POTENTIAL EFFECTS OF FOREIGN GOVERNMENTS' POLICIES OF PRICING NATURAL RESOURCES

Final Report on Investigation No. 332-202 Under Section 332(b) of the Tariff Act of 1930

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PREFACE

The Commission instituted this investigation on December 14, 1984, following the receipt of a letter of request therefor dated November 20, 1984, from Chairman Sam M. Gibbons of the Subcommittee on Trade, Committee on Ways and Means of the U.S. House of Representatives. This investigation was conducted under section 332(b) of the Tariff Act of 1930 (19 USC 1332(b)), for the purpose of gathering and presenting information on the potential effects of foreign governments' policies of pricing natural resource products to domestic industrial users in the country concerned at prices substantially below the export selling price or other market value of the products. 1/ Specifically, the Commission was asked to describe certain foreign governments' pricing policies; analyze the effects of such pricing policies on certain industries or groups of industries; estimate the foreign production cost savings conferred by such pricing policies; analyze the competitive advantage of such production cost savings vis-a-vis United States producers; and analyze the effect of such foreign resource pricing policies on the resource allocation within the foreign country.

Public notice of the investigation was given by posting copies of the notice at the Office of the Secretary, U.S. International Trade Commission, Washington, D.C., and by publishing the notice in the Federal Register of December 27, 1984 (49 F.R. 50318). 2/

The information presented in this report was obtained from published materials, fieldwork, private individuals and organizations, and Federal Government sources in the United States and overseas.

1/ The request from Chairman Gibbons is reproduced in app. A.

2/ A copy of the notice of the Commission's investigation is reproduced in app. B.

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EXECUTIVE SUMMARY

Many U.S. industry officials, as well as other informed observers, are concerned over certain foreign governments' practices or policies of pricing natural resource products to domestic industrial users in the country concerned at prices substantially below the export selling price or other market value of the product. If natural resources, such as crude petroleum, natural gas, and metal ores are sold or transferred to industrial users within the producing country at such preferential prices, these industrial users could potentially have an energy or raw-material cost advantage. This advantage could enable these users to displace production of competitively priced downstream products from traditional producing countries in chosen markets.

While dual pricing practices have been and are used by a number of nations, domestic interest in this matter has grown sharply in the last 2 years due to U.S. imports of certain Mexican energy-intensive products such as ammonia, carbon black, and cement. It was alleged by the affected U.S. industries that each of these products is in effect subsidized because of the Mexican dual pricing policies for petroleum and natural gas. 1/ The subsidy is alleged to be equal to the difference between the foreign domestic price and the export selling price or other market value of the products.

The U.S. Department of Commerce has ruled that under current U.S. law, foreign government programs that are generally available to all industries in a foreign country are not countervailable. The pricing of domestic Mexican petroleum and natural gas, although below Mexican export and/or general world levels, was not considered to be a subsidy countervailable under current U.S. law because these resources were available at equivalent prices to all industries in Mexico. U.S. industries concerned with the Commerce determinations pursued Congressional legislative remedies. The natural resource subsidy proposal 2/ that emerged from these efforts was only narrowly

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1/ Final Negative Countervailing Duty Determination Anhydrous and Aqua Ammonia from Mexico, 48 F.R. 28522, June 22, 1983; Final Affirmative Countervailing Duty Determination and Countervailing Duty Order; Carbon Black from Mexico, 48 F.R. 29564, June 27, 1983; Final Affirmative Countervailing Duty Determination and Countervailing Duty Order; Portland Hydraulic Cement and Cement Clinker from Mexico, 48 F.R. 43063, Sept. 21, 1983.

2/ H.R. 4784, the Trade Remedies Reform Act of 1984 indicated that a natural resource subsidy exists whenever: (1) a government-regulated or controlled entity sells natural resource products internally to its own producers at prices which, by reason of such regulation or control, are lower than the export price or the fair market value in the exporting country, whichever is appropriate; and (2) the internal price is not one which is fully available to U.S. producers for purchase and export to the U.S. market; and (3) the resource product, as measured by the export price or fair market value, is a significant portion of the production costs of the final product under the countervailing duty investigation. The level of a natural-resource subsidy for purposes of assessing the duty is the difference between the domestic price and the export price of the natural resource product; except that, in cases where there are no exports or where the export price is distorted by government manipulation, the administering authority must measure the subsidy by comparing the domestic price to the "fair market value"--the price that would normally apply in an arms length transaction absent government regulation or control.

defeated in the 98th Congress; however, the issue remains a subject of debate in both the public and private sectors.

An important factor influencing the natural resources pricing policies of a government is the natural resource endowment itself. All other things being equal, those nations with the faster producing crude petroleum or natural gas wells, or higher grade metal ores, should have a production cost advantage relative to those nations with slower producing wells or lower grade metal ores. Concern generally arises, not over whether such nations should be able to price these natural resources below generally accepted world levels for domestic use or industrial development, but rather over the implications of using the lower priced materials to produce items that are then exported, compete with U.S. produced products, and potentially disrupt world markets. A closely related issue has to do with access to, or the distribution of, the lower priced resources. Even if the lower price is offered to all, inequality may result if access to the resources is limited or controlled by some arbitrary mechanism.

Many factors affect industrial production in a country other than the government's pricing policies and the physical abundance of natural resources. If a country desires to contribute to a domestic industry's competitiveness or encourage investment in manufacturing, it may do so through preferential natural resources pricing or any number of other factors that influence production costs. Some of the other factors identified during the investigation that affect the competitiveness of a nation's industry in the world market and lower production costs include state-owned or -controlled producers; preferential inland and ocean transportation costs; income tax deferrals and exemptions; forgiveness of debt; low interest loans; investment tax credits; investment controls; access controls on obtaining the low-priced natural resources; government water projects that provide low-cost water; vertical integration, including transfer price manipulations; World Bank and IMF financing of developing country producers; regional development plans; exchange rates in general as well as dual exchange rates such as one exchange rate for imports and another for the repatriation of profits; export financing; price rebates on brokerage, seaport handling, and insurance; preferential raw materials cost including lower prices for items other than energy; overseas marketing and technical services; import duty reductions or rebates on imported equipment; reimbursement for worker training; a low level of environmental, health safety, and welfare requirements; low wage and labor rates; and government control of production goals. Many of these factors influence the pricing practices discussed in this report and are identified when of special importance in the commodity pricing practices of any nation.

This study concentrates on those nations where public domain information indicates natural gas, crude petroleum and petroleum products, or metal ores are priced to industrial users below export sale prices or general world price levels. In some countries, these lower prices may be attributable to specific natural resources pricing policies. However, in most of the countries studied the lower prices appear to reflect practices and factors other than deliberate pricing policies. None of the ore producing nations that were studied had explicit government metal ores pricing policies which discriminated between domestic and export price.

Lower priced natural gas, crude petroleum, and petroleum products, can confer a production cost advantage to those industries that use these inputs for energy or raw materials. The greater the quantity of these inputs an industry uses per unit of output, the greater the benefit the industry obtains. In the United States, for example, the cost of natural gas and crude petroleum currently accounts for as much as 50 and 80 percent of the total production costs per unit for materials such as cement and ammonia, respectively.

Highlights of the Commission's investigation are as follows:

1. Foreign nations' pricing practices.

- Few instances of formal natural resources pricing policies by foreign governments were identified.

Formal, written government pricing policies for natural resources were identified in only a few of the over 45 energy and metal-ore producing nations studied. However, evidence accumulated during the investigation indicates that pricing practices exist in many of the natural resource-rich nations, particularly for crude petroleum and natural gas.

In most of the crude-petroleum- and natural-gas-rich nations, the pricing practices appear to be centered in the national petroleum company. Although the responsibilities of these national companies differ among nations, most have broad powers in exploration, production, refining, and marketing. Some of the companies also have authority extending to petrochemicals, liquefied petroleum gas, and marine transportation.

The table on page xxi contains a summary of the information on pricing practices obtained during the study for 18 of the crude-petroleum- and natural-gas-rich nations.

- The transparency of crude petroleum and natural gas pricing practices in any particular nation depends to a large degree upon the structures of the petroleum refining and petrochemical industries.

There are many different relationships between companies in the crude-petroleum- and natural-gas-rich nations that affect the ease of obtaining actual prices and determining pricing practices. The greatest difficulty in determining a nation's pricing practices largely occurs in those instances where one government company (itself or through completely controlled subsidaries) is involved in crude petroleum and natural gas from wellhead through marketing, and perhaps also in petrochemicals. Pricing practices are most easily observed where crude petroleum and natural gas, though produced by a government company, are sold to private sector companies.

Crude petroleum and natural gas: Pricing practices of certain nations including examples of the resulting prices, 1984

Country	National petroleum company	Pricing mechanism	Implemented by	Examples of prices resulting from the pricing mechanisms: Crude petroleum		Natural gas	
				Domestic	Export 1/	Domestic	Export
				Dollars per barrel		Dollars per thousand cubic feet	
Canada	Petro-Canada	Policy and practices o National Energy Program (NEP) o Canada-Aberta Energy Pricing and Taxation Adjustment Agreement (EPTA)	Government and national energy board	2/ 30-38	29 (26.66)	3/ 1.65 5/ 3.15	4/ 3.40-4.40
Mexico	PEMEX	Policy and practices	Government Committee/Pemex	6/ 6-7	29 (26.54)	1.60-1.70	7/ 4.40
Saudi Arabia	Petromin	Practices	Exports-Government Domestic-Petromin	8/ 3-6	29 (27.34)	0.50	None.
Kuwait	Kuwait Petroleum Company (KPC)	Practices	Exports-Government Domestic-(KPC)	10-20	29 (26.42)	1.00	None.
Indonesia	Pertamina	Practices	Exports-Government Domestic-Pertamina	10-20	29 (29.29)	1.00	LNG to Japan.
Nigeria	Nigerian Nation Petroleum Operation (NNPC)	Practices	Exports-Government Domestic-NNPC	10-20	29 (29.51)	1.00	None.
Venezuela	Petroleos de Venezuela (PDV)	Practices	Exports-Government Domestic-PDV	9/ 6-8	29 (24.18)	1.00	None.
Other OPEC Nations	Yes	Practices	Exports-Government Domestic-Government directly or national petroleum company	10-20	29 (27.65 to 29.02)	1.00	None.
Trinidad and Tobago	National Energy Corporation of Trinidad and Tobago	Practices	Government	-	29 (30.37)	0.90-1.25	None.
China	Government	Policy	Government	5-7	29 (27.46)	1.05-1.30	None.
U.S.S.R	Government	Administrative decision	Government	4-6	29 (None)	10/ 2.10 12/ 2.71	3.60-6.17 11/

1/ Export price for all of the exporting nations is the OPEC marker price; however, the actual prices of exports differ and are not usually reported in public documents. Prices in parenthesis are average values for 1984 U.S. imports from the respective nations.
2/ Prices for "old" and "new" crude petroleum.
3/ Price in Alberta.
4/ Price range depending on offtake; lower price applies to marginal product.
5/ Price at Toronto City Gate.
6/ Based on foreign domestic petroleum product prices relative to U.S. prices; cost of production estimated at $3. to $6.50 per barrel.
7/ Price at which Mexico exported to the United States. When the price went below this price, Mexico ceased exports in November 1984.
8/ Based on foreign domestic petroleum prices.
9/ Based on foreign domestic petroleum production prices relative to U.S. prices.
10/ Estimated foreign local domestic use as fuel.
11/ Estimated price of sales by pipeline to East European nations.
12/ Calculated netback at large ammonia facility.

o <u>Price differentials between metal ores used domestically (by foreign country) and those exported are difficult to document and government policies designed specifically to support such price differentials are not known to exist.</u>

Metal ores move from the producing mine to the consuming smelters and refineries (often owned by the same company) through trading companies or through intracompany shipments. Due to this vertical integration of the mining industry, metal ores are often not traded at market prices. Transfer prices are set by the companies involved as a function of their costs of production (such as ore grade and labor cost) and taxes, and are generally not disclosed.

Though metal ore pricing differentials may exist, they are not the result of government policies designed specifically for that purpose. Price differentials may arise due to profitability and employment criteria of mining operations associated with state ownership, lower capital costs associated with development bank financing, inflation control policies, guaranteed source arrangements, and long term supply contracts.

o <u>Some foreign government policies or practices, including the policy of pricing natural resources to domestic industries below export levels have the promotion of exports or import substitution as stated or unstated objectives</u>.

Many types of foreign government policies and practices, including those in the natural resources pricing area, often indicate the desire to decrease imports and increase exports. In many instances lower prices for energy resources are directly related to industrial development plans which in turn are designed to promote exports of value-added products or reduce import dependence.

For example, in Mexico companies locating in a priority development zone may receive 30 percent discounts on the cost of their industrial energy. In addition, petrochemical companies in this priority development zone, under certain conditions, including agreement to export at least 25 percent of their production for three years, are eligible to receive a 30 percent discount on their consumption of basic petrochemicals.

In the case of Saudi Arabia, industry experts estimate that the price of 50 cents per thousand cubic feet for natural gas sold to the petrochemical industry (which gives the Saudi petrochemical industry a comparative advantage vis-a-vis U.S. producers) covers the cost of the domestic distribution system. Government policy does not state that a goal in setting this price is to stimulate exports. However, there are indications that the dominant portion of their petrochemical production is earmarked for export. It has been stated, by Saudi officials, for example, that only 10 percent of the petrochemicals produced are to be consumed in the Saudi domestic market, with 20 percent to go to the United States, 22 percent to Europe, 20 percent to Japan, and 28 percent to the rest of the world.

In Canada the National Energy Program (NEP) was intended to keep domestic Canadian prices for crude petroleum and natural gas below world levels to "provide a competitive advantage for Canadian industries." Many of the changes now underway in the Canadian energy policy area are intended to restore the Canadian advantage in domestic and export markets.

Both China and the U.S.S.R. price exports at levels necessary to make export sales, particularly those for hard currencies, which are required to pay for imports. Efforts to raise hard currency generally take precedence over supporting market prices.

- o <u>The pricing of crude petroleum, and particularly natural gas, in major producing countries is affected by lower than average world production costs and alternate use values</u>.

