly owned subsidiaries and joint ventures in the United States.
- There are 165 operating refineries in the United States with the total capacity to refine 15.4 million barrels of crude petroleum per day. U.S. consumption of refined petroleum products increased from 17.2 million barrels per day in 1993 to 18.6 million barrels per day in 1997 and 18.4 million barrels per day during January-June 1998. Although the United States imports more than half of the crude petroleum that serves as the feedstock for refining operations, U.S. production satisfies most of domestic demand for refined petroleum products, with imports accounting for an average of 11 percent of annual consumption.
- The primary product produced in U.S. refineries is finished motor fuels, followed by distillate and residual fuel oils. U.S. production of these products increased from 17.8 million barrels per day in 1993 to 18.9 million barrels per day in 1997; production has averaged 18.8 million barrels per day during January-June 1998. U.S. refinery utilization rates increased to more than 94 percent in 1997.
- The United States is the largest world consumer of refined petroleum products. Most domestic production of refined products is for domestic consumption with only a small percentage exported. The United States relies primarily upon Venezuela, Saudi Arabia, Algeria, Nigeria, and Canada to supplement domestic production. U.S. imports of these products remained relatively stable during 1993-97 and during January-June 1998.
- As of January 1, 1998, there were 702 operating refineries in the world with most of the new distillation capacity in the Latin American and Caribbean nations, the Middle East, and the Asia/Pacific region. World demand for refined petroleum products is forecast to increase by 11 million barrels per day by 2002, with the bulk of the rise in demand projected to occur in these regions. Prospects for joint ventures also appear to be greatest in these regions as many have begun or are planning to replace dirtier fuels with cleaner burning gasoline and diesel fuel.

INTRODUCTION

This report contains information regarding U.S. and foreign refined petroleum products industries,¹ tariff and nontariff measures affecting trade in these products, and U.S. and foreign refined petroleum products markets. Most of the information in this report is provided in the context of a 5-year (1993-97) time frame.² Data are generally presented in terms of quantity, which for many indicators of industry performance is a more accurate measure than value because of the impact of fluctuations in the price of crude petroleum on the value of refined petroleum products.

Petroleum refining is the process by which crude petroleum is converted into finished products, such as motor fuels, home heating fuels, diesel fuels, kerosene, naphthas, mineral oils, and lubricating oils and greases. Petroleum refinery processes are generally designed to maximize the production of highly demanded products such as gasoline and diesel fuel; however, there are as many as 2,000 refined petroleum products made, many to individual specifications. Most refinery processes³ can be grouped into one of the following classes:

1. Separation, or distillation, which yields the desired type of product without chemically altering the materials;
2. Conversion, or cracking, which reduces molecular weight and boiling point; and
3. Upgrading, which is used to bring the product up to quality specifications.

The configuration of a refinery varies depending upon size, location, desired products, and the type of crude petroleum used; it can be small or large, simple or complex. In the United States, large, complex refineries are common and from a barrel of crude petroleum feedstock produce a high yield of the lighter more valuable products, such as gasoline. In addition, the larger refineries are often integrated with petrochemicals complexes to supply feedstocks and energy for the production of chemicals.

¹ This report does not contain information on the crude petroleum industry except as the price of crude relates to the price of refined petroleum products.

² When available, data for January-June 1998 are also presented.

³ Refining processes are: atmospheric distillation, vacuum distillation, reforming, BTX recovery, catalytic cracking, alkylation, isomerization, catalytic hydrotreating, and delayed and fluid coking.

U.S. INDUSTRY PROFILE

Refined petroleum products are classified in the North American Industrial Classification System (NAICS) No. 324110, Petroleum Refineries. The major refined petroleum products discussed in this report are distillate fuel oils, residual fuel oils, and finished motor fuels. Distillate fuel oils include:

No. 1 fuel oil — a light distillate fuel oil intended for domestic heating;

No. 2 fuel oil — a distillate fuel oil intended for moderate capacity commercial and industrial heating burners;

No. 1 and No. 2 diesel fuel oils — distillate fuel oils used in compression and ignition engines, such as trucks, buses, industrial and heavy mobile service, and railroad engines; and

No. 4 fuel oil — a fuel oil usually blended with residual fuel oil for heating in commercial and industrial plants.

Residual fuel oils are usually used to generate electric power, for space heating, vessel bunkering, and various other industrial purposes. Residual fuel oils are composed of the heaviest parts of the crude petroleum.

Finished motor fuels are complex mixtures of relatively volatile hydrocarbons, with or without additives, blended to form a fuel suitable for use in spark-ignition engines. Gasoline has been the principal product of U.S. refineries primarily as a result of its high demand for automotive fuels.

The refining industry is comprised of large, multinational energy companies with crude petroleum reserves and operating facilities throughout the world; large domestic refiners with crude petroleum reserves in the United States only; domestic refiners with no crude holdings dependent on other domestic suppliers and imports; and independent blenders. In 1997, in the United States, there were 165 operating refineries with the total capacity to refine 15.4 million barrels per day (b/d) of crude petroleum. The industry employed approximately 100,000 people, with 65 percent being production workers⁴. The major refining States are Texas, California, and Louisiana, which together account for more than 60 percent of total U.S. refining capacity⁵.

Productivity in the refining industry is not closely associated with the output per worker but instead is based on the flow of crude petroleum from the wells, the refinery's onstream days, and the products produced. The petroleum industry is both labor and capital intensive. Employees include scientific and engineering personnel, as well as many nonprofessional personnel possessing highly sophisticated mechanical and technical skills. The industry is also

⁴ Official statistics of the U.S. Department of Energy.

⁵ Ibid.

capital intensive, utilizing the most sophisticated, high-tech processes and equipment available. With the adoption of more stringent environmental regulations, the refining industry has developed and utilized more elaborate and expensive systems to reduce pollution while still producing demanded products.