In many of the crude-petroleum-rich nations of the world the production cost per barrel of crude petroleum is often low because of the prolific nature of the wells. The average well in the Organization of Petroleum Exporting Countries (OPEC), for example, produces thousands of barrels per day versus about 15 barrels per day for the average U.S. well. In addition, many OPEC wells actually cost less to drill and operate because they are not as deep and are more likely to be located onshore. Since the relatively low production cost per barrel in the crude petroleum-rich nations is easily recouped when the crude petroleum is sold at world prices, the associated natural gas produced with the crude petroleum is generally viewed as having little or no production cost. Most of the OPEC nations have no significant domestic natural gas markets and netback calculations for potential liquefied natural gas trade often indicate a negative wellhead value after all the associated costs such as liquefaction facilities and transportation are deducted.

In Saudi Arabia, for example, an effort to reduce the flaring of natural gas has led to development of a gathering system whereby the retained commodity is sold to the natural gas-based petrochemical facilities in Saudi Arabia. Reportedly a price of $0.50 per thousand cubic feet is sufficient to pay for the system over the life of the project. In nations that have alternate markets such as exports, natural gas is often priced to domestic industries significantly below the value in these alternate markets. For example, although Mexico could sell natural gas to the United States at around $3.40 per thousand cubic feet, the natural gas is largely consumed internally where it sells for around $1.60 to $1.70 per thousand cubic feet.

Although each nation is selling natural gas to domestic industries at prices below the world or potential export levels, Saudi Arabia is apparently selling at the highest price it can, whereas Mexico is apparently foregoing $1.70 to $1.80 per thousand cubic feet to sell in its domestic market. It would appear that Saudi Arabia's price for natural gas is reflective of a natural resource comparative advantage and not a pricing practice.

In general, when a nation is selling its resource to domestic industries at a price that is above the price at which it could be exported it cannot be said that the nation has a pricing practice. This is particularly applicable to natural gas which is not as universally consumed as crude petroleum and is expensive to transport. For a nation that has no current viable natural gas export market, the domestic price cannot be compared to the world natural gas price.

- o <u>Canada's pricing policies for crude petroleum and natural gas are contained in the National Energy Program; although changes are under consideration by the Canadian Government, the goal is still to have preferential prices for domestic industries</u>.

The Canadian pricing policies for crude petroleum and natural gas, as originally specified in the National Energy Program (NEP) in 1980, were rigid and exact. The goal was to maintain crude petroleum prices at 85 percent of the lesser of the world price or the average U.S. price and to tie increases in the price of natural gas to increases in the wellhead price of crude petroleum. Revisions in 1981 maintained Eastern Zone wholesale natural gas prices at the equivalent of 65 percent of the domestic refinery acquistion price for crude petroleum. In practice, the NEP caused Canadian prices to rise above world levels because the NEP price mechanism was based on the assumption that world prices would increase when, in fact, they actually decreased.

Canadian natural gas and crude petroleum export prices are currently tied to world prices, although a process whereby natural gas export prices may be negotiated was initiated in November 1984. Spot market sales of natural gas have also been started. Provincial governments also have a voice in crude petroleum and natural gas pricing that has resulted in natural gas prices within some provinces that are significantly below Canadian export levels. For example, natural gas prices as low as $1.65 per thousand cubic feet have been reported in Alberta whereas exports to the United States are $3.40 per thousand cubic feet.

- o <u>Mexico's pricing policies for crude petroleum and natural gas are outlined in the National Industrial Development Plan and the National Energy Program and implemented by a committee that decides export and domestic prices.</u>

The Mexican Constitution of 1917 provided that subsurface resources are considered to be the domain of the States. Petroleos Mexicanos (PEMEX), established on June 8, 1938, to administer the nation's hydrocarbon reserves, is a government entity with broad authority over virtually all phases of crude petroleum, refining, and natural gas operations. It is also the sole producer of basic petrochemicals in Mexico. Because of this vertical integration, PEMEX's internal consumption of crude petroleum or natural gas (to make petroleum products or basic petrochemicals) is not considered a sale and no transfer price is assigned or made public. In general, it is believed these transfers occur at below-world-price levels, but not below production costs, which are estimated to be $3 to $6.50 per barrel for crude petroleum and $1.00 per thousand cubic feet for natural gas.

The prices PEMEX charges other domestic users for petroleum products, natural gas, and basic petrochemicals can be determined and are below export or world price levels. The Government has initiated efforts to raise domestic prices to world levels and has made some progress. For example, in 1984, Mexican domestic natural gas prices had risen to about 40 percent of U.S. prices, from approximately 11 percent in 1982; for light fuel oils the respective figures are about 20 percent and 5 percent.

However, although the domestic natural gas and petroleum product prices are uniform to all domestic users, certain other Government plans may result in different prices actually being paid by different consumers. Discounts are allowed on industrial energy and basic petrochemicals to ventures that locate in certain areas of Mexico that the Government wants to develop. In addition, there are many other Government programs that effectively lower prices, such as dual level currency exchange, which favors export sales.

- Pricing practices for crude petroleum and natural gas in the individual OPEC nations appear to originate at high government levels; OPEC attempts to maintain arbitrary export prices for crude petroleum by limiting supply through imposition of production quotas on individual OPEC nations.

The domestic pricing practices of the individual OPEC nations are sanctioned by the respective governments and often implemented through their national petroleum companies. While OPEC attempts to have its members maintain a common crude petroleum export price, no such attempt is made to control individual nations' domestic pricing practices. Evidence indicates that the prices of both crude petroleum and natural gas for domestic use are commonly set below the export or world market levels.

OPEC has attempted to maintain a relatively high export price by assigning production quotas to its individual members which was fairly successful until the early 1980's, when a surplus developed in world crude petroleum supplies. Because of the surplus, OPEC has had to reduce its export price for benchmark crude petroleum from $34 per barrel to $29 per barrel (in 1983). Currently, a significant quantity of OPEC crude petroleum exports are moving for less than $29 per barrel as individual OPEC nations require continued sales to support domestic economies and to pay for imports. OPEC does not attempt to control the export prices of natural gas or petroleum products.

- Many other crude-petroleum- and-natural-gas-rich nations are studying or implementing plans to utilize their natural resources to assist industrial development, gain foreign exchange and reach social goals such as increased employment.

Other nations, such as Trinidad and Tobago, Malaysia, and Thailand, are developing refining and petrochemical plants that are international in scale.

Given the highly competitive nature of the world's petroleum product and petrochemical markets, it is believed that many of these nations use crude petroleum and natural gas pricing practices designed to give their producers of energy-intensive products a price advantage. It would be difficult for these nations to price the energy and feedstock materials to their domestic industries at world prices, transport the products over great distances, incur import tariffs, and still compete with local production. As an example, the ammonia facilities in Trinidad and Tobago reportedly use natural gas priced at $0.95 to $1.25 per thousand cubic feet, reflecting their comparative advantage in this product. There are no natural gas export facilities in Trinidad to provide an alternative use other than flaring or use as a feedstock and fuel for Trinidad industry.

- The nonmarket economies, such as the U.S.S.R., China, and the Eastern European nations, all follow pricing practices for crude petroleum and natural gas as well as for most other commodities.

The pricing authority for goods of national importance, such as crude petroleum and natural gas, resides with the central government of China. Although China does not enumerate its pricing mechanism, historic evidence indicates that the mechanism tends to understate the relative worth of these natural resources and maintain price stability. The domestic wellhead price of crude petroleum in China is reported to be in the $5 to $7 per barrel range, and the wellhead price for natural gas is estimated at between $1.30 and $1.50 per thousand cubic feet. This compares with $24 to $26 per barrel and $2.50 and $3.00 per thousand cubic feet, respectively, in the United States.

Most prices in the U.S.S.R., including those of crude petroleum and natural gas, are established by administrative decision rather than by the marketplace. In general, the U.S.S.R.'s crude petroleum policy is intended to facilitate exports to obtain hard currency while providing enough for internal use and that of the East European and other socialist nations. In periods when world demand is high and the market strong, Soviet crude petroleum export prices are among the highest in the world. When demand is low, as in recent years, Soviet prices are established just low enough to maintain sales, regardless of the world price level. Netback calculations 1/ using the prices of recent Soviet exports of petroleum products to the United States indicate that the Soviets may often be charging crude petroleum to their refineries at prices 10 to 15 percent below their export crude petroleum price of $27.25 per barrel. Similar netback calculations for recent Soviet ammonia exports to the United States indicate a natural gas price of around $2.71 per thousand cubic feet compared with $2.50 to $3.00 per thousand cubic feet in the United States.

1/ Netback calculations have inherent problems, however, they are widely used in industry as a tool to provide some insight where other data are unavailable. See p. 2 of the Introduction for additional comments on netback calculations and appendices J and K for copies of submissions and briefs to the U.S. International Trade Commission utilizing the netback calculation methodology.

2. The impact of natural resources pricing practices on production costs, competitiveness, and resource allocation.

   o <u>The foreign energy-intensive industries stand to benefit the most from the foreign pricing practices that maintain domestic crude petroleum and natural gas prices below world or export price levels.</u>

Industries for which the cost of energy per unit of production is a large part of the total production cost per unit are those which are potentially affected by natural resource pricing practices of foreign governments. Such industries include those producing petroleum products, ammonia, methanol, ethylene, cement, lime, float glass, and steel. The following tabulation uses U.S. Bureau of the Census data to show the energy intensity of certain 4-digit Standard Industrial Classification (SIC) industries:

Industry	Ratio of the value of crude petroleum, petroleum products and natural gas to-- Value of shipments	Ratio of the value of crude petroleum, petroleum products and natural gas to-- Cost of materials
	Percent	Percent
Petroleum refining	74	84
Plastics and resins	39	71
Non-cellulosic organic fibers	36	54
Nitrogenous fertilizers	33	64
Industrial organic chemicals	30	41
Miscellaneous plastic products	26	52
Hydraulic cement	25	55
Cyclic crude and intermediate petrochemicals	23	37
Alkalies and chlorine	18	40
Industrial inorganic chemicals	16	25
Paperboard mills	14	24
Primary aluminum	11	26
Paper mills	10	18
Glass containers	10	24
Blast furnaces/steel mills	9	16

   o <u>Not all foreign nations examined have all of the energy-intensive industries usually found in developed nations.</u>

Many of the crude-petroleum- and natural-gas-rich nations are developing nations which do not have the broadly developed energy-intensive industries found in most industrialized nations. However, many have developed or are developing petroleum refining and petrochemical industries since each uses petroleum and natural gas as raw materials as well as energy sources. Certain nations are more deeply involved in other energy-intensive industries, such as lime and cement, for which they possess the other necessary raw materials in addition to energy natural resources.

- o <u>The investigation identified data that substantiates that production cost savings are realized by certain foreign industries with respect to U.S producers of like products</u>.

The estimated production costs for certain energy-intensive commodities in the United States and in certain nations that price crude petroleum or natural gas below export or world market levels is given in the table on the following page.

The crude petroleum and natural gas pricing practices followed by foreign nations are not uniform, with the result that crude petroleum and natural gas are available at different prices in different nations. This fact, combined with the difference in other costs of production, such as labor, maintenance, and raw materials input, result in total production costs for the same commodities that differ significantly between nations.

- o <u>The production cost savings realized by a foreign producer vis-a-vis a U.S. producer of like merchandise may be used by the foreign producer in a number of ways in order to gain a competitive advantage in the U.S. market</u>.

The difference between the production costs of foreign and U.S. producers may confer a competitive advantage to a foreign producer in at least three areas: (1) it may be retained as additional profit which could enable the foreign producer to invest more heavily in research and development or new, more efficient facilities, for example; (2) it may provide additional pricing leverage to enable the foreign producer to discount its product in order to gain additional market share or to penetrate new markets; and (3) it could enable the foreign producer to defray transportation and other costs to markets that could not have been reached on a competitive basis if the producer had paid export or world level prices for the energy resources used.

- o <u>U.S. customers benefit to the extent that lower foreign production costs are passed along to the consumer in the way of lower prices.</u>

Lower foreign production costs do not necessarily mean lower U.S. consumer prices for imports. In addition, even if the import price does reflect at least part of the lower foreign production cost, further

Sample energy-intensive products: Foreign and U.S. production costs, 1983-84

Country	Commodity	Estimated average production cost: Foreign: Total	Foreign: Fuel/ feedstock	United States: Total	United States: Fuel/ feedstock
Canada	Ammonia	$79-$110/ST	$59-$70/ST	$92-$170/ST	$71-$114/ST
	Ethylene	0.17-.23/lb.	0.05-.07/lb.	0.20-.27/lb.	0.09-.14/lb.
	Methanol	1/ .29-.58/gal.	.15-.23/gal.	.44-.56/gal.	.28-.37/gal.
	Steel	2/ 436/ST	62-90/ST	484/ST	68-97/ST
Mexico	Ammonia	3/ 45-85/ST	20-67/ST	92-170/ST	71-114/ST
	Carbon black	4/ .08-.09/lb.	.03-.05/lb.	.21-.23/lb.	.16-.18/lb.
	Cement	25-35/ST	4.75-8/ST	40-50/ST	13-18/ST
	Float glass	.16-52/sq. ft.	.06-.21/sq. ft.	.20-.64/sq. ft.	.10-.32/sq. ft.
	Lime	15/ST	6.32/ST	32-40/ST	19-21/ST
	Petroleum products	5/ 6-7/bbl.	3-6.50/bbl.	30-32/bbl.	28-29/bbl.
	Steel	6/ 179/ST	28-57/ST	285/ST	68-97/ST
Saudi Arabia	Ammonia	45-65/ST	12-19/ST	92-170/ST	71-114/ST
	Ethylene	.07-.19/lb.	.01-.03/lb.	.20-.27/lb.	.09-.14/lb/
	Methanol	.24-.37/gal.	.04-.06/gal.	.41-.56/gal.	.28-.37/gal.
	Petroleum products	4.40-7.65/bbl.	3-6/bbl.	30-32/bbl.	28-29/bbl.
Trinidad and Tobago	Ammonia	84-105/ST	32-44/ST	92-170/ST	71-114/ST
	Methanol	7/ .22-.24/gal.	.08-.14/gal.	.41-.56/gal	.28-.37/gal.
U.S.S.R	Petroleum products	8/ 12-13/bbl.	4-6/bbl.	30-32/bbl.	28-29/bbl.
	Ammonia	9/ 70-149/ST	18-95/ST	92-170/ST	71-114/ST
China	Petroleum products	10/ 10-11/bbl.	5-7/bbl.	30-32/bbl.	28-29/bbl.

1/ For Western Canadian plants.

2/ Estimate for integrated mills based on relative natural gas prices and petroleum product prices in Canada and the United States.

3/ Estimate based on foreign domestic price.

4/ Estimate based on relative CBFS prices in Mexico and the United States.

5/ Estimate based on relative petroleum product prices in Mexico and the United States.

6/ Estimate for non-integrated mills based on relative natural gas prices in Mexico and the United States.

7/ Estimate based on relative natural gas prices in Trinidad and Tobago and the United States.

8/ Estimate based on relative natural petroleum product prices in the U.S.S.R. and the United States.

9/ Estimate based on natural gas values of zero and $2.71 thousand cubic feet which is the [illegible] distribution and marketing profits and costs in the United States could absorb the margin. For example, a lower foreign price for natural gas that results in a $60 per ton lower foreign production cost for ammonia, may only provide about a $15 per ton advantage after deduction of the costs associated with its movement to the United States. Some or all of this $15 per ton could then be used to pay for costs associated with transportation and marketing in the United States as well as retained as profit by the U.S. distributor.

3. Industry-specific impact of natural resources pricing practices.

Canada

- <u>Ammonia</u>.--The Canadian ammonia industry is comprised of nine major producers of ammonia, with a combined annual capacity of 3.165 million metric tons. Additional capacity of 380,000 metric tons is expected to come onstream in 1985.

- Production costs in Western Canada are estimated to be $79.00 to $109.00 per short ton, or about 75 percent of those in the United States. Feedstock costs to produce a short ton of ammonia in Western Canada amount to about $59.00 to $70.00 compared with $71.00 to $114.00 in the United States.

- Major competitive factors in this industry include transportation cost, construction costs, and depreciation. Balanced against higher Canadian costs for these items are lower Canadian prices for natural gas, particularly within the province of Alberta. These low natural gas costs have enabled Canadian producers to overcome high transportation and construction costs and penetrate U.S. markets.

- In 1984, Canada exported about 832,000 metric tons of ammonia, the production of which consumed about 33.3 billion cubic feet of natural gas. This natural gas probably would not have been consumed for the production of ammonia but for its price. The production cost savings attributed to the lower natural gas price enabled Canadian producers to offset higher production costs in the areas of capital, and plant maintenance and operation. Further, part of the savings were also used to defray transportation costs from Canada to the U.S. Midwest which are higher than those from the U.S. Gulf.

- <u>Ethylene</u>.--The Canadian ethylene industry is comprised of four major companies, with a combined annual capacity of 2.2 million metric tons.

- In 1983, the production cost advantage of ethylene in Alberta, compared with that on the U.S. Gulf Coast, was about $25 per metric ton in favor of Canada. Future changes in natural gas pricing practices are expected to result in greater margins for Canadian products.

- The competitive factors influencing the competitiveness of ethylene are essentially the same as for ammonia. Offsetting higher Canadian costs for certain costs of production are Alberta feedstock prices that are 5 percent below the U.S. Gulf Coast spot prices. This difference is expected to increase in the future as new Canadian pricing practices take effect. The net effect would be that chemicals made from Canadian ethylene will have an even greater advantage vis-a-vis the products of U.S. producers.

- Very little ethylene per se is exported because it is a gas. However, to the extent the ethylene production-cost advantage is passed on to downstream products, these derivative products are given an advantage in export markets that they would not otherwise have.

- Methanol.--The Canadian methanol industry is currently comprised of three major producers, whose combined annual capacity in 1983 was 1.87 million tons.

- Producers of methanol have feedstock and energy cost advantages compared with those in the U.S. Gulf Coast, leading to a production cost of around $0.29 to $0.58 per gallon compared with approximately $0.41 to $0.56 per gallon in the United States.

- Due to lower production costs, Canadian producers of methanol can absorb higher transportation and distribution costs to secure new or expanded markets, including those in the United States. The production cost advantage also can enable them to shave prices to the level necessary to achieve the desired markets.

- Approximately 450 million gallons of methanol are exported, the production of which consumes about 45 billion cubic feet of natural gas. The exports of methanol would probably not have occurred except for the lower natural gas price. Therefore, the natural gas resources would also not have been consumed. The lower priced natural gas allowed Canadian producers to offset other higher methanol production costs and the transportation costs to the export markets, including the United States.

- Steel.--Three Canadian integrated steel producers together accounted for over 70 percent of Canada's 1983 raw steel capacity of 23.9 million tons. Canada remained a net exporter of steel mill products during 1980-84, with an annual trade surplus ranging from 656,000 tons to 2.3 million tons.

- Natural gas energy policies favoring Canadian steel producers have resulted in estimated cost savings of $2.83 per ton, which represents about 0.8 percent of total steelmaking costs. The cost savings are viewed as a relatively small component affecting Canadian competitiveness, as Canadian producers enjoy overall production costs that are about $48 per ton lower than U.S. producers.

- The Canadian steel industry would have remained competitive in the U.S. market even if Canadian producers had incurred a natural gas production input cost based on world market prices; this continued competitive status is largely attributable to Canada's cost advantage in labor which translates into $45 per ton of finished steel product.

Mexico

- Ammonia--.The Mexican ammonia industry is comprised of a sole producer, PEMEX, whose annual capacity increased from 1.9 metric tons in 1980 to 2.6 million metric tons in 1984. The United States is the major market for Mexican ammonia exports.

- PEMEX is the only Mexican producer of both natural gas and ammonia. It is claimed that an internal transfer of natural gas takes place rather than a sale, and, therefore there is no price as such. It is known, though, that ammonia has been priced in Mexico as low as $41 per metric ton for Mexican domestic use, whereas U.S. production costs range between approximately $92 and $170 per short ton.

- The wellhead price of natural gas to Mexican domestic industries is less than $1.00 per thousand cubic feet, and Mexican ammonia exports were priced under the U.S. domestic ammonia price by an average of 12 percent during 1980-84.

- In 1984, Mexico exported about 626,000 metric tons of ammonia. The production of this quantity of ammonia would require approximately 24.4 billion cubic feet of natural gas. This quantity of natural gas probably would not have been used had it not been for its low price. This enabled the production cost of the ammonia to be kept sufficiently low to allow the ammonia to be priced competitively in export markets. It is probable that had Mexico chosen not to transfer natural gas to the ammonia industry ay $1.60 to $1.70 per thousand cubic feet it could have been exported to the United States at $3.40 per thousand cubic feet.

- Carbon black.--The Mexican carbon black industry has two producers, one of which is 60 percent owned by PEMEX. Production of carbon black increased from 81,257 short tons in 1980 to 110,784 short tons in 1984.

- Carbon black feedstock (CBFS) represents about 76-78 percent of the U.S. cost to produce carbon black. Therefore since PEMEX's prices for CBFS ranged from $2.08 to $7.45 per barrel during 1982-84 compared with U.S. prices ranging from $24 to $29 per barrel, PEMEX has enjoyed a carbon black production cost advantage of around $0.13 per pound.

- Mexican carbon black producers have an advantage in terms of low-priced CBFS and natural gas used for fuel. Mexican exports of carbon black to the United States are duty free, and since carbon black is usually shipped in bulk over land, the United States is Mexico's major export market.

- In 1984, Mexico exported 50 million pounds of carbon black to the United States. Carbon black is expensive to transport. Consequently, it can be assumed that it could not have been economically exported to the United States if not for the production cost advantage conferred by the low priced CBFS.

- Cement.--About 20 plants account for 75 percent of Mexican cement production capacity. Mexican production capacity increased about 77 percent during 1981-83, from 17.0 million metric tons to 30.7 million metric tons in 1983. The Mexican cement industry is expanding exports due to lower domestic consumption, as reflected by a ten-fold increase in exports since 1980 to 2.2 million short tons in 1984.

- Cement plants in Mexico use similar technology and equipment to that used in the United States. Total Mexican production costs are an estimated 34 percent lower per short ton of cement produced than comparable costs in the United States. The Mexican fuel pricing policy provides a fuel cost advantage for Mexican producers of around $4.00 to $6.40 per ton of manufactured cement. Mexican fuel costs average 11.5 percent of production cost compared with 19 percent for U.S. fuel costs.

- One of the most important factors considered in the purchasing of cement is the transportation cost. Mexican cement producers are able to ship longer distances because of the offsetting cost savings realized through lower fuel costs, which provides a competitive advantage for Mexican producers in U.S. border areas and inland southern coastal markets. The fuel cost savings provides additional pricing leverage to Mexican producers which also have structural advantages in all other production costs (collectively averaging $10 per ton), including raw materials, power, and labor.

- The Mexican Government fuel pricing policy provided an estimated $11.4 million cost savings on exported cement in 1984. A Mexican fuel production cost input based on world prices for fuel oil would likely make Mexican cement too costly to export on a competitive basis in most U.S. markets. The U.S. marketing area would be substantially reduced due to the much lower Mexican cost advantage with which to compensate for high transportation costs to many of these markets.

- <u>Float glass</u>.--The Mexican float glass industry is dominated by two producers, with total production capacity of approximately 51 million square meters, sufficient to meet more than 100 percent of domestic demand. The United States has traditionally been Mexico's largest glass export market and would remain a prime market for future Mexican exports.

- Mexican float glass producers utilize similar technology to manufacture float glass as other world producers; however, Mexican producers have about a 52 percent ($2.00 per thousand cubic feet) lower natural gas cost than U.S. producers. Comparing a representative price range for U.S.-produced float glass (excluding transportation) with price ranges for Mexican float glass produced with lower-cost natural gas, Mexican producers obtain an estimated average cost advantage of 18 percent. The U.S. industry alleges that this differential has resulted in suppression of U.S. prices.

- International trade in float glass is largely limited due to high transportation costs. Nearly all the float glass manufactured in Mexico is consumed internally, with less than an estimated 7 percent exported to world markets. However, the advantages held by Mexican producers from lower natural gas costs, alleged preferential pricing of other raw materials inputs, and lower labor costs could be significant in Mexico's development as a float glass exporter, principally to border markets in the United States.

- o The Mexican float glass industry would remain competitive in the U.S. market even if Mexican producers incurred a natural gas production cost input based on world market prices; this continued competitive status is believed largely attributable to the Mexican industry's cost advantage in labor and raw material inputs, the border nature of its U.S. trade, and alleged price discounting which together provide an advantage in the price-sensitive float glass market.

- o Lime.--Fifteen lime companies produced 50 to 60 percent of the lime manufactured in Mexico, although two companies located on the U.S.-Mexican border accounted for most of the exports to the United States. Lime exports from Mexico, which go almost entirely to the United States, increased nearly fourfold since 1980 to 73,000 tons in 1984 and represented about 2 percent of Mexican production.

- o Total production costs for Mexican lime average 58 percent ($14.97 per short ton) lower than U.S. production costs. The Mexican fuel pricing policy provides a fuel cost advantage of $12.47 per ton of manufactured lime to Mexican producers. Mexican fuel costs average 39 percent of total production costs, whereas the comparable U.S. cost share is 51 percent.

- o A major factor in the final delivered costs of lime is transportation charges. Mexican lime producers are able to ship longer distances than their U.S. counterparts due to the offsetting cost savings realized from lower fuel costs. Imports of Mexican lime generally impact certain southern regions of the United States. The fuel savings provides Mexican producers with a competitive advantage through additional pricing leverage given their structural cost advantage in all other production inputs (collectively averaging $9 per ton).

- o The Mexican Government's fuel pricing policy provided an estimated $892,852 in cost savings on lime exported to the United States in 1984. A Mexican fuel production cost input based on world prices for fuel oil would likely substantially eliminate the delivered cost advantage of Mexican lime producers in U.S. markets. The U.S. marketing area would be significantly reduced due to an inability of Mexican producers to offset high transportation costs to these markets.

- o Petroleum refining.--The petroleum refining industry consists of PEMEX as the sole operator of petroleum refining facilities with a reported crude petroleum refining capacity of about 1.3 million barrels per day.

- It has been indicated that the transfer price for crude petroleum to the refining industry is below world price levels, but not below the cost of producing the crude petroleum, estimated at $3 to $6.50 per barrel.

- Competition in the world petroleum products market is based primarily on price. Most petroleum products are homogeneous fungible commodities that are indistinguishable as to producer and are therefore usually sold on the basis of price. As a result, any factor that lowers the production cost of petroleum products allows the seller to defray transportation costs or to shave prices to gain market access or share.

- In 1984, U.S. imports from Mexico of distillate and residual fuel oils, jet fuel, and naphtha did not differ significantly in prices from similar U.S. imports from other sources. Under these circumstances it is probable that resource allocation was minimally impacted as Mexican crude petroleum pricing practices apparently did little to effect crude petroleum use and allocation. The Mexican petroleum products exports to the United States would probably have been competitive even if Pemex had transferred crude petroleum to its refining operations at world price levels.

- Steel.--The Mexican steel industry is divided into public and private sectors, with more than 74 enterprises controlled by the Government producing more than half of Mexico's total steel output. Total raw steel capacity in 1983 was 11 million tons.

- Mexican natural gas pricing policies have resulted in an estimated $16-per-ton cost savings, representing 9.0 percent of total steelmaking costs. The energy cost savings amount to approximately one-sixth of the estimated $106-per-ton overall production cost advantage enjoyed by the Mexican steel industry compared to U.S. producers.

- Comparative advantages of Mexico in labor ($61 per ton) and raw material ($28 per ton) costs would contribute to an overall cost advantage to the Mexican steel industry even if the industry's production cost component for natural gas were based on world market prices.

Saudi Arabia

- Ammonia.--The Saudi ammonia industry is comprised of two existing plants and one new facility, which is one-third owned by the Saudi Arabia Basic Industries Corporation (SABIC) and is expected to begin operations early in 1986.

These three plants are expected to operate at full capacity and produce approximately 860,000 metric tons of ammonia.