The Clean Air Act Amendments of 1990 required the use of reformulated gasoline (RFG) in almost one-third of domestic gasoline markets.⁶ The requirement had unexpected consequences for refiners producing RFG; for example, several States that had voluntarily agreed to participate in Phase I of the program withdrew, leaving excess amounts of RFG and depressed prices.⁷ To reduce similar risks to refiners, during Phase II, the Environmental Protection Agency (EPA) proposed rules that would make it more difficult to abruptly leave the program.⁸ These rules required areas voluntarily using Phase I RFG to notify the EPA by December 1997 if they planned to leave the program on January 1, 2000, when Phase II begins; otherwise, they would have to remain in the program until December 2003, when Phase II ends.⁹

The price of refined petroleum products closely follows the price of the crude petroleum used as a feedstock. Customarily, the cost to the refinery for a barrel of crude petroleum plus the cost to refine that barrel and a profit usually combine to form the wholesale price of the product before markup by distributors. Sales, excise, and other taxes are also reflected in the consumer prices of most refined petroleum products. The refiner acquisition costs for domestically produced and imported crude petroleum are shown in the following tabulation (in dollars per barrel), based on official statistics of the U.S. Department of Energy:

Year	Domestic crude	Imported crude	Composite
1993	\$16.67	\$16.14	\$16.41
1994	15.67	15.51	15.59
1995	17.33	17.14	17.23
1996	20.77	20.64	20.71
1997	19.67	18.59	19.13

Several factors influence the price of certain major refined petroleum products. For example, during certain periods, the prices for fuel oils change significantly as a result of seasonal

⁶ Regulations implementing the RFG program were issued as part of a two-phased program. All refiners producing RFG were required to certify that their gasoline met the fuel content specifications and/or performance standards set forth in the Clean Air Act Amendments of 1990. Under Phase I, RFG was required, as of Jan. 1, 1995, in the mandatory ozone nonattainment areas and in the opt-in areas. Phase II, which begins on Jan. 1, 2000 and covers the remainder of the United States, requires a 20-percent reduction in toxic air pollutants (TAPs) emissions and a 5-percent reduction in oxides of nitrogen (NOX) emissions as compared with the refiner's 1990 baseline gasoline. New baselines are required to establish further reductions in volatile organic compounds (VOC) emissions. The RFG regulations also require that the conventional gasoline sold by each refiner or importer must not increase certain emissions over the quantities produced on an average per gallon basis using their 1990 baseline.

⁷ U.S. Department of Commerce, *U.S. Industry and Trade Outlook 1998: Petroleum Refining*, p. 4-3.

⁸ *Ibid.*

⁹ *Ibid.*

demand. Also, in times of abundant supply and more product competition in the marketplace, prices can vary widely.

The methods for marketing the wide variety of refined petroleum products produced in a refinery are almost as varied as the products themselves. In general, all products are moved from the refineries to storage and distribution points and ultimately to consumers. When supplies are restricted, the marketing of refined petroleum products, such as gasoline, can be a matter of availability. During times of adequate supply, the consumer can be more selective and marketers compete for business not only by price, but also by offering product variety, service, and location convenience.

When supplies are plentiful, independent marketers are no longer tied to fixed suppliers and can turn to the noncontract or open market, where prices are often below the wholesale prices of the major suppliers.¹⁰ As a result, particularly at times of readily available supplies, the retail prices for unbranded products are often less than those for branded products.¹¹

The petroleum industry is a globalized industry. U.S. companies have holdings throughout the world and foreign petroleum companies operate wholly owned subsidiaries or joint ventures in the United States. Joint ventures are one way refineries have consolidated operations by providing refiners with a method of increasing the value of their fixed assets, reducing costs, or both by sharing assets and operations with a foreign partner. One of the largest of the recent joint ventures merged the European downstream operations of British Petroleum and Mobil in 1997-98. That consolidation reduced production costs to both companies by \$400 million to \$500 million.¹² Also, in 1996, Exxon and Conoco announced a joint venture between their German refineries. In addition, downstream joint ventures in the United States have occurred between domestic, independent refiners, Ultramar and Diamond Shamrock. These two companies, operating in different regions of the United States, merged to create a downstream company in late 1997. Also, in late 1996, Texaco, Star Enterprise (a joint venture company between Texaco and Aramco, the Saudi Arabian state oil company), and Shell Oil (the U.S. subsidiary of the Royal Dutch Shell) recently completed negotiations to merge their U.S. refining and marketing operations. The resulting venture will have assets worth approximately \$10 billion and have 80 percent more refining capacity than Chevron, the second largest U.S. refiner.¹³ In the summer of 1998, British Petroleum acquired Amoco in a \$48 billion purchase agreement. Most recently, Exxon and mobil agreed to merge operations resulting in the new company being the world's largest petroleum company with assets of over \$186 billion.

¹⁰ Telephone interview by USITC staff, Sept. 16, 1998.

¹¹ Unbranded products are usually high-volume, low-overhead operators, which purchase gasoline from a variety of sources. Branded dealers own or lease their stations and sell the product of one of the major producers.

¹² "Global Refining Addresses Increased Oil Demand, New Challenges," *Oil and Gas Journal*, pp. 51-62.

¹³ *Ibid.*, and telephone interview by USITC staff, Sept. 16, 1998.

U.S. MARKET

Consumer Characteristics and Factors Affecting Demand

The major end-use markets for refined petroleum products are transportation, industrial, residential and commercial, and electric utilities. The shares of refined petroleum products that different sectors of the domestic economy consume have changed little during the 1990s and are expected to remain largely unchanged in the next decade. Electric utilities, and to a lesser extent, residential and commercial consumers continue to reduce their consumption of refined petroleum products. The industrial and transportation sectors are slowly consuming greater shares of production, as shown in the following tabulation (in million b/d):¹⁴

Year	Residential/ commercial	Industrial	Transportation	Electric utilities	Total
1993	1.14	4.45	11.18	0.46	17.24
1994	1.11	4.69	11.49	0.43	17.72
1995	1.07	4.58	11.79	0.30	17.73
1996	1.10	4.69	12.23	0.29	18.31
1997	1.03	4.56	12.76	0.27	18.62

Price is a major factor in total demand for refined petroleum products. As the price of these products increases, consumers turn to lower-cost alternate fuels such as natural gas, greater energy-efficient equipment and plants, more fuel-efficient automobiles, added insulation in homes and buildings, and, in general, toward an overall policy of energy conservation.

Consumption

U.S. consumption of refined petroleum products increased from 17.2 million b/d in 1993 to 18.6 million b/d in 1997 and 18.4 million b/d during January-June 1998. Although the United States is self-sufficient in terms of the production of these products, U.S. imports accounted for an average of 11 percent of total domestic consumption per year (table 1 and figure 1).

¹⁴ Official statistics of the U.S. Department of Energy.

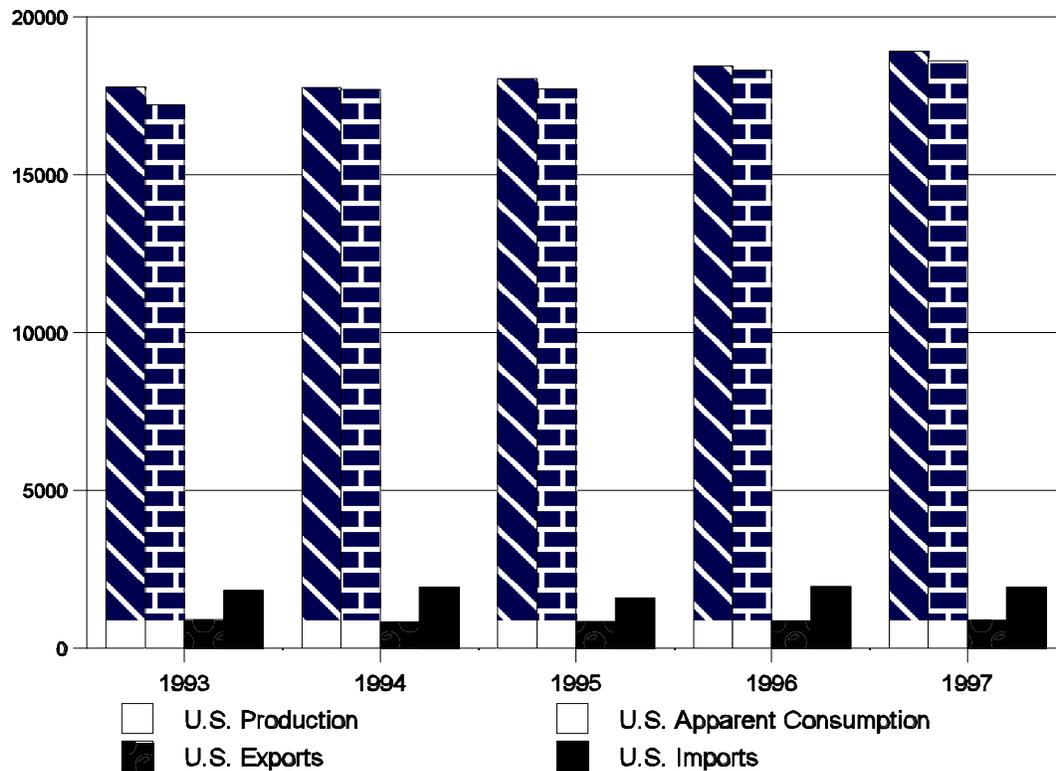
Table 1
Refined petroleum products: U.S. production, exports, imports, and apparent consumption, 1993-97 and Jan.-June 1998

Year	U.S. production	U.S. exports	U.S. imports	Apparent U.S. consumption ¹	Ratio of imports to consumption
	Thousands of barrels per day				Percent
1993	17,777	904	1,833	17,237	11
1994	17,776	843	1,933	17,718	11
1995	18,060	855	1,605	17,725	9
1996	18,468	871	1,971	18,309	11
1997	18,918	896	1,936	18,620	10
Jan.-June 1998	18,814	837	1,829	18,439	10

¹ Apparent consumption equals production, plus imports, minus exports, plus or minus stock changes.

Source: Derived from official statistics of the U.S. Department of Energy.

Figure 1
Refined petroleum products: U.S. production, exports, imports, and apparent consumption, 1993-97



Source: Derived from official statistics of the U.S. Department of Energy.

Finished motor gasolines (gasolines) are the primary refined petroleum products consumed in the United States, followed by distillate and residual fuel oils (table 2). Consumption of gasolines increased steadily during 1993-97 because of relatively stable prices (averaging \$1.20 to \$1.23 per gallon during 1993-97) and a renewed interest by consumers in purchasing less fuel-efficient automobiles such as sport utility vehicles. U.S. imports of gasoline accounted for an average of 3-4 percent per year of domestic consumption during 1993-97 and during Jan.-June 1998. Consumption of distillate fuel oils (used as home heating fuels) also increased during the period in response to unusually cold winters and increased industrial demand associated with a strong business upturn. U.S. imports accounted for approximately 6 percent per year of domestic consumption during 1993-97 and during Jan.-June 1998. U.S. consumption of residual fuel oils decreased during 1993-97 primarily as a result of a continued shift by electric utilities to less expensive alternate fuels. U.S. imports accounted for approximately 24-29 percent per year of domestic consumption during 1993-97 and during Jan.-June 1998.¹⁵ Consumption of other refined petroleum products, such as jet fuel, motor fuel blending stocks, and lubricating oils and greases also increased during 1993-97 as a result of a strong business upturn during the period. U.S. imports accounted for an average of 16 percent to 18 percent per year of domestic consumption during 1993-97 and during Jan.-June 1998.

Table 2
Refined petroleum products: U.S. consumption, by type, 1993-97 and Jan.-June 1998

Year	Finished motor gasolines	Distillate fuel oils	Residual fuel oils	Other ¹	Total
	<i>Thousands of barrels per day</i>				
1993	7,476	3,041	1,080	5,640	17,237
1994	7,601	3,162	1,021	5,934	17,718
1995	7,789	3,207	852	5,877	17,725
1996	7,891	3,365	848	6,205	18,309
1997	8,017	3,435	797	6,371	18,620
Jan.-June 1998	7,982	3,485	808	6,164	18,395

¹ Includes jet fuels, liquefied petroleum gases, motor fuel blending stocks, pentanes, unfinished oils, and other hydrocarbons.