- Natural gas used as feedstock and fuel for the Saudi ammonia industry is reported to be priced by Petromin at 50 cents per thousand cubic feet. Since the natural gas used for the production of ammonia is associated natural gas, and would otherwise be flared, the comparison of production costs which follows is an estimate of the Saudi comparative advantage in producing this associated natural gas. The Saudi cost for feedstock and fuel (natural gas-based) ranged from $12 to $19 per short ton of ammonia produced in 1984, while the U.S. ammonia industry's corresponding costs ranged from $71 to $114 in 1983. Total Saudi production cost f.o.b. the Saudi plants ranged from $45 to $65 in 1984, while total U.S. production costs ranged from $92 to $170.

- The costs of Saudi ammonia in major world markets indicate that Saudi-produced ammonia can compete effectively on a price basis with U.S.-produced ammonia in any of these markets. The Saudi costs are lower than U.S. costs by 55 to 70 percent on the U.S. Gulf Coast, 45 to 55 percent in Italy and 48 to 63 percent in Rotterdam.

- Saudi Arabian produced ammonia could not compete in U.S. markets if it were not for the low priced natural gas. Saudi-produced ammonia would, however, apparently remain competitive with U.S.-produced ammonia in Mediterranean markets and would probably retain a competitive advantage over U.S.-produced ammonia in the Japanese market even at world level prices for natural gas in Saudi Arabia. So Saudi natural gas pricing practices essentially only impact the competitiveness of ammonia exports to the United States. However, before Saudi Arabia built a natural gas gathering system essentially all of the natural gas was flared with little commercial return. The current price of $0.50 per thousand cubic feet to petrochemical facilities is claimed to cover the cost of the gathering system.

- <u>Ethylene</u>.--By yearend 1985, the Saudi ethylene industry capacity is expected to be approximately 1.6 million metric tons per year, distributed fairly evenly among three major Saudi petrochemical producers. A large percentage of the ethylene produced in Saudi Arabia will be consumed within the domestic Saudi petrochemical industry to make petrochemicals, a large percentage of which will be exported into world markets.

- The Saudi ethylene industry is based on $0.50 per thousand cubic feet natural gas feedstock supplied by PETROMIN. Since the natural gas used for the production of ethylene is associated natural gas, and would otherwise be flared, the comparison of production costs which follows is an estimate of the Saudi comparative advantage in producing this associated natural gas. The production cost to the Saudi ethylene industry is expected to range from 7 to 19 cents per pound of ethylene produced compared with a range of 20 to 27 cents per pound in the United States. Feedstock and fuel costs for the Saudi ethylene facilities are expected to range from 1 to 3 cents per pound whereas this range is from 9 to 14 cents per pound of ethylene produced in the United States.

- The costs of Saudi ethylene in major world markets indicate that Saudi ethylene could compete in most. However, the ethylene will not be exported in any great quantities, if at all, but made into products in Saudi Arabia which will then be exported. The 8 to 13-cents-per-pound production cost advantage in Saudi Arabia if fully passed on could enable such products as ethylene glycol and polyethylene to be competitive in the major world markets.

- Saudi-produced ethylene requires the production cost advantage conferred by the low priced natural gas to have an unequivocal price advantage over U.S.-produced ethylene in the U.S., Italian, Rotterdam, and Japanese markets. Without this advantage it is only marginally competitive with U.S. produced ethylene in these markets. In addition, before Saudi Arabial built a natural gas gathering system essentially all of the natural gas was flared with little commercial return. The current price of $0.50 per thousand cubic feet to petrochemical facilities is claimed to cover the cost of the gathering system.

- Methanol.--The Saudi methanol industry is comprised of two modern, efficient world-scale methanol plants, which began operating during 1983-85 and together have a capacity of more than 1.2 million metric tons per year. There is negligible current domestic demand. Exports will be to the Far East (Japan and Taiwan) and to Western Europe.

- The Saudi methanol industry is based on $0.50 per thousand cubic feet natural gas price for use as both feedstock and fuel. Since the natural gas used for the production of methanol is associated natural gas, and would otherwise be flared, the comparison of production costs which follows is an estimate of the Saudi comparative advantage in producing this associated natural gas. Saudi natural gas costs per gallon of methanol produced range from 4 to 6 cents, while the corresponding costs for the U.S. industry range from 28 to 37 cents. Total production costs for the Saudi industry are estimated to range from 24 to 37 cents per gallon, while comparable U.S. production costs range from 41 to 56 cents per gallon.

- o With the fuel and feedstock cost advantage, Saudi-produced methanol is competitive with U.S.-produced methanol in the Italian, Rotterdam, and Japanese markets; it is not competitive on the U.S. Gulf. Saudi-produced methanol would probably not be competitive in these markets if world prices were paid for the fuel and feedstock. However, before Saudi Arabia built a natural gas gathering system essentially all of the natural gas was flared with little commercial return. The current price of $0.50 per thousand cubic feet to petrochemical facilities is claimed to cover the cost of the gathering system.

- o Refining.--The six Arabian refineries, as of the beginning of 1984, had a combined crude petroleum refining capacity of 920,000 barrels per day. Three new additional major export refineries, when completed, will add another 825,000 barrels per day of capacity.

- o PETROMIN does not make public the price at which crude petroleum is transferred to refining operations. Netback calculations for Saudi exports of petroleum products indicate that crude petroleum is transferred to the refineries at a crude petroleum price of $24 to $27 per barrel, compared with the official Saudi crude petroleum export price of $29.25 per barrel. However, the petroleum products in the Saudi domestic market indicate crude petroleum is transferred to refineries at between $3 and $6 per barrel.

- o To assess the competitiveness of the Saudi producers of petroleum products, transportation costs to various major market ports need to be added to the production cost. It appears that most, if not all, of these cost as well as the cost of refining may be absorbed in the price at which crude petroleum is transferred to the refineries. This practice would make Saudi petroleum products competitive in any world market they chose to enter.

- o Netback calculations on Saudi export sales of petroleum products do indicate the practice of pricing below export levels the crude petroleum that goes into the Saudi refining industry. This practice enables the Saudis to meet or slightly shave, if it so desired, any market price necessary to make a sale. It is probable that Saudi-refined products would not be competitive without the advantage of low priced crude petroleum. However, the Saudi's believe expansion of the refining industry furthers industrial development and provides the basis for further broadening of the industrial base. Under these circumstances it is probable that Saudi-produced products would be made competitive regardless of crude petroleum prices.

U.S.S.R.

- Ammonia.--U.S.S.R. ammonia capacity has been increasing and is scheduled to reach 27.3 million short tons by 1985 with the addition of 17 new plants.

- Various sources have estimated the U.S.S.R. natural gas wellhead price at from $0.50 per thousand cubic feet to $2.71 per thousand cubic feet. These prices are from 80 percent below to an approximate equivalent of the average wellhead price for natural gas in the United States which was estimated at $2.59 per thousand cubic feet in 1984. Based on these two extremes of Soviet natural gas prices, and taking into account differences in other production costs between the U.S.S.R. and the United States, the Soviet producers could have a hypothetical total production cost advantage of between $12- and $21-per-short-ton vis-a-vis U.S. producers.

- Ammonia is sold primarily on the basis of price, and using the 1984 U.S. Gulf Coast price, a calculated natural gas feedstock value of around $2.70 to $2.80 to the U.S.S.R. plant can be calculated. This value is in the range of U.S. Gulf Coast natural gas prices and would indicate that the U.S.S.R.'s competitive advantage is modest.

- Ammonia export prices for arms length sales generally reflect world price levels. Prices for ammonia sold to barter or countertrade partners are usually negotiated annually, are not made public, and may not reflect world price levels. Under these conditions it is difficult to evaluate the extent, if any, that natural gas is priced into Soviet ammonia facilities at below world level prices.

- Refining.--The Soviet refining industry is government-owned and consists of 38 refineries, a capacity of 11.7 million barrels per day in 1983.

- Crude petroleum for refining was available in the U.S.S.R. for as low as $23.50 per barrel in the third quarter of 1984, based on netback calculations while the U.S. refiners acquisition cost was $28.69 per barrel. It has been estimated that crude petroleum is transferred to refineries in the $4 to $6 per barrel range to make petroleum products for use in the U.S.S.R.

- A $5-per-barrel crude petroleum price advantage, if passed through entirely to the prices of petroleum products, would mean an average saving of almost $0.12 per gallon, which is significant considering residual oils sell at around $0.68 per gallon and gasoline for approximately $0.90 per gallon at U.S. refineries.

  In addition, it is believed crude petroleum may actually be priced as low as $4 to $6 per barrel to refineries that supply the foreign domestic market. If the crude petroleum used to produce petroleum products for exports is also priced at this level, the competitive advantage would be significantly greater.

- The U.S.S.R. prices crude petroleum into its refineries at below world levels. This practice is substantiated both by netback calculations for certain petroleum product exports and for domestic petroleum product sales.

  However, in the world export market the U.S.S.R. prices petroleum product exports at prices as close to world levels as it may and still assure the sale. Therefore, during periods of high prices the Soviets might be competitive even if world prices were charged for the crude petroleum used in their refineries. However, during surplus periods, such as at present, it is probable that Soviet- produced refined products would not be competitive without a crude petroleum price advantage.

<u>China</u>

- <u>Refining</u>.--China's refining industry is comprised of 33 medium-to-large state-owned refineries, with an annual total capacity of 2 million barrels per day.

- Generally, it is difficult to assess China's production cost savings resulting from its pricing practices for energy materials. Since prices of goods besides natural resources also are administered, the cost discrepancies of these goods may either add to or reduce the cost savings provided by relatively low cost of crude petroleum or natural gas as energy sources or as feedstocks.

- The refining industry in China reportedly obtains most of its crude petroleum at $5 to $7 per barrel, or approximately $22 to $24 per barrel less than the composite acquisition cost of crude petroleum paid by refiners in the United States in 1983 and 1984. Therefore, even though China sells its refined products such as gasoline, diesel fuel, and kerosene, at or near world prices on the world market it could reduce prices significantly to gain market penetration or share.

- Past Chinese energy policies have fostered small, locally designed plants and refineries that were inefficient and uneconomical. In addition, chronic underpricing of natural resources combined with little incentive for cost control have led, until recently, to high energy consumption rates and affected the allocation of natural resources. It has been the desire to reallocate natural resources that has resulted in China's current Five-Year Plan (1981-85) which attempts to redirect the economy towards energy conservation by promoting the growth of light industry and closing energy-inefficient plants. Therefore, although China's government will continue to control prices of crude petroleum and natural gas, internal prices reportedly will rise as the Chinese attempt to allocate their resources better.

INTRODUCTION

Dual-pricing of natural resources, or selling a natural resource domestically at a price below the export price or general world level, is being and has been utilized by a number of nations. Domestic interest in this matter, however, has grown and focused on this practice in the past few years due to U.S. imports of certain Mexican energy-intensive products such as ammonia, carbon black, and cement. It was claimed by the affected U.S. industries that each of these products received a subsidy because of the Mexican dual-pricing policies for petroleum and natural gas. 1/ The subsidy was claimed to be equal to the difference between the the foreign domestic price and the export selling price or other market value of the products.

The U.S. Department of Commerce determined that under current U.S. law, foreign government programs that are generally available to all industries in the foreign country are not countervailable. The pricing of domestic Mexican petroleum and natural gas, although below Mexican export and/or general world price levels, was not considered to be a subsidy countervailable under current U.S. law because these resources were available at equivalent prices to all industries in Mexico. U.S. industries having concerns about the Commerce determinations pursued Congressional legislative remedies. The natural resource subsidy proposal 2/ that emerged from these efforts was only narrowly defeated in the 98th Congress; however, the issue remains at the center of debate in both the public and private sectors.

This report presents the findings of the Commission on the natural resource pricing policies and practices of foreign countries. It addresses the pricing of natural resources, such as metal ores and, in particular, crude petroleum and natural gas in the energy-rich nations. Information is presented and analyzed on the structure of the foreign metal ores and energy industries; natural resource pricing practices, including government policies where they were identified; the foreign resources affected; and the primary foreign consuming industries benefitting. The benefitting industries discussed in detail are those that have previously been the subjects of Commerce investigations such as steel, cement, lime, carbon black, and ammonia, and includes others which are of growing interest to both industry and Government, such as methyl alcohol, the olefins, and petroleum products. 3/

1/ Final Negative Countervailing Duty Determination Anhydrous and Aqua Ammonia from Mexico, 48 F.R. 28522, June 22, 1983; Final Affirmative Countervailing Duty Determination and Countervailing Duty Order; Carbon Black from Mexico, 48 F.R. 29564, June 27, 1983; Final Affirmative Countervailing Duty Determination and Countervailing Duty Order; Portland Hydraulic Cement and Cement Clinker from Mexico, 48 F.R. 43063, Sept. 21, 1983.

2/ See p. ix of the Executive Summary for a description of the proposal.

3/ "Third World Petrochemicals: How Much Market Clout," Chemical Business, March 1985, pp. 1-15; "OPEC Refining Alarms U.S. Oilman," The New York Times, Nov. 14, 1984, p. D1.

The foreign industries investigated are compared and analyzed in the report in relation to the world and/or U.S. industries. Background information on the counterpart world or U.S. industries are discussed and analyzed in detail in the appendixes. These appendixes cover the world and U.S. crude petroleum and petroleum products (app. C), natural gas (app. D), and metal ores industries (app. E). In addition, an appendix discusses and analyzes the major U.S. crude petroleum and petroleum products, natural gas, and metal ores consuming industries (app. F).

Appendix G to this report utilizes input-output (I/O) analysis to estimate the effect of pricing policies and practices for certain natural resources on production costs of commodities using these resources. The effect on U.S. imports and consequent effect on competing U.S. producers is then estimated. Finally, the effect of the reduced import prices on production costs is estimated for selected U.S. industries that use these imports as inputs. This appendix is referred to throughout the report whenever its analysis provides additional insight into the effects of the foreign practice of dual pricing of natural resources, particularly crude petroleum and natural gas. Appendixes H and I address various aspects of the ammonia situation, including trade with the U.S.S.R.

Since world market conditions and commodity prices change rapidly, the information in this report is essentially a snapshot of a continuously changing scene. The data presented are factual, or derived from actual data and industry practices, although in certain instances figures may not appear to be consistent. For example, although the average U.S. price for natural gas is often given as $2.50 to $3.00 per thousand cubic feet, individual ammonia plants or methanol plants buy natural gas at many different prices. Therefore, even though U.S. natural gas prices may differ within sections or between sections of the report the prices are not inconsistent but reflect actual events for the particular industry being examined.