Note.—Apparent consumption equals production, plus imports, minus exports, plus or minus stock changes.

Source: Derived from official statistics of the U.S. Department of Energy.

¹⁵ Official statistics of the U.S. Department of Energy and telephone interview by USITC staff, Sept. 16, 1998.

Production

The United States has the world's largest and most sophisticated refining industry. U.S. refineries process an average light (32.3° API¹⁶) and low sulfur crude petroleum. U.S. refineries have a complexity ratio of 70 percent as compared with a worldwide average of only 30 percent.¹⁷ Since 1990, a total of 30 U.S. refineries have been shut down, many with capacities of less than 100,000 b/d, or a total of 15 percent of total domestic capacity. Despite the shutdown of these refineries, capacity has expanded through conventional projects, such as adding cracking units, and through debottlenecking investments, which are marginal investments that effectively create additional refining capacity from the same physical plant. The additional capacity, called "capacity creep," resulted in crude distillation capacity¹⁸ increasing from 15.1 million b/d in 1993 to 15.4 million b/d in 1997.

U.S. refinery utilization rates increased from a low of 66 percent in 1982 to more than 94 percent in 1997¹⁹. U.S. production of refined petroleum products increased by 6 percent during 1993-97. Because of increased demand for gasoline, the primary product produced in U.S. refineries, production also increased by 6 percent (table 3).

Table 3
Refined petroleum products: U.S. production, by type, 1993-97 and Jan.-June 1998

Year	Finished motor gasolines	Distillate fuel oils	Residual fuel oils	Other ¹	Total
))))))))) Thousands of barrels per day)))))))				
1993	7,360	3,132	835	6,450	17,777
1994	7,312	3,205	826	6,433	17,776
1995	7,588	3,155	788	6,529	18,060
1996	7,647	3,316	726	6,779	18,468
1997	7,870	3,392	708	6,948	18,918
Jan.-June 1998	7,866	3,433	768	6,747	18,814

¹ Includes jet fuels, liquefied petroleum gases, motor fuel blending stocks, pentanes, unfinished oils, and other hydrocarbons.

Source: Derived from official statistics of the U.S. Department of Energy.

¹⁶ Specific gravity of crude petroleum is measured in degrees on the American Petroleum Institute (API) scale. On the API scale, crude petroleum with the least specific gravity has the highest API gravity. The higher the API gravity, the greater the value of the crude. Most crudes range from 27-35 degrees API.

¹⁷ Complexity ratios are measured by the refiner's upgrading capacity relative to its overall distillation capacity.

¹⁸ Distillation capacity does not account for the total production of refined petroleum products. Distillation is the initial operation in the refining process; crude petroleum is heated in a furnace and charged to an atmospheric distillation tower where it is separated into various product streams. The product streams are then sent to other processing units, such as crackers, reformers, and hydrotreaters.

¹⁹ Refineries have a maximum sustainable capacity utilization rate of 95 percent.

U.S. TRADE

Overview

The U.S. trade deficit in refined petroleum products increased from \$4.4 billion in 1993 to \$13.8 billion in 1997 (table 4); however, in terms of quantity, U.S. imports and exports of these products remained relatively stable during 1993-97. The United States relies primarily upon Venezuela, Saudi Arabia, Algeria, Nigeria, and Canada to supplement domestic production.

U.S. Imports

Principal Suppliers and Import Levels

The United States imports refined petroleum products primarily from Venezuela and Canada. U.S. imports of refined petroleum products increased from 1.8 million b/d in 1993 to 1.9 million b/d in 1997 and decreased slightly to 1.8 million b/d during January-June 1998 (table 5). However, primarily because of the increase in the per barrel price of crude petroleum, the refining feedstock, the value of U.S. imports of refined petroleum products increased from \$11.0 billion in 1993 to \$21.5 billion in 1997 (table 4).

The major sources of U.S. imports of refined petroleum products during 1993-97 and January-June 1998 were Venezuela, Canada, and Algeria. The OPEC member-nations together accounted for an average of 36 percent of total U.S. imports of these products during 1993-96; in 1997 and the first half of 1998, OPEC accounted for 41 percent. This increase in the share of imports accounted for by OPEC is almost entirely accounted for by increased imports of RFG from Venezuela. In 1996, Venezuela modified refineries to meet the RFG standards of the Clean Air Act, including a \$2.5 billion expansion of the refinery in Cardon, Venezuela to produce RFG for the U.S. market under the 1997 RFG specifications.

Gasoline is the single-largest imported refined petroleum product and accounted for an average of 25 percent of total imports of these products during 1993-97; distillate fuel oils accounted for 15 percent; and residual fuel oils accounted for about 10 percent. The remaining 50 percent were accounted for by RFG, motor fuel blending stocks, jet fuels, and specialty lubricants.

Table 4
Refined petroleum products: U.S. exports of domestic merchandise, imports for consumption,
and merchandise trade balance, by selected countries and country groups, 1993-1997