In the course of the investigation, it was found that natural resource prices were not available in many instances. In an attempt to derive an estimate of these prices or obtain insight into their relative magnitude, the Commission made use of "netback" calculations. In general, netback calculations use prices for processed products as the starting point to estimate input costs to make these products. By subtracting from the known price, estimates of transportation, production and other costs, an estimate of the input cost can be constructed. For example, from the delivered price for a petroleum product, estimates of all costs may be subtracted to arrive at an estimate of the price of the crude petroleum used to make the petroleum product. Similar to selling prices, market values, and production costs, the netback calculation presents information at a certain point in time. The validity of the netback calculation rests to a great extent upon the sources and methods of determining these costs. In spite of the limitations of the netback methodology, it is widely used in natural resource pricing applications.

Often, industry practice is to use netback calculations that are relatively straightforward and involve subtraction of few costs from a known price to estimate input costs. For example, the petroleum industry uses a procedure wherein only source to market ocean transportation costs are subtracted from delivered petroleum product price to obtain an estimate of the relative prices of petroleum products and crude petroleum. No storage marketing, refining, or other costs are netted-out of the delivered petroleum product prices. If the netback price of a petroleum product is below the price of crude petroleum in the producing nation it may be taken as an indication that the nation is effectively discounting the price of crude petroleum by marketing petroleum products. On the other hand, some netback calculations are more complex and essentially attempt to reconstruct costs using surogates, analogies, and third party estimates of costs. 1/ In using this approach, each step and cost are discussed to enable users of the netback calculation to adjust the netback estimate to unique circumstances.

The exchange rates reflected in this report are based on either official statistics of the International Monetary Fund or on those that are implicit in the briefs and submissions to the Commission in relation to this investigation.

Soviet and Chinese prices and costs cited in U.S. dollars in this report are from interested party submissions and from recognized scholars.

Production cost data are also used throughout the report. These data are often difficult to obtain because companies consider production costs confidential and guard their disclosure carefully. Further, often as a result of different customs or practices between industries, or even between some companies in the same industry, the concept of production cost may differ. Additional difficulty in ascertaining production costs occurs in those industries or companies where vertical integration is the norm. Transfer prices, and internal common costs which may be allocated among a number of products, are almost never disclosed. This is particularly true in the case of foreign government-owned or controlled industries where only one government entity may be involved in a string of operations spanning from the wellhead production of crude petroleum and natural gas through to the manufacture of many basic petrochemicals. As in the case of price, production costs change rapidly as process improvements occur and input costs vary.

In spite of these difficulties, production cost data are used to illustrate the importance of energy and energy-derived feedstocks in those industries that produce items whose manufacture is energy-intensive. For an industry that uses a large quantity of energy per unit of output, the price that industry pays for energy will have a large and direct effect on the cost of producing each unit of output, regardless of government policies and practices affecting other factors of production.

1/ App. K.

MAJOR COUNTRY ANALYSIS OF CRUDE PETROLEUM, PETROLEUM PRODUCTS, AND NATURAL GAS PRICING PRACTICES

Canada

Canadian Industry Profile

The crude petroleum and natural gas industry in Canada is largely foreign-owned or controlled. 1/ In 1979, only 8 of the top 25 oil and gas-producing companies in Canada were Canadian-owned and, overall, about 26.1 percent of the total industry was under Canadian ownership or control. 2/ Since that time, Canadian ownership or control has increased to 37.2 percent in 1983 under the National Energy Program (NEP) 3/, with a goal of 50 percent by 1990. 4/

Government interests are exercised through Petro-Canada, a Government-owned organization, which was created in 1975 to observe the industry. The firm now has substantial interests in all phases of the industry, ranging from domestic exploration, marketing, and production to downstream production. 5/ By 1981, after several acquisitions, Petro-Canada was ranked fourth among the major companies in the industry as shown in the following tabulation: 6/

1/ "The level of foreign ownership is given by the proportion of total voting shares of a Canadian company that is held either directly or indirectly by nonresidents. A company is said to be foreign-controlled when 50 percent or more of its shares are held directly or indirectly,". Economic Council of Canada, Connections: An Energy Strategy for the Future, 1985, p. 195.

2/ United States International Trade Commission, Foreign Industrial Targeting and its Effects on U.S. Industries Phase III: Brazil, Canada, The Republic of Korea, Mexico and Taiwan, USITC Publication No. 1632, January 1985, p. 117.

3/ National Energy Program, started in October 1980, stresses energy security for Canada, fairness in energy pricing and the distribution of revenues, and increased Canadian control of the industry.

4/ Energy, Mines and Resources Canada, The National Energy Program: Update 1982 A Summary; 1982, p. 10.

5/ Economic Council of Canada, Connections: An Energy Strategy for the Future, 1985, p. 22.

6/ Energy, Mines and Resources Canada, The National Energy Program: Update 1982 A Summary; 1982, p. 11.

Rank	Foreign controlled	Canadian controlled
1	Imperial (1)	
2	Gulf (2)	
3	Texaco (3)	
4		Petro-Canada (7) 1/
5	Shell (4)	
6	Amoco (5)	
7		Dome(12) 2/
8	Mobil (6)	
9	Suncor (10)	
10	Chevron Standard (9)	
11		Pan Canadian (11)
12		Canterra (14) 3/
13	Canadian Superior (13)	
14	Canada Cities (17)	
15		Noreen (15)

1/ Includes Petrofina.
2/ Includes Hudson's Bay Oil and Gas.
3 Includes Aquitaine, CDC Oil and Gas Texasgulf.

Note.--Figures in parentheses indicate ranking in 1979.

The major share of the reserves and the production of crude petroleum (including synthetic crudes) and natural gas is concentrated in the Western Canada Sedimentary Basin, one of the six major petroleum regions in Canada. It has accounted for approximately 70 percent of the domestic hydrocarbon resources discovered to this day. 1/ Alberta, located in the Western Basin, is the primary producing province, having accounted for about 86 percent of Canada's total production of crude petroleum and natural gas in the past 10 years. 2/ The synthetic crude produced in Alberta is primarily obtained from Albertan oilsand.

Exploration is presently underway in the frontier regions, i.e. the Beaufort Sea/Mackenzie Delta Basin, the Arctic Islands, and the Eastern Canada Offshore. These regions are portions of federally-controlled lands in the territories and offshore, known as "Canada Lands".

Estimated proved reserves of crude petroleum in Canada amounted to 7.08 billion barrels in January 1985. This was an increase of 5.2 percent from 6.73 billion barrels in the prior year. The estimated proved reserves of natural gas stood at 92.3 trillion cubic feet, compared with 90.5 trillion cubic feet in January 1984.

In most of the post-World War II era, Canada has attracted a large amount of foreign direct investment in all domestic industries. In 1978, the United States accounted for 79.4 percent of such investment and the United Kingdom

1/ Connections, op cit., p. 30.
2/ Ibid.

for another 9.3 percent. The Canadian petroleum and gas industry is largely foreign-owned and controlled. 1/

In the 1960's, Canadians became increasingly sensitive to the potential impact that foreign investment could have on the Canadian economy. Following the report of a task force on foreign direct investment in Canada, the Foreign Investment Review Act was passed in 1973. The Act established the Foreign Investment Review Agency (FIRA) to screen new investments in Canada in order to ensure maximum local advantage.

As a result, Canada started to be viewed as a less advantageous place to invest. This viewpoint has been recognized by the leadership of the new government, which went on record as wanting to distinguish its position on foreign investment from that of the previous government. Joint ventures and industrial partnerships with foreign companies and entrepreneurs were to be encouraged. 2/ In December 1984, new legislation was introduced into the Canadian Parliament to change the name of FIRA to Investment Canada. The new name is to underscore the agency's new mandate to encourage investment. Its role is intended to be positive rather than restrictive in order to emphasize the Government's efforts to foster and encourage investment. The new agency will continue to review major investment proposals of national economic significance. It will also assume the more positive role of facilitating "job-creating investment" and assisting in identifying new ideas, new technologies, and new export potential in investment opportunities for Canada. Priority sectors where increased capital investment is expressly desired are energy, rail transportation, applied technology, and basic infrastructure. The basic criterion of determining whether proposed investments are of "significant" benefit to Canada has been altered. The new legislation requires only that proposed investment be of "net" benefit to Canada. 3/

Natural Resources Pricing Policy

The pricing practices for crude petroleum and natural gas in Canada are in a state of flux. The NEP, introduced in the October 1980 budget, was intended to keep domestic Canadian prices for crude petroleum and natural gas below world levels to "provide a competitive advantage for Canadian industries." 4/ However, world crude petroleum price declines combined with the NEP practices, actually resulted in some Canadian energy prices rising above world levels. Modifications designed to correct these pricing practices are now being implemented.

It should also be noted that many Provincial Governments in Canada also have powers and practices that affect crude petroleum and natural gas prices. Often these practices, overlaid with national policies, make Canadian pricing systems difficult to follow.

The NEP was launched in a period of escalating crude petroleum prices and growing Canadian nationalism. The energy program was to provide for among other things, "predictable" and "gradual" increases in crude petroleum prices

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1/ Foreign Industrial Targeting . . ., op cit., p. 82.

2/ Ibid., pp. 84-86.

3/ Ibid.

4/ Energy, Mines, and Resources Canada, The National Energy Program: 1980, p. 25.

in Canada, that would reflect conditions in Canada, to foster the development of new supplies and encourage development, while allowing Canadian consumers time to adjust." 1/ The Government sought to boost Canadian nationalism with a series of measures, ranging from taxes to incentives, designed primarily to provide revenues to enable the Canadian government and domestic firms to increase Canadian ownership and control of the sector. Energy security was also stressed. To achieve the goals of the NEP, the Government instituted a four-pronged program addressing pricing, taxes, incentives, and Canadianization.

Crude petroleum

Pricing of conventional crude petroleum under the NEP stipulated that the price should not exceed 85 percent of the lesser of the world price and the average U.S. price. To achieve this, the wellhead price for a barrel of conventional crude was to increase by $1 every 6 months until the end of 1983. 2/ At that time, it would increase by $2.25 every 6 months until the wellhead price reached the quality-determined level of the oilsands "reference price." The reference price for synthetic crude was to be the lesser of $38 per barrel (effective January 1, 1981, and increased annually by the Consumer Price Index), or the international price, as illustrated in the following tabulation: 3/

Period	Conventional oil	Reference prices 1/	
		Oilsands 2/	Tertiary oil
	Dollars per barrel		
1980:			
December	16.75		
1981:			
January	17.75	38.00	30.00
July	18.75		
1982:			
January	19.75	41.85	33.05
July	20.75		
1983:			
January	21.75	45.80	36.15
July	22.75		
1984:			
January	25.00	49.85	39.35
1986:			
January	35.25	58.55	46.20

1/ To be escalated by reference to increases in the Consumer Price Index.
2/ Cannot exceed international price.

1/ Ibid., p. 23.
2/ Unless otherwise stated, in this section dollars will mean Canadian dollars; the Canadian dollar has been valued at approximately 75 to 85 U.S. cents during 1980-85.
3/ Price Waterhouse, The National Energy Program, 1981, p. 30.

In September 1981, the Federal Government and the Government of Alberta signed the Canada-Alberta Energy Pricing and Taxation Agreement (EPTA), effective through December 31, 1986. This agreement, along with others signed with the other provinces, tended to revise the pricing plan outlined in the NEP. A primary reason for the changes was the discovery that some NEP procedures were resulting in Canadian energy prices higher than world prices. Energy-intensive industries, particularly the Canadian petrochemical industry, became increasingly concerned about a loss of competitiveness. 1/

The EPTA, designed to address these concerns, established two pricing categories for crude petroleum: the Conventional Old Oil Price (COOP) and the New Oil Reference Price (NORP). Under the terms of the agreement, COOP prices (originally applying to crude petroleum discovered prior to January 1, 1981 and then amended in 1983 to that discovered prior to 1974) were adjusted to 75 percent of the international price for crude petroleum, including transportation costs to Montreal. NORP prices, which also apply to synthetic crude petroleum, crude petroleum obtained by more expensive recovery methods, and crude petroleum produced in hostile environments, such as production in frontier regions, were tied to world prices, with adjustments for differences in quality. The difference between the COOP prices and NORP price, called the NORP supplement, is the amount reimbursed by the Government to the producers of NORP crude petroleum after the product is sold at COOP price. 2/ The funds for the NORP supplement are drawn from the revenues derived from the Petroleum Compensation Charge (PCC), which is paid by the refiners. The PCC compensates for the use of imported crude petroleum, crude petroleum obtained by more expensive recovery methods, and synthetic crude petroleum. Refiners also pay the Canadian Ownership Special Charge (COSC), which is levied on all crude petroleum and natural gas consumption in Canadian. An amendment to the EPTA in 1983 froze the wellhead price of COOP at $29.75 per barrel. The development of the prices of old crude petroleum and new crude petroleum in February 1984 are shown in the following tabulation (per barrel): 3/

1/ U.S. International Trade Commission, The Probable Impact on the U.S. Petrochemical Industry of the Expanding Petrochemical Industries in the Conventional-Energy-Rich Nations, USITC Publication No. 1370, April 1983, p. 98.

2/ From a brief submitted by Shell Canada Ltd., pertaining to the subject of the investigation on Feb. 19, 1985; Connections, op. cit., p. 50.

3/ Connections, op. cit., p. 161.

Old crude petroleum:	
Wellhead price----------------------	$29.75
Canadian ownership special charge----------------------------	+1.15
Transportation from Alberta to Toronto----------------------------	+1.66
Petroleum compensation charges 1/----	+3.76
Consumer blended crude petroleum price at Toronto 2/---------------	36.32
New crude petroleum:	
Actual world price at Toronto 3/-----	40.04
Transportation from Alberta to Toronto------------------------	-1.66
Wellhead price----------------------	38.38

1/ These charges are as follows (per barrel); import levy, $1.36, NORP levy, $1.64; Syncrude levy, $0.76.
2/ The consumer blended price is now least 92 per cent of the world price at Toronto.
3/ Based on 36-40 API crude petroleum (D2S2).

Canadian crude petroleum exports are priced competitively with the current price in the export market by the National Energy Board (NEB). The NEB first determines the amount that can be exported after domestic requirements are covered, and then adds an "export charge" to the transportation charges and the COOP received by the producer. The export charge is collected by the Government and changes from month to month. The producer also receives the NORP supplement. In February 1985, the export charge for light Canadian crude petroleum was $2.30 per barrel. 1/ An example of the development of the field price value for Canadian crude petroleum sold in the U.S. market is shown in the following tabulation (in dollars per barrel): 2/

COOP price----------------------------------	$29.75
Export charge-------------------------------	2.30
Transportation:	
Edmonton to U.S. border-------------------	.35
Field gathering charge to Edmonton--------	.57
Total----------------------------------	32.97

Natural gas

The pricing of natural gas under the NEP was a two-tier system in which exports were priced higher than the gas supplied to domestic consumers. The signing of the EPTA further complicated the procedure by revising the pricing practice such that the domestic price was itself broken into two levels. The wholesale price of domestically consumed natural gas in Toronto and eastern

1/ Shell, op. cit.
2/ Ibid.

Canada (via downstream and the TransCanada pipeline) was kept at 65 percent of the refinery acquisition cost of crude petroleum in an effort to encourage the use of natural gas instead of crude petroleum. 1/ Consumers in Ontario, for example, would pay approximately US$2.90 per thousand cubic feet for their natural gas. However, prices at the upstream end of the pipeline, in Alberta, where prices are negotiated based on current local market conditions, could be as low as US$1.65 per thousand cubic feet for intraprovincial users. This was the first time in Canadian history that different pricing systems existed at each end of the pipeline. 2/ The incentive for a natural gas-intensive industry to locate in Alberta is large under this pricing scheme. 3/ The development of the natural gas price in Ontario in February 1984 is shown in the following tabulation (in dollars per thousand cubic feet):

Average field price in Alberta----------------	2.94
Export flowback--------------------------------	-0.43
Market-development incentive payments----------	-0.06
Average field price in Alberta for domestic sales--	2.45
Transmission in Alberta (NOVA)-----------------	+0.33
Alberta "border price"-------------------------	2.78
TransCanada pipeline toll----------------------	+0.94
Transportation assistance program--------------	-0.01
Natural gas and gas liquids tax (now zero)-----	+ -
Canadian ownership special charge--------------	+0.14
Toronto wholesale price------------------------	3.85
Distribution margin----------------------------	+1.08
Average price at the burner tip----------------	4.93

The export price of natural gas was tied to the value of crude petroleum imported into Canada. In effect, it was given a "substitution value" since Canadian natural gas sold for export could be used to back out imported crude petroleum. 4/ The producer would receive the domestic price and the added export charge would be collected by the Government and distributed equally to the producing companies as an "export flowback" to encourage domestic as well as export sales. 5/ In July 1983, a two-tiered export system was initiated, called the "volume-related incentive price" (VRIP). The base value, corresponding to a base volume defined as generally equivalent to 50 percent of annual export allowances, was kept at US$4.40 per million Btu's. This was a decrease from the base value of US$4.94 per million Btu's prior to April 1983, reflecting the decreasing costs of importing crude petroleum into Canada. Incremental sales above the base volume were priced at US$3.40 per million Btu's as an incentive.

Negotiation of the export price was initiated in November 1984. The negotiated prices have to show evidence of increased economic benefits to Canada, compared to the Government-administered prices, before the negotiated prices can be approved. Prices determined under the VRIP program are in

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1/ From submission from Novacor, Chemicals Ltd., concerning the subject of the investigation on Feb. 14, 1985.

2/ Connections, op. cit., p. 25.

3/ Ibid., p. 161.

4/ Energy, Mines, and Resources Canada, "Communique: Government Approves Negotiated Pricing Arrangements for Natural Gas Exports", Nov. 1, 1984.

5/ Connections, op. cit., p. 69.

effect until the contract price is finalized. The base volume was amended to be the lesser of the 50 percent rule or 1981-82 actual sales. The average export price is expected to drop to about US$3.25 per million Btu's under negotiated pricing, with the base export price being set at the Toronto City Gate Price of US$3.15 per million Btu's.

Lower priced exports are expected to increase the Canadian share of the U.S. market. 1/ Exports transported through the "Prebuild" section of the Alaska Natural Gas Transportation System (ANGTS) are exempt from the minimum export price and are expected to average approximately US$2.97 per million Btu's. Spot market sales have also been initiated. 2/

The Federal Government instituted the Payment Incentives Program (PIP) which provided incentives for crude petroleum exploration development, particularly in the Canada Lands. PIP grants, which generally cover up to 25 percent of exploration costs, can cover up to 80 percent of such costs for companies with at least 65 percent Canadian ownership. The Province of Alberta administers a petroleum incentives program of its own. 3/ This is an illustration of the point previously made that it is difficult to follow Canadian pricing policies. Additional incentive programs have been initiated by the Federal Government since May 1984. Firms that increase their consumption of natural gas by over 75 percent of that consumed in the 1982-83 period can obtain a discount of 35 cents per megajoule. In addition, natural gas exported to customers not previously serviced is eligible for a reduced border price. 4/ As previously indicated, this practice, combined with others, confers a significant natural gas cost advantage in industries that use large quantities of natural gas. Many of the large petrochemical producers that use natural gas to make methanol and ammonia are already located or are planning to build plants in Alberta.

A new crude petroleum and pricing agreement was ratified by Ottawa and the Governments of the producing Provinces to "revitalize the Canadian energy industry." 5/ The agreement, which replaces the present pricing system, provides for the complete deregulation of crude petroleum, effective June 1, 1985, by bringing the price of all crude petroleum to market prices, thereby eliminating the designations of COOP and NORP. The pricing system for natural gas is expected to be modified to allow for the creation of a new "market-sensitive domestic pricing system" for natural gas on or before November 1, 1985. 6/ The agreement also provides for a new fiscal regime, which, in turn, "provides for the elimination of a number of Federal oil and gas taxes or charges." 7/ The regime calls for the phasing out of the Petroleum and Gas Revenue Tax (PGRT) for existing production by January 1, 1989, with conventional crude petroleum, natural gas, or natural gas liquids produced after April 1, 1985 not being taxed, the elimination of

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1/ "More Natural Gas from Over the Border," Chemical Week, Dec. 14, 1983, p. 32.

2/ "Canada Moving to Capture Bigger Slice of U.S. Gas Market," Oil & Gas Journal, Jan. 28, 1985, p. 57.

3/ Targeting, op. cit., p. 118.

4/ "Special Natural Gas, LNG/LPG Trade and Technology," Noroil, October 1984, p. 39.

5/ Canadian Embassy, "Canadian Energy Minister Announces New Energy Accord," April 1, 1985.

6/ Platt's Oilgram News, Mar. 28, 1985; "Canadian Energy Minister Announces New Energy Accord," op cit.

7/ "Canadian Energy Minister Announces New Energy Accord," op cit.

the PCC and the COSC, and replacement of the PIP with a program emphasizing reinvestment. 1/

Resources Affected

Crude petroleum

Production of crude petroleum in Canada decreased from 1.42 million barrels per day in 1980 to 1.27 million barrels per day in 1982, or by 11 percent (table 1). The decline was primarily attributed to temporary production cuts in Alberta, marketing problems, lowered product demand, and high inventories at refineries. 2/ In 1982, Alberta accounted for 87 percent of domestic production, Saskatchewan accounted for 9 percent, and the remaining 4 percent came from the Northern Territories, Manitoba, Ontario, and British Columbia. Production increased to 1.32 million barrels per day in 1983, reflecting improvement in the domestic and worldwide economies. The momentum continued into 1984, and production increased by 8 percent to 1.43 million barrels per day.

Exports of crude petroleum decreased by 20 percent during 1980-81, from 205,000 barrels per day to 164,000 barrels per day, mainly due to the worsening world economy and increased domestic demand for Canada light crude petroleum (table 1). Exports then increased annually to 358,000 barrels per day in 1984, as the NEB authorized additional exports of light crude petroleum to prevent growing inventories caused by a slackening in demand. Heavy crude exports increased due to a surplus of heavy crude petroleum as a result of greater production from newly discovered reserves and to increased demand in export markets, as refiners became better able to utilize heavier feedstocks. Since 1983, Canada has been a net exporter of heavy crude petroleum and a net importer of light crude petroleum. 3/

Table 1.--Crude petroleum: Canadian production, exports, imports, and apparent consumption, 1980-84

(Thousands of barrels per day)

Year	Production	Exports 1/	Imports 1/	Apparent consumption
1980	1,424	205	554	1,773
1981	1,285	164	509	1,630
1982	1,270	2/ 214	2/ 339	1,395
1983	1,320	2/ 294	2/ 248	1,274
1984	1,430	2/ 358	2/ 245	1,317

1/ International Energy Annual 1983, Energy Information Administration, p. 30.
2/ Statistics Canada.

Source: Central Intelligence Agency, Handbook of Economic Statistics, 1984; p. 134, except as noted.

1/ The PGRT is a flat-rate tax levied on net operating revenues from all crude petroleum and natural gas production in Canada; "Canadian Energy Minister Announces New Energy Accord," op cit.
2/ International Petroleum Encyclopedia, op. cit., p. 77.
3/ Connections, op. cit., p. 18.

Imports of crude petroleum, in line with the goals of the NEP regarding increased domestic energy self-sufficiency, have decreased by 56 percent over the last 5 years (table 1). Imports in 1980 amounted to 554,000 barrels per day, compared with 245,000 barrels per day in 1984. Greater conservation and substitution of natural gas where possible have reduced the demand for imported crude petroleum.

Apparent consumption of crude petroleum in Canada decreased during 1980-83 by 28 percent, from 1.79 million barrels per day to 1.27 million barrels per day (table 1). This is line with the goals of the NEP, as stated earlier. Major reasons for the decline, particularly in 1983, include the economic downturn, high prices of crude petroleum, increased energy conservation, and the emphasis on converting to natural gas use. Crude petroleum held a higher share of the energy market than natural gas during 1980-83 as, in 1983, crude petroleum held 37 percent of the market, compared with 22 percent for natural gas. A recovery mainly attributed to the improved domestic economy occurred in 1984, as apparent consumption increased to 1.32 million barrels of crude petroleum per day. 1/

Natural gas

Production of natural gas in Canada decreased from 2.47 trillion cubic feet in 1980 to 2.43 trillion cubic feet in 1981, or by 1.6 percent (table 2). The decline reflected decreased exports of natural gas to the United States, resulting in increased domestic inventories, as well as lowered domestic demand. 2/ Production increased by 3 percent in 1982, to 2.50 trillion cubic feet, resulting in a surplus of natural gas. As a result, the NEB revised its guidelines on surpluses and allowed increased exports.

The increase in production of about 11 percent between 1983 and 1984 was accounted for by both the improving economy, the NEB decision to allow greater exports, and the revision of export laws to allow for negotiated export prices. Some Canadian observers expect this new climate to result in a continued increase in exports.

Exports of natural gas decreased in general during 1980-83 by 5.5 percent from 797 billion cubic feet to 753 billion cubic feet (table 2). High export prices, the economic slowdown, a softening in the U.S. export market, and declining crude petroleum prices were some of the major factors causing the deteriorating situation. 3/ New programs were initiated in an effort to lower export prices and maintain a competitive position in the U.S. export market. This resulted in a modest upturn in exports in 1984, but the full effects are not expected to be felt until this year.

1/ "Increasing Optimism for Oil and Gas," Petroleum Economist, October 1984, pp. 376-378.

2/ Ibid.

3/ Norman V. Breckner, Leonard B. Levine, Evolution of United States-Canadian Gas Trade: Regulation to Competition", prepared for presentation at the 1984 North American Conference of the International Association of Energy Economists, Nov. 6, 1984.

The future export market of natural gas is also expected to increase because of exports of liquefied natural gas (LNG). As of January 1985, negotiations were underway between Canada and Japan concerning the start-up of a $3.5 billion project to ship LNG from Canada to Japan. 1/

Table 2.--Natural gas: Canadian production, exports, imports, and apparent consumption, 1980-84

(Billion cubic feet)

Year	Production	Exports 1/	Imports 2/	Apparent consumption
1980	2,465	797	0.157	1,668
1981	2,430	762	0.112	1,668
1982	2,500	783	0.172	1,717
1983	2,375	2/ 753	0.142	1,622
1984	2/ 3/ 2,648	2/ 799	0.093	1,849

1/ International Energy Annual 1983, Energy Information Administration, p. 70.
2/ Statistics Canada.
3/ Estimated.

Source: Central Intelligence Agency, Handbook of Economic Statistics, 1984; p. 134, except as noted.

Imports of natural gas over the last 5 years have been extremely small and have averaged 128 million cubic feet (table 2). Canada is self-sufficient in natural gas.

Apparent consumption of natural gas during 1980-84 fluctuated between a low of 1.62 trillion cubic feet in 1983 and a high of 1.85 trillion cubic feet in 1984 (table 2). 2/ The increase in consumption in 1984 was caused, at least in part, by the various programs designed to make gas an attractive energy source.

Primary Consuming Industries That Benefit

Ammonia

Canadian industry profile.--There are nine major producers of ammonia in Canada, with a combined annual capacity of 3.16 million metric tons. Capacity of 380,000 metric tons is expected to be added in 1985. The producers are primarily located in Alberta and Ontario, with one each in British Columbia and Manitoba.

Canadian market.--The production of ammonia during the period from 1980 to 1984 exhibited a continual upward climb, except for a decrease in 1982. For the entire period, it increased almost 41 percent (table 3).

1/ "Talk Extended on Canadian LNG Project," Oil & Gas Journal, Jan. 7, 1985.
2/ Petrochemical Task Force Report, op. cit.

Exports of anhydrous ammonia, which played a part in the growth of production, increased by 91 percent between 1980 and 1984, from 435,000 metric tons to 832,000 metric tons. The majority of these exports go to the United States, principally because U.S. firms have facilities in Canada; this production is considered to be "captive" in nature by the U.S. firms. 1/ The growth may also be attributable to an increased need for fertilizer

Table 3.--Ammonia: Canadian production, exports, imports, and apparent consumption, 1980-84

(Thousands of metric tons)

Year	Production	Exports	Imports	Apparent consumption
1980	2,555	435	33	2,153
1981	2,654	468	41	2,227
1982	2,508	520	32	2,020
1983	2,888	675	41	2,254
1984	3,600	832	19	2,787

Source: "Rebound in Chemicals May Be Grinding to an Early Halt," Chemical and Engineering News, Dec. 17, 1984, p. 53.

materials in certain areas of the United States proximate to Canadian fertilizer production facilities, and increased Canadian productive capabilities as a result of capacity expansion. 2/

Canadian imports, consistently much smaller than exports during 1980-84, amounted to an average 37,000 metric tons during 1980-83 and then declined further to 19,000 metric tons in 1984. Increased domestic capacity is at least partially responsible for this decrease.