	1993	1994	1995	1996	1997
))))))))) Thousand dollars)))))))				
U.S. exports of domestic merchandise:					
Venezuela	82,741	119,811	122,083	144,421	209,304
Canada	773,873	795,416	877,630	1,001,257	1,104,709
Mexico	801,053	777,464	844,299	1,081,614	1,520,771
Saudi Arabia	27,946	26,839	29,664	35,822	36,439
Algeria	575	785	395	150	767
Nigeria	33,970	2,586	19,244	22,840	46,098
United Kingdom	70,042	77,780	119,130	85,551	98,868
Colombia	31,181	33,130	54,837	113,137	125,989
Angola	1,270	911	702	1,239	1,846
Netherlands	274,239	148,781	190,907	352,076	301,031
All Other	4,556,672	4,030,545	4,323,856	4,765,470	4,282,542
Total	6,653,563	6,014,047	6,582,747	7,603,576	7,728,362
EU-15	908,691	749,560	967,829	1,032,122	962,506
OPEC	254,583	230,832	267,871	313,016	407,176
Latin America	2,028,855	2,093,920	2,245,151	2,791,412	3,419,094
CBERA	719,863	674,346	764,469	846,016	931,805
Asian Pacific Rim	2,495,860	1,987,595	1,927,948	2,080,844	1,609,064
ASEAN	646,031	702,031	607,612	577,817	470,891
Central and Eastern Europe	5,098	5,394	13,766	4,968	16,774
U.S. imports for consumption:					
Venezuela	2,120,991	1,752,032	2,059,407	3,627,838	4,339,230
Canada	1,870,465	1,788,589	1,885,887	2,709,062	2,649,879
Mexico	492,552	297,523	307,543	582,945	789,416
Saudi Arabia	493,437	394,756	415,591	1,694,905	2,271,869
Algeria	1,297,065	1,285,838	1,414,854	1,720,055	1,831,675
Nigeria	251,441	173,120	184,254	813,112	1,229,890
United Kingdom	362,102	486,655	417,271	1,240,987	1,086,828
Colombia	200,537	163,814	134,254	512,069	635,954
Angola	1,932	76,934	85,230	552,513	698,513
Netherlands	103,732	233,806	173,108	172,056	309,495
All Other	3,846,656	3,797,004	2,699,656	5,289,538	5,679,894
Total	11,040,911	10,450,070	9,777,056	18,915,080	21,522,643
EU-15	1,710,986	2,105,724	1,368,720	2,675,669	2,817,817
OPEC	4,315,734	3,824,714	4,418,230	8,321,234	10,227,598
Latin America	4,284,068	3,533,976	3,338,434	6,550,228	7,309,500
CBERA	891,291	833,094	616,878	1,302,726	1,058,061
Asian Pacific Rim	472,996	585,126	539,426	765,101	852,735
ASEAN	293,087	409,668	373,135	439,037	436,938
Central and Eastern Europe	3,578	47,865	2	40,549	67,643
U.S. merchandise trade balance:					
Venezuela	-2,038,251	-1,632,221	-1,937,324	-3,483,417	-4,129,927
Canada	-1,096,592	-993,174	-1,008,257	-1,707,805	-1,545,170
Mexico	308,501	479,941	536,756	498,669	731,355
Saudi Arabia	-465,490	-367,916	-385,928	-1,659,083	-2,235,430
Algeria	-1,296,490	-1,285,053	-1,414,459	-1,719,904	-1,830,908
Nigeria	-217,470	-170,534	-165,011	-790,273	-1,183,793
United Kingdom	-292,060	-408,875	-298,141	-1,155,437	-987,960
Colombia	-169,356	-130,684	-79,417	-398,932	-509,965
Angola	-662	-76,024	-84,528	-551,274	-696,667
Netherlands	170,507	-85,025	17,799	180,020	-8,464
All Other	710,016	233,541	1,624,200	-524,068	-1,397,352
Total	-4,387,348	-4,436,023	-3,194,309	-11,311,504	-13,794,281
EU-15	-802,296	-1,356,164	-400,892	-1,643,547	-1,855,312
OPEC	-4,061,151	-3,593,882	-4,150,359	-8,008,218	-9,820,422
Latin America	-2,255,213	-1,440,056	-1,093,283	-3,758,816	-3,890,406
CBERA	-171,428	-158,748	147,591	-456,709	-126,257
Asian Pacific Rim	2,022,864	1,402,469	1,388,521	1,315,743	756,329
ASEAN	352,944	292,364	234,477	138,780	33,953
Central and Eastern Europe	1,520	-42,472	13,763	-35,581	-50,869

Note.—Because of rounding, figures may not add to totals shown. The countries shown are those with the largest total U.S. trade (U.S. imports plus exports) in these products in 1997.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 5
Refined petroleum products: U.S. imports, by country, 1993-97 and Jan.-June 1998

Country	1993	1994	1995	1996	1997	Jan.-June 1998
<i>))))))))))))) Thousand barrels per day)))))))))))))))</i>						
Venezuela . . .	290	300	329	373	379	325
Canada	281	289	292	349	365	325
Algeria	196	222	207	248	279	293
Saudi Arabia	132	105	84	115	114	116
Mexico	56	45	41	37	25	21
Other	878	972	652	848	775	727
Total	1,833	1,933	1,605	1,970	1,937	1,807

Source: Derived from official statistics of the U.S. Department of Energy.

U.S. Trade Measures²⁰

Table 6 shows the rates of duty, as of January 1, 1998, applicable to imports of refined petroleum products under the Harmonized Tariff Schedule of the United States (HTS). Column 1-general rates of duty for countries considered for most-favored-nation (MFN) treatment range from zero to 9.8 percent ad valorem. There are no known U.S. nontariff measures that affect the refined petroleum products industry.

U.S. Exports

Principal Markets and Export Levels

The United States is not a major exporter of refined petroleum products, exporting less than 5 percent of total production and accounting for less than 6 percent of total world exports of refined petroleum products. U.S. exports fluctuate from year to year, depending upon world demand patterns. U.S. exports of refined petroleum products decreased from 904,000 b/d in 1993 to 896,000 b/d in 1997 and to an average of 837,000 b/d during January-June 1998 (table 7). Most of these exports were naphthas, used in the production of certain petrochemicals, and certain bunker fuels, which are most easily transported via pipelines. Mexico and Canada were the major U.S. markets for these exports because of their close proximity.

²⁰ See app. A for an explanation of tariff and trade agreement terms.

Table 6
Refined petroleum products: Harmonized Tariff Schedule subheading; description; U.S. col. 1 rate of duty as of Jan. 1, 1998; U.S. exports, 1997; and U.S. imports, 1997

HTS subheading	Description	Col. 1 rate of duty as of Jan. 1, 1998		U.S. exports, 1997	U.S. imports, 1997
		General	Special ¹		
))) Million dollars-)))					
2710.00.05	Distillate and residual fuel oils: Testing under 25 degrees A.P.I.	5.25¢/bbl	Free (A+, CA, IL) 2.6¢/bbl (MX)	953	6,140
2710.00.10	Distillate and residual fuel oils: Testing 25 degrees A.P.I. or more	10.5¢/bbl	Free (A+, CA, IL) 5.2¢/bbl (MX)	893	3,646
2710.00.15	Motor fuel	52.5¢/bbl	Free (A+, CA, IL) 26.2¢/bbl (MX)	1,767	4,059
2710.00.18	Motor fuel blending stock	52.5¢/bbl	Free (A+, CA, IL) 26.2¢/bbl (MX)	120	717
2710.00.20	Kerosene	10.5¢/bbl	Free (A+, CA, IL) 5.2¢/bbl (MX)	4	63
2710.00.25	Naphthas	10.5¢/bbl	Free (A+, CA, IL) 5.2¢/bbl (MX)	116	863
2710.00.30	Lubricating oils	84¢/bbl	Free (A+, CA, IL) 42¢/bbl (MX)	703	138
2710.00.35	Lubricating greases	5.8%	Free (A, CA, IL, MX)	70	5
2710.00.40	Other lubricants	1.3¢/kg + 5.7%	Free (A, CA, IL, MX)	8	12
2710.00.45	Other mixtures of hydrocarbons	10.5¢/bbl	Free (A+, CA, IL) 5.2¢/bbl (MX)	158	1,895
2710.00.60	Other	7%	Free (A+, CA, E, IL, J) 3.5% (MX)	216	6
2712.10.00	Petroleum jelly	Free		18	3
2712.20.00	Paraffin wax	Free		31	56
2713.11.00	Petroleum coke, not calcined	Free		498	2,344
2713.12.00	Petroleum coke, calcined	0.6%	Free (A, CA, E, IL, J, MX)	635	19
2713.20.00	Petroleum bitumen	Free		30	764
2713.90.00	Other residues	Free		7	54
2714.10.00	Bituminous or oil shale and tar sands	Free		1	181
2714.90.00	Other bitumen and asphalt . . .	Free		26	254
2715.00.00	Other bituminous mixtures . . .	Free		27	63
3403.19.10	Lubricating preparations containing 50% or more by weight of petroleum oils . . .	0.2%	Free (A+, CA, E, IL, J, MX)	75	5
3403.19.50	Other lubricating prepara- tions	5.8%	Free (A*, CA, E, IL, J, MX)	32	10

See footnote at end of table.

Table 6—Continued

Refined petroleum products: Harmonized Tariff Schedule subheading; description; U.S. col. 1 rate of duty as of Jan. 1, 1998; U.S. exports, 1997; and U.S. imports, 1997

HTS subheading	Description	Col. 1 rate of duty as of Jan. 1, 1998		U.S. exports, 1997	U.S. imports, 1997
		General	Special ¹		
))) Million dollars)))	
3606.10.00	Liquid or liquefied gas-fuels in containers for filling/refilling cigarette or similar lighters .	Free		15	2
3811.11.10	Antiknock preparations based on tetraethyl lead	Free		8	26
3811.11.50	Other antiknock preparations based on lead compounds .	Free		3	2
3811.19.00	Other antiknock preparations .	2.2¢/kg + 10.8%	Free (A+, CA, E, IL, J) 1.8¢/kg + 6.8% (MX)	67	29
3811.21.00	Additives for lubricating oils containing petroleum oils or oils from bituminous minerals	9.8%	Free (A+, CA, E, IL, J) 6% (MX)	856	130
3811.29.00	Other additives for lubricating oils	6.6%	Free (A+, CA, E, IL, J) 3.5% (MX)	93	20
3811.90.00	Prepared additives for mineral oils	2.2¢/kg + 10.8%	Free (A+, CA, E, IL, J) 1.8¢/kg + 6.8% (MX)	223	12
3819.00.00	Hydraulic brake fluids	2.2¢/kg + 10.8%	Free (A+, CA, E, IL, J, MX)	79	5

¹See Appendix A for an explanation of the programs under which special tariff treatment may be provided, and the corresponding symbols for such programs.

Source: Harmonized Tariff Schedule of the United States (1998). Data on U.S. exports and imports were compiled from official statistics of the U.S. Department of Commerce.

Table 7
Refined petroleum products: U.S. exports, by country, 1993-97 and Jan.-June 1998

Country	1993	1994	1995	1996	1997	Jan.-June 1998
<i>))))))))))))) Thousand barrels per day)))))))))))))))</i>						
Mexico	110	124	125	143	207	85
Canada	70	72	73	78	89	40
Japan	105	73	76	97	86	23
Netherlands	45	49	46	43	41	13
Singapore.	20	20	24	25	26	5
Other	554	505	510	484	447	671
Total	904	843	855	871	896	837

Source: Derived from official statistics of the U.S. Department of Energy.

Foreign Trade Measures

The major world markets for refined petroleum products are the industrialized nations of the world, such as the countries of the European Union (EU), Japan, and Canada. Except for Canada and the EU-North Sea producers, the United Kingdom and Norway, these nations do not possess significant reserves of crude petroleum for refining and thus must rely heavily on imports to satisfy domestic demand. As a result, tariffs on refined petroleum products imported into the EU and Japan range from zero to less than 1 percent ad valorem. Imports of refined petroleum products are duty free in Mexico and Canada.

FOREIGN INDUSTRY PROFILE

As of January 1, 1998, there were 702 refineries in the world with distillation capacity of 76.1 million b/d (table 8). Capacity utilization averages about 84 percent. Most distillation capacity growth is in the Latin American, Caribbean, Middle East, and Asia/Pacific regions. Global spending on refining projects is expected to reach a record \$17.2 billion in 1998.²¹

²¹ "Worldwide Report," *Oil and Gas Journal*, Dec. 22, 1997, p. 33, "Global Refining Addresses Increased Oil Demand, New Challenges," *Oil and Gas Journal*, pp. 51-62, and official statistics of the U.S. Department of Energy.