Apparent consumption of ammonia showed an upward trend during 1980-84. Domestic demand has been strong in Western Canada and future demand for nitrogen facilities is expected to increased by about 6.5 percent annually. 3/

Effects on production costs.--Comparison of production costs in Alberta and the on U.S. gulf coast shows that if production costs for U.S. gulf coast facilities are set equal to 1.0, the production cost index for Alberta would be 0.75. 4/ This is further illustrated in the following tabulation, which presents an estimate of ammonia production costs in Western Canada in 1985 (in U.S. dollars per short ton): 5/

1/ Brief by Charls E. Walker Associates, Inc., Feb. 19, 1985, on behalf of the Committee of Domestic Nitrogen Producers.

2/ U.S. International Trade Commission, The Probable Impact on the U.S. Petrochemical Industry of the Expanding Petrochemical Industries in the Conventional-Energy-Rich Nations, USITC Publication No. 1370, April 1983, p. 93.

3/"Canadian Ammonia Faces Some Big Hurdles," Chemical and Engineering News, Oct. 18, 1982, p. 16.

4/ Richard P. Kendon, op. cit.

5/ Data compiled from industry sources.

Feedstock and fuel	$59.00 -	$70.00
Catalysts and chemicals	1.00 -	2.00
Cooling water	2.00 -	4.00
Electricity	0.15 -	0.35
Operating labor	1.00 -	3.00
Maintenance -		
materials and labor	3.50 -	7.00
General plant overhead	0.90 -	2.50
Insurance and property taxes	1.00 -	3.00
Depreciation	11.00 -	18.00
Total production cost	79.00 -	109.85

The major cost advantage to Canada is in the pricing of the feedstock, which represents about 70 percent of the total cost. As shown in Appendix F, the total production cost in the United States ranges from about $92.00 to $170.00, with feedstock costs in the range of $71.00 to $114.00. Cost advantages also exist in regard to electricity and cooling water. These advantages are partially offset, however, by higher costs for transportation, depreciation, and maintenance.

Effects on competitiveness.--Many factors affect the competitiveness of Canadian petrochemical producers compared with U.S. gulf coast producers. For example, the industry has historically operated at about a 15 to 20 percent disadvantage on the cost of capital, compared to companies on the U.S. gulf coast. The relatively hostile Canadian climate also causes increased costs associated with the construction and operation of plants. 1/ Constructions costs alone typically are 20 to 30 percent above U.S. gulf coast costs. 2/

Transportation costs also are a prime factor affecting the competitiveness of Canadian producers in U.S. markets. Transportation costs between Alberta and Chicago are about 50 percent higher than those between the U.S. Gulf Coast and Chicago. 3/ Overall, on current Canadian exports they average about 10 percent of the price of the product, and in some cases may reach as high as 35 percent of the price. 4/ The major production cost advantage Canadian petrochemical producers have enjoyed was in the area of feedstocks and energy. A larger part of this advantage was nullified by the implementation of pricing practices specified in the NEP, which tended to increase Canadian energy and feedstock prices at a time of generally declining world prices. This situation is changing and is expected to continue to change as the new pricing practices previously discussed for crude petroleum and natural gas are phased in. As a result, Canadian exports are expected to become stronger and more competitive in the U.S. and other world markets. These changes are expected to be particularly significant for the methanol and ammonia industries. 5/

1/ "NPRA Looks at its Neighbors," Manufacturing Chemist, June 1983, p. 49; Petrochemical Task Force Report, op.cit., p. 33.

2/ Ibid.

3/ The Probable Impact on the U.S. Petrochemical Industry of the Expanding Petrochemical Industry, op. cit., p. 91.

4/ Petrochemical Task Force Report, op. cit., p. 30.

5/ From the submission by Charls E. Walker & Associates Inc. concerning the subject of this study on Feb. 19, 1985.

Effects on resource allocation.--An ammonia plant will consume about 40 thousand cubic feet of natural gas for each metric ton of ammonia produced. 1/ In 1984, Canada exported about 832,000 metric tons of ammonia, the production of which consumed about 33.3 billion cubic feet of natural gas. The cost of this amount of natural gas in Western Canada was about $54.9 million, or about $66 per metric ton, compared to about $103.2 million, or about $124 per metric ton, along the U.S. Gulf Coast. It is probable that exports of ammonia would not have been made without the benefit of natural gas priced at below U.S. levels. Other costs of production in Canada, including capital, construction, and operation costs are higher and are offset by the savings from the use of lower priced natural gas. In addition, part of the savings are also used to defray transportation costs from Canada to the U.S. midwest, which are higher than from the U.S. gulf.

Ethylene

Canadian industry profile.--Ethylene produced in Canada is primarily produced by four companies with plants in Alberta, Ontario, and Quebec. Their combined annual capacity in 1983 was equal to 1.5 million metric tons. Since 1983, one of the firms has added another ethylene plant in Joffre, Alberta, with a capacity of 680,000 metric tons.

Canadian market.--The production of ethylene generally increased between 1980 and 1984, rising from 1.2 million metric tons in 1980 to 1.5 million metric tons in 1984 (table 4). Fluctuations during this period primarily mirrored changes in the Canadian and world economies. The strong recovery in production between 1983 and 1984 may be primarily attributed to stronger markets for ethylene derivatives, buoyed by a general improvement in many of the world's economies. 2/ However, in October 1984, one of the major firms

Table 4.--Ethylene: Canadian production, and apparent consumption, 1980-84 1/

(1,000 metric tons)

Year	Production	Apparent consumption
1980	1,197	1,197
1981	1,330	1,330
1982	1,013	1,013
1983	1,196	1,196
1984	1,460	1,460

1/ There are negligible imports and exports of ethylene from Canada, as most trade of ethylene is in the form of ethylene derivatives, such as polyethylene, ethylene glycol, ethylene dichloride, and ethylene oxide.

Source: Statistics Canada.

1/ Industry sources.
2/ "Kanadas Chemie Atmet Wieder Aus," Chemische Industry, March 1984, pp. 141-144.

idled one of its plants due to the oversupply of ethylene on the world markets, and the higher price it had to pay for its natural gas. 1/

Canada exports a negligible amount of ethylene. Practically all domestic production is consumed internally to manufacture ethylene derivatives. 2/ To an extent however, this statement can be misleading, for even though the ethylene is consumed domestically, a large volume of the derivatives produced are not consumed domestically.

Imports of ethylene have decreased in general over the last 5 years, from 146 metric tons in 1980 to 88 metric tons in 1984. Most have been via pipeline from the United States; they are essentially confined to border installations and primarily serve to balance supply with demand. Overall the decline in imports reflects an increased domestic supply as well as an effort to reduce imports. Apparent consumption of ethylene in Canada followed the same trend as production, since most of it was consumed internally. Increased demand in the ethylene-derivatives market boosted consumption.

Effects on production costs.--Alberta, because of the overlay of Provincial and National Government pricing practices, probably now has the lowest priced natural gas in Canada. Since feedstock costs represent about 80 to 85 percent of the production costs of ethylene 3/, the commercial significance of locating the plant in Alberta is clear, except for firms that must buy the natural gas from shippers at a regulated price. 4/

In 1982, the Albertan price of Canadian ethane was $10.50 per barrel versus $8.50 per barrel on the U.S. gulf coast, primarily because of the difficulties in pricing practices previously discussed. 5/ As of January 1985, the Albertan price of ethane decreased to within 5 percent of the U.S. Gulf Coast spot price of about 20 cents per gallon. 6/ If the production costs of ethylene in Alberta and the U.S. Gulf Coast are compared, with those of the U.S. gulf coast being set equal to 1.0, the current production cost index for Western Canada would be 0.84. 7/ This is in spite of other production costs, including insurance, taxes, and maintenance, being higher in Canada, primarily due to the harsh environment. 8/

Estimates indicate that the difference between the production cost of ethylene in Alberta compared with that from the U.S. Gulf Coast in 1983 was $25 per metric ton in favor of Canada. This differential is expected to

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1/ "Gloom in Petrochemicals," Financial Post, Oct. 27, 1984, p. 27.

2/ G.R. Bunting, presentation prepared for the Energy Bureau Inc. Conference, Houston, TX, Sept. 10, 1984.

3/ "Gloom in Petrochemicals," op. cit., p. 27.

4/ Industry sources.

5/ The Probable Impact on the U.S. Petrochemical Industry of the Expanding Petrochemical Industries in the Conventional-Energy Rich Nations, op. cit., p. 98.

6/ From transcripts in regard to Probable Economic Effect of Providing Duty Free Treatment for Selected Imports from Canada at the public hearing held on January 15, 1985, p. 156.

7/ Richard P. Kendon, Presentation prepared for the Chemical Marketing Research Association May 1-10, 1984, entitled "The Chemical Industry: An Emerging Phoenix."

8/ Petrochemical Task Force Report, op. cit., p. 33.

increase as much to $230 per metric ton by 1990. 1/ Future expected changes in pricing practices would allow for even greater margins, thereby increasing competitiveness, which will probably result in increased exports of ethylene derivatives.

Effects on competitiveness.--As in the case of ammonia, Canadian ethylene producers experience higher costs related to insurance, construction, and operation of their plants than do their counterparts on the U.S. Gulf Coast. If fixed costs on the Gulf Coast are set equal to one, the fixed-cost index in Alberta is estimated to be approximately 1.12. 2/

Effects on resource allocation.--As mentioned previously, practically all domestic production of ethylene is consumed internally, with a negligible amount exported. Thus, the amount of natural gas allocated to the production of ethylene is dependent on domestic demand for ethylene to produce ethylene derivatives, which are both consumed internally and exported. Increasing demand for such exports could result in increased production of ethylene and, therefore, in increased consumption of natural gas. Exports of polyethylene from Canada were valued at $C165 million in 1984, an increase of about 11 percent from $C150 million in 1983.

Methanol

Canadian industry profile.--There are currently three major producers of methanol located in Alberta and British Columbia. Their combined annual capacity in 1983 was 1.87 million metric tons.

Canadian market.--Methanol production increased during 1980-84 by 309 percent, from 126 million gallons to 515 million gallons (table 5). A large share of the increased production came from facilities located in Alberta that take advantage of lower price for the natural gas, which accounts for the major portion of the cost to produce methanol.

Table 5.--Methanol: Canadian production, exports, and apparent consumption, 1980-84 1/

(In millions of gallons)

Year	Production	Exports	Apparent consumption
1980	126	63	63
1981	132	67	65
1982	278	223	55
1983	506	444	63
1984	2/ 515	448	2/ 67

1/ There are negligible imports of methanol into Canada.
2/ Estimated.

Source: Public submission from Borden Inc. concerning the subject in Investigation No. 332-196 on Jan. 31, 1985.

1/ "Canadian Petrochemical Industry, Reaction to Policy", op. cit., p. 16.
2/ Richard P. Kendon, op. cit., p. 48.

Exports of methanol from Canada increased dramatically during 1980-84, from 63 million gallons to 448 million gallons, or by 611 percent. A significant part of this increase is accounted for by the growth in Canadian exports to the United States. The concentration of Canadian exports to the United States was partially due to the increased Canadian production capacity, which is "captive" U.S. production. 1/

Methanol is presently in oversupply in the world. The situation was aggravated when the crude petroleum crisis eased, resulting in decreased demand for methanol as an alternative fuel. A negligible amount of methanol is imported into Canada.

Apparent consumption of methanol in Canada remained relatively constant during 1980-84. The rise in production went to serve the export market and not to meet any appreciable rise in domestic consumption.

Effects on production cost.--In the case of methanol, the feedstocks, primarily natural gas and some petroleum products, constitute 50 percent of production costs. 2/ Since natural gas prices in Alberta and British Columbia are probably the lowest in Canada, producers in these provinces have a production cost advantage in relation to producers on the U.S. Gulf Coast. The Western Canada Provinces also have production cost advantages owing to lower costs for electricity and cooling water. However, other operating costs in Canada are are often higher, including maintenance, taxes, insurance, and overhead. A representative range of these costs are shown in the following tabulation (in cents per gallon of methanol produced):

Feedstock and fuel 1/--------	15 - 23
Other utilities, cooling water, catalyst, and chemicals------------------	2 - 4
Labor------------------------	1 - 2
Maintenance------------------	6 - 8
Fixed costs, depreciation, overhead, and other administrative costs-------	5 - 21
Total--------------------	29 - 58

1/ Natural gas-based.

Comparable costs for the U.S. methanol industry are shown in Appendix F.

Effects on competitiveness.--Two principal advantages are conferred on Canadian producers because of their lower production cost. First, they are able to absorb higher transportation and distribution costs in order to secure new or expanded markets. This means they can market at greater distances from their plants and still obtain a greater profit than they could if their production cost was higher. Second, the production cost advantage can enable

1/ "Methanol Producers See Nowhere Else to Go But Up, Though Imports Are a Problem," Chemical Marketing Reporter, Feb. 4, 1985, p. 3.
2/ Novacor submission, op. cit., p. 3.

them to reduce prices to the level necessary to achieve the markets desired. To lower prices further would appear unjustified and would only tend to reduce profit margins.

Effects on resource allocation.--The Canadian methanol industry is estimated to have used between 50 and 78 billion cubic feet of natural gas as feedstock and fuel in 1984; 87 percent of this natural gas (43-68 billion cubic feet) was exported as methanol. The difference between the cost of the natural gas to the methanol producers ($1.50 to $2.00 per thousand cubic feet) and that of the natural gas if it would have been exported as natural gas ($4.00 to 4.50) would total $105 to $170 million for 1984. It is probable that exports of methanol would not have been made without the benefit of natural gas priced at below U.S. prices. These lower natural gas prices provided the Canadian producers the capability to offset higher production costs in the areas of cost of capital, and plant maintenance and operation. The savings in natural gas costs also allowed the producers to ship over longer distances and still maintain competitive selling prices in the United States.