Table 8
World refining capacity, by region and the top three countries in each region, as of January 1, 1998

Region/country	Number of refineries	Distillation capacity <i>(1,000 barrels per day)</i>
North America	193	18,824
Canada	22	1,852
Mexico	6	1,520
United States	165	15,452
Central/South America	79	5,932
Argentina	12	665
Brazil	14	1,256
Venezuela	6	1,177
Western Europe	120	14,646
France	14	1,786
Germany	18	2,108
Italy	17	2,262
Eastern Europe/Former Soviet Union	89	12,125
Poland	7	232
Romania	10	559
Russia	38	6,733
Middle East	37	5,423
Iran	8	1,242
Iraq	8	348
Saudi Arabia	8	1,656
Africa	45	2,849
Algeria	5	465
Egypt	8	546
Nigeria	4	433
Far East/Oceania	139	16,287
China	34	1,086
India	12	2,867
Japan	40	4,989
Total world	702	76,085

Source: Official statistics of the U.S. Department of Energy

Historically, the large multinational petroleum companies have accounted for most of the world's refining capacity whether through joint ventures or wholly owned subsidiaries; however, state oil companies²² have been increasing their market share in the large consuming nations. In 1997, foreign-owned firms owned nearly 30 percent of total U.S. refining capacity. Table 9 shows a breakdown of several state-owned companies and their joint venture partners. The top nine state-owned companies in the world have a total refining capacity of about 14 million b/d versus about 15.9 million b/d of refining capacity owned by the top six international petroleum companies.²³

Historically, the member nations of the Organization of Economic Cooperation and Development (OECD) consumed about 60 percent of the world's refined petroleum products, with the United States accounting for about 25 percent of OECD consumption. In 1995, 75 percent of the world's GDP was concentrated in North America, Western Europe, and Japan; that figure is expected to fall to less than 70 percent by 2010.²⁴ At the same time, worldwide demand for refined petroleum products is increasing at a rate of about 1.3 percent per year.²⁵

Demand for refined petroleum products is anticipated to increase by 11 million b/d by 2002. Despite the current economic crisis in Southeast Asia and the Pacific Rim nations, China is expected to see a 45-50 percent increase in consumption by 2002, with the economies of the other nonindustrialized countries of Asia and the Pacific Rim expected to increase their consumption by 45 percent as these nations lessen their reliance on coal.²⁶

²² Nations with major state-owned oil companies include: Mexico, Kuwait, Saudi Arabia, and Venezuela.

²³ "Refining," *Petroleum Economist*, various issues.

²⁴ U.S. Department of Energy, *International Energy Outlook 1998, With Projections Through 2020*, April 1998, pp. 25-32.

²⁵ *Ibid.*

²⁶ Official statistics of the U.S. Department of Energy and the U.S. Department of Commerce.

Table 9
Investments of national petroleum companies and joint venture partners

National Petroleum Company	Joint venture partner (country of ownership)
Aramco (Saudi Arabia)	Star Enterprise (United States) Petron (Philippines) Sangyong Oil (South Korea) Future: Greece, China, Indonesia, Japan
Abu Dhabi National Oil Co. (United Arab Emirates)	OMV AG (Austria) Compania Expanola de Petroles (Spain) Future: Pakistan
National Oil Co. (Libya)	Tamoil SA (Switzerland)
Kuwait National Petroleum Co. (Kuwait)	British Petroleum Co. (United States, United Kingdom) Q8 (Italy) Gulf Oil Ltd. (Europe) Ultramar Diamond Shamrock (United States) Future: India, Singapore, Pakistan, Thailand, Indonesia
Iran	Future: Pakistan, India
Petroleos de Venezuela SA (Venezuela)	Citgo Petroleum Corp. (United States) Chevron Products, U.S.A. (United States) Star Enterprise (United States) Mobil Corp. (United States) Phillips Petroleum Co. (United States) Uno-Ven (United States) Amerada Hess (Virgin Islands)
Oman	Hinustan Petroleum Co. Ltd. (India) Bharat Petroleum Co. Ltd. (India)
Petroleos Mexicanos (Mexico)	Royal Dutch Shell (U.S. division) Ultramar Diamond Shamrock (United States)
Petronas (Malaysia)	Future: China, India, Iran, Pakistan, Philippines, South Africa, Vietnam, Yemen

Source: U.S. Department of Energy, various issues of Petroleum Economist, World Oil, and Oil and Gas Journal.

The prospect for joint ventures and investment by U.S. refiners appears good as the U.S. industry developed much of the technology necessary for the construction and operation of world-scale refineries and for the production of environmental cleaner-burning fuels, such as desulfurization. Investment in refinery desulfurization processes is expected to play a major role in future refining projects worldwide as the international trend toward regulation of fuel qualities continues. Most nations have begun or are planning for the displacement of dirtier

fuels with cleaner burning formulations of gasoline and diesel fuel. In many countries, leaded gasoline has been or is being replaced by unleaded gasoline. A growing number of countries have either introduced RFG and diesel fuel or have plans to do so. Goals to remove lead as a gasoline additive in China, Europe, and Latin America may require additional blending with oxygenates. Demand for oxygenates is expected to rise where RFG has a minimum oxygen content, such as in the United States, Finland, and Sweden, and where proposed standards require a minimum oxygen content, such as Latin America and the Caribbean countries.

Potential reductions in nitrogen oxides (NOX), volatile organic compounds (VOC), air toxicity, and particulate matter emissions from lowering the sulfur content of gasoline and diesel have made sulfur reduction a major focus in the development of RFGs. For example, proposed standards in Latin America and the Caribbean require a maximum sulfur content of 5,000 parts per million (ppm) in 2001, whereas Finland, Sweden, and California already require diesel fuel containing less than 50 ppm of sulfur.²⁷

Prospects of foreign investment for U.S. refining companies appear to be greatest in non-OECD Asia. Despite current economic difficulties, this region is expected to have the largest growth potential in terms of refined petroleum products consumption. The Middle East is expected to be the world leader in terms of refining capacity growth well into the next century, which is expected to result in investment opportunities for U.S. companies as joint venture partners.²⁸

²⁷ Official statistics of the U.S. Environmental Protection Agency.

²⁸ U.S. Department of Energy, *International Energy Outlook 1998, With Projections Through 2020*, April 1998, pp. 25-3.

APPENDIX A
EXPLANATION OF TARIFF AND TRADE
AGREEMENT TERMS

TARIFF AND TRADE AGREEMENT TERMS

In the *Harmonized Tariff Schedule of the United States* (HTS), chapters 1 through 97 cover all goods in trade and incorporate in the tariff nomenclature the internationally adopted Harmonized Commodity Description and Coding System through the 6-digit level of product description. Subordinate 8-digit product subdivisions, either enacted by Congress or proclaimed by the President, allow more narrowly applicable duty rates; 10-digit administrative statistical reporting numbers provide data of national interest. Chapters 98 and 99 contain special U.S. classifications and temporary rate provisions, respectively. The HTS replaced the *Tariff Schedules of the United States* (TSUS) effective January 1, 1989.

Duty rates in the *general* subcolumn of HTS column 1 are most-favored-nation (now referred to as normal trade relations) rates, many of which have been eliminated or are being reduced as concessions resulting from the Uruguay Round of Multilateral Trade Negotiations. Column 1-general duty rates apply to all countries except those listed in HTS general note 3(b) (Afghanistan, Cuba, Laos, North Korea, and Vietnam), which are subject to the statutory rates set forth in *column 2*. Specified goods from designated general-rate countries may be eligible for reduced rates of duty or for duty-free entry under one or more preferential tariff programs. Such tariff treatment is set forth in the *special* subcolumn of HTS rate of duty column 1 or in the general notes. If eligibility for special tariff rates is not claimed or established, goods are dutiable at column 1-general rates. The HTS does not enumerate those countries as to which a total or partial embargo has been declared.

The *Generalized System of Preferences* (GSP) affords nonreciprocal tariff preferences to developing countries to aid their economic development and to diversify and expand their production and exports. The U.S. GSP, enacted in title V of the Trade Act of 1974 for 10 years and extended several times thereafter, applies to merchandise imported on or after January 1, 1976 and before the close of June 30, 1999. Indicated by the symbol "A", "A*", or "A+" in the special subcolumn, the GSP provides duty-free entry to eligible articles the product of and imported directly from designated beneficiary developing countries, as set forth in general note 4 to the HTS.

The *Caribbean Basin Economic Recovery Act* (CBERA) affords nonreciprocal tariff preferences to developing countries in the Caribbean Basin area to aid their economic development and to diversify and expand their production and exports. The CBERA, enacted in title II of Public Law 98-67, implemented by Presidential Proclamation 5133 of November 30, 1983, and amended by the Customs and Trade Act of 1990, applies to merchandise entered, or withdrawn from warehouse for consumption, on or after January 1, 1984. Indicated by the symbol "E" or "E*" in the special subcolumn, the CBERA provides duty-free entry to eligible articles, and reduced-duty treatment to certain other articles, which are the product of and imported directly from designated countries, as set forth in general note 7 to the HTS.

Free rates of duty in the special subcolumn followed by the symbol "IL" are applicable to products of Israel under the *United States-Israel Free Trade Area Implementation Act* of 1985 (IFTA), as provided in general note 8 to the HTS.

Preferential nonreciprocal duty-free or reduced-duty treatment in the special subcolumn followed by the symbol "J" or "J*" in parentheses is afforded to eligible articles the product of designated beneficiary countries under the *Andean Trade Preference Act* (ATPA), enacted as title II of Public Law 102-182 and implemented by Presidential Proclamation 6455 of July 2, 1992 (effective July 22, 1992), as set forth in general note 11 to the HTS.

Preferential free rates of duty in the special subcolumn followed by the symbol "CA" are applicable to eligible goods of Canada, and rates followed by the symbol "MX" are applicable to eligible goods of Mexico, under the *North American Free Trade Agreement*, as provided in general note 12 to the HTS and implemented effective January 1, 1994 by Presidential Proclamation 6641 of December 15, 1993. Goods must originate in the NAFTA region under rules set forth in general note 12(t) and meet other requirements of the note and applicable regulations.

Other special tariff treatment applies to particular *products of insular possessions* (general note 3(a)(iv)), *products of the West Bank and Gaza Strip* (general note 3(a)(v)), goods covered by the *Automotive Products Trade Act* (APTA) (general note 5) and the *Agreement on Trade in Civil Aircraft* (ATCA) (general note 6), *articles imported from freely associated states* (general note 10), *pharmaceutical products* (general note 13), and *intermediate chemicals for dyes* (general note 14).

The *General Agreement on Tariffs and Trade 1994* (GATT 1994), pursuant to the Agreement Establishing the World Trade Organization, is based upon the earlier GATT 1947 (61 Stat. (pt. 5) A58; 8 UST (pt. 2) 1786) as the primary multilateral system of disciplines and principles governing international trade. Signatories' obligations under both the 1994 and 1947 agreements focus upon most-favored-nation treatment, the maintenance of scheduled concession rates of duty, and national treatment for imported products; the GATT also provides the legal framework for customs valuation standards, "escape clause" (emergency) actions, antidumping and countervailing duties, dispute settlement, and other measures. The results of the Uruguay Round of multilateral tariff negotiations are set forth by way of separate schedules of concessions for each participating contracting party, with the U.S. schedule designated as Schedule XX. Pursuant to the *Agreement on Textiles and Clothing* (ATC) of the GATT 1994, member countries are phasing out restrictions on imports under the prior "Arrangement Regarding International Trade in Textiles" (known as the **Multifiber Arrangement** (MFA)). Under the MFA, which was a departure from GATT 1947 provisions, importing and exporting countries negotiated bilateral agreements limiting textile and apparel shipments, and importing countries could take unilateral action in the absence or violation of an agreement. Quantitative limits had been established on imported textiles and apparel of cotton, other vegetable fibers, wool, man-made fibers or silk blends in an effort to prevent or limit market disruption in the importing countries. The ATC establishes notification and safeguard procedures, along with other rules concerning the customs treatment of textile and apparel shipments, and calls for the eventual complete integration of this sector into the GATT 1994 over a ten-year period, or by Jan. 1, 2005.