Steel

Canadian industry profile.--Canada was the 15th largest producer of raw steel in the world in 1983, with total production of 14.0 million short tons. Canada ranked as the second largest supplier (after Japan) of steel products to the United States in 1984, with 3.1 million short tons. Production of raw steel in Canada declined during 1980-82, falling 26 percent to 13.0 million short tons before rising to 16.2 million short tons in 1984 (table 6). Canada's capacity to produce raw steel rose 14 percent during 1980-84, from 19.6 million short tons to 22.4 million short tons. Capacity utilization during the five years declined 61.3 from 89.6 percent in 1980 to 61.3 percent in 1982, before increasing to 72.3 percent in 1984.

Table 6.--Raw steel: Canadian production, capacity, and capacity utilization, 1980-84

Year	Production	Production capacity	Capacity utilization
	1,000 short tons	1,000 short tons	Percent
1980	17,528	19,566	89.6
1981	16,135	21,715	74.3
1982	12,966	21,155	61.3
1983	14,030	22,200	63.2
1984	1/ 16,203	22,400	72.3

1/ Preliminary data.

Source: Production compiled from data of the International Iron & Steel Institute; preliminary data from Statistics Canada. Capacity compiled from data in The Iron and Steel Industry, Organization for Economic Cooperation and Development (OECD), various editions, and the OECD report, The Steel Market in 1983 and the Outlook for 1984.

Approximately 67 percent of Canada's steel was produced in basic oxygen furnaces in 1983, while 26 percent was produced in electric furnaces, and 7 percent was produced in open hearth furnaces. 1/ The Canadian steel industry in 1982 was composed of five integrated producers, two nonintegrated iron producers, two plants with rolling mills, and 16 nonintegrated steel producers. Industry plants are concentrated along the St. Lawrence River and near the Midwestern states, the largest U.S. steel consuming region. Three integrated producers together account for over 70 percent of total Canadian raw steel capacity.

Capital expenditures on construction and machinery fluctuated from C$584 (US $489) million in 1980 to C$710 (US $599) million in 1981 and dropped to C$198 (US $161) million in 1983, and are estimated at C$227 (US $172) million in 1984 according to Statistics Canada. 2/ Industry employment declined from 53,200 in 1980 to approximately 47,000 in 1983, or by 12 percent.

Canadian market.--Apparent consumption declined from 11.3 million short tons in 1980 to 8.1 million short tons in 1982. The decline reflects a reduction in the use of steel and a drop in consumers' steel inventories, which had risen during 1981. In 1984, apparent consumption rose to 11.7 million short tons reflecting improved economic conditions. Imports peaked at 3.4 million short tons in 1981, then fluctuated downward to 2.1 million short tons in 1984 (table 7). Exports fell irregularly from 3.9 million short tons in 1980 to 3.4 million short tons in 1984. The major export market for Canadian steel products was the United States, which accounted for 71 percent of total exports during 1980-83. Secondary markets were the Far East, Western Europe and South America. Producers of flat rolled products experienced an improvement in shipments in 1983 and in the first half of 1984. This was the result of a higher demand for consumer goods, particularly autos, and an

Table 7.--Steel mill products: Canadian production, exports, imports, and apparent consumption, 1980-84

Year	Production/ shipments	Exports	Imports	Apparent consumption	Ratio of imports to consumption
	1,000 short tons				Percent
1980	13,526	3,861	1,622	11,287	14.4
1981	13,227	3,887	3,351	12,691	26.4
1982	10,306	3,506	1,334	8,134	16.4
1983	11,020	2,931	1,426	9,515	15.0
1984	1/ 12,962	3,413	2,127	11,676	18.2

1/ Estimated by the staff of the U.S. International Trade Commission.

Source: Producers' shipments compiled from data of the American Iron and Steel Institute; imports and exports from Statistics Canada.

1/ American Iron and Steel Institute, 1983 Annual Statistical Report, p. 101.
2/ 1980-82 data from Canadian Minerals Yearbook, 1982, p. 232, 1983-84 data from officials at Statistics Canada.

upturn in housing. Bars, pipes and tubes, and some lines of plates showed little recovery as capital spending for industrial goods and construction weakened.

Effects on production costs.--Canadian steelmaking technology is basically the same as that in the United States. The percent of total production cost for each factor of production, which is approximately the same as that experienced by the U.S. industry, is shown in the following tabulation: 1/

Raw material--------	25
Labor---------------	28
Maintenance---------	8
Overhead------------	13
Depreciation--------	5
Insurance-----------	1
Energy--------------	20
Total-----------	100

The 1983 distribution of total energy inputs used to produce one metric ton of raw steel, as reported by six companies representing 85 percent of Canadian steel production is as follows: 23.93 megajoules, composed of 18.3 percent natural gas, 7.1 percent electricity, 6.1 percent crude petroleum, and 68.5 percent coal. 2/ Consumption of natural gas in the production of finished steel amounts to approximately 5.7 million British Thermal Units (Btu's) per short ton. The Toronto Gate Price for natural gas (the price of domestically-consumed natural gas in Toronto and eastern Canada) of US$2.90 per thousand cubic feet, versus the 1983 "volume-related incentive price" (export price) of US$4.40 per thousand cubic feet, translates into approximately a $1.50 per ton cost advantage to the Canadian steel producers. This cost savings represents 0.4 percent of the customs value (per ton) of Canadian steel imports in 1983.

In 1983, 80.7 million gallons of fuel oil were consumed in Canadian steelmaking operations 3/ or 7.8 gallons per ton of finished steel products. The 1983 Canadian domestic crude petroleum price was pegged to 75 percent of the international benchmark price of $29.00 per barrel, 4/ or was an estimated $0.52 per gallon. The $0.17 cost difference per gallon translates into roughly a $1.33 cost advantage per ton to Canadian producers, or approximately 0.4 percent of the 1983 customs value (per ton) of imports from Canada.

Effects on competitiveness.--Although raw materials prices and usage rates are approximately the same in Canada as in the United States, the Canadian steel industry is viewed as having a significant cost advantage over the United States in the area of labor cost. According to the U.S. Department of Labor, hourly compensation in the U.S. industry averaged $21.73 per hour in

1/ Estimated from information received from Canadian steel industry representatives.
2/ According to Canadian industry representatives.
3/ American Iron and Steel Institute, 1983 Yearbook, p. 107.
4/ Oil & Gas Journal, May 9, 1983.

1983, compared to $15.32 per hour (U.S. dollars) in Canada. 1/ At 7 work hours per ton of finished steel product, the lower labor cost translates into approximately a $45.00 per ton cost advantage to the Canadian producers, or 12 percent of the customs value (per ton) of Canadian steel imports in 1983. The overall production cost advantage for Canada of $47.70 per ton can be broken down by factor of production as follows:

$44.87-----	Labor
2.83-----	Energy
$47.70	

Part of the natural gas and petroleum advantage is negated by transportation and other costs from the Canadian manufacturing site to the U.S. market. The following tabulation shows how U.S. and Canadian prices compare in the U.S. market:

Producer	1983 production cost 1/	Other costs to market 2/	Total delivered cost 3/
Canada	$436.04	$56.08	$492.12
United States	$483.87	$54.78	$538.65

1/ Canadian production cost is based on the World Steel Dynamics (WSD) U.S. price/cost model adjusted for Canadian labor and energy cost components. U.S. production cost is based on WSD U.S. carbon steel price/cost model.

2/ Assuming that transportation, insurance, and other costs from Canada to the U.S. market are roughly the same as those experienced by the U.S. industry. The Canadian costs do not include U.S. tariffs, which differ from product to product. The U.S. cost to market represents the average cost per short ton of haul of plates, sheets, and bars in 1982, based on data obtained in ITC investigation No. TA-201-51, Carbon and Certain Alloy Steel Products.

3/ Total delivered cost for imports from Canada is based on estimated production cost and estimated transportation costs to the U.S. market. Total delivered cost of U.S. product is based on WSD U.S. price/cost model and estimated average transportation costs.

Effects on resource allocation.--Exports of steel mill products from Canada to the United States amounted to 2.4 million short tons ($885.1 million) in 1983. The total quantity of natural gas used in its manufacture, at an estimated 5.7 million Btu's per short ton, is approximately 13.7 trillion BTU's. This translates into an overall 1983 cost savings to Canadian steel producers of $3.6 million, based on consumption of domestically produced natural gas. The quantity of petroleum used in the manufacture of steel products shipped from Canada to the United States amounted to approximately

1/ U.S. Department of Labor, Bureau of Labor Statistics, Office of Productivity and Technology "Hourly Compensation Costs for Production Workers in Iron and Steel Manufacturing, 20 Countries, 1975-83," unpublished data, January 1984.

18.7 million gallons of petroleum and resulted in a savings of about $3.2 million based on consumption of domestic petroleum. Total cost savings of about $2.83 per ton of steel, as a result of energy pricing policies, represent a relatively small component of the cost structure affecting Canadian steelmakers' competitiveness. Since Canadian producers enjoy an overall production cost advantage of approximately $48.00 per ton compared to U.S. producers, the energy pricing policy is believed to have a limited influence on Canadian steelmaking.

Other consuming industries

Cement.--The Canadian cement industry, like the U.S. industry, is highly energy intensive and energy costs are a major concern for producers. Although pricing policies are found to exist in Canada with respect to its natural gas and petroleum industries, it has not been substantiated that the Canadian cement industry is a beneficiary of these policies. The bulk of the Canadian cement plants are located long distances from the producing natural gas and petroleum industries. It is believed that if the cement industry does receive any benefit from lower-cost fuel, it has been offset to a large degree by the cost of transporting the natural resources from the wellhead to the producing plants. Therefore, such benefits to the Canadian cement industry is not believed to be a major concern with respect to its competitive effect on the U.S. market.

Portland hydraulic cement is produced in Canada by 9 companies with 24 plants having an estimated capacity of 17.9 million short tons. In the Atlantic Provinces (Newfoundland, Nova Scotia, New Brunswick, and Prince Edward Island), there are three portland hydraulic cement manufacturing plants with a capacity of about 1.1 million tons; in the Province of Quebec, there are five plants (4.1 million tons); in Ontario, six plants (6.3 million tons), in the Prairie region (Manitoba, Saskatchewan, and Alberta), five plants (4.8 million tons); and in the Pacific region (British Columbia), three plants (1.7 million tons). The Canadian cement industry is strongly regionalized on the basis of market requirements. Capacity is concentrated near growth areas that are convenient to serving U.S. markets as well.

Since 1983, the average Canadian plant consumption of energy of all types has been 4,896 megajoules per ton, 1/ a 21.3 percent fuel saving over 1974. From 1974 to 1983 there was a dramatic change in the fuel mix to produce Canadian cement. In 1983, natural gas usage decreased and accounted for 36.0 percent of total fuel costs (49.5 percent in 1974), petroleum products dropped to 12.3 percent (39.7 percent in 1974) and coal and coke increased to 51.7 percent (10.8 percent in 1974). New plants have incorporated preheater systems, and older, less efficient production capacity has been replaced with fuel-conserving equipment.

Canadian cement production decreased 19 percent during 1980-84, from 10.3 million tons in 8.6 million tons. Exports have declined slightly from 1.5

1/ 1,055 joules is equal to approximately one Btu.

million tons in 1980 to 1.4 million tons in 1984, with over 98 percent of all Canadian exports shipped to the United States. During 1984, cement imports into Canada amounted to 195,000 tons, down 13 percent from 223,000 tons in 1980.

Float glass.--The Canadian float glass industry is comprised of at least two companies producing float glass at two plants in Ontario. Both companies are subsidiaries of two U.S. float glass companies. Therefore, the Canadian industry is not believed to be a major concern with respect to its competitive effect on the U.S. market. In addition, it is likely that any price advantage owing to Canadian pricing policies on natural gas would be largely offset by transportation costs to production facilities and markets. U.S. imports of float glass from Canada accounted for 21 percent ($3.6 million) of total float glass imports and less than 1 percent of apparent U.S. consumption ($697 million) in 1984.

Lime.--The Canadian lime industry, like the U.S. industry, is highly energy-intensive and energy costs are major concern for producers. Although pricing policies are found to exist in Canada with respect to its natural gas and petroleum industries, it has not been substantiated that the Canadian lime industry is a beneficiary of these policies. The bulk of the Canadian lime plants are located far from the producing natural gas and petroleum industries. It is believed that if the lime industry does receive any benefit from lower-cost fuel, that it has been offset to a large degree by the cost of transporting the natural resources from the wellhead to the producing plants. Therefore, such benefit to the Canadian lime industry is not believed to be a major concern with respect to its competitive effect on the U.S. market.

In 1984, Canadian lime was produced by 18 companies at 23 plants, with 5 companies producing for captive use. The principal markets are in the steel, pulp and paper, and mining industries. Canada's lime producing capacity is about 3.6 million tons annually. Total production in 1984 was 2.3 million tons, down 18 percent from 2.8 million tons in 1980. Exports of lime from Canada declined sharply, about 56 percent, from 403,000 tons in 1980 to about 177,000 tons in 1984. Almost all of Canadian lime exports are shipped to the United States whereas Canadian lime imports are small and have declined 68 percent from 41,000 tons in 1980 to an estimated 13,000 tons in 1984.

Mexico

Mexican Industry Profile

The petroleum and natural gas industries in Mexico are wholly owned by the Government through the state-owned agency, Petroleos Mexicanos (PEMEX). PEMEX was formed in 1938 to administer the nation's hydrocarbon resources and to maintain petroleum industry productivity after Mexico nationalized the industry and expropriated foreign investments. 1/ PEMEX was also designed to achieve such social goals as full employment. Since then it has also acquired a central role in the production, marketing, pricing, and trade of petrochemicals. 2/ In this section, primary emphasis will be on crude

1/ Brief submitted by PEMEX, Feb. 19, 1985.
2/ Ibid.

petroleum production and natural gas; the other activities of PEMEX, including petrochemical and refining will be covered later as will the primary consuming industries benefitting from Mexico's two-tier natural resource pricing policy.

Crude petroleum and natural gas production, development, extraction, and allocation are totally within the purview of the State in accord with domestic requirements and the national interest. Because of the large deposits of these materials discovered in Mexico, PEMEX has become important in world markets. In 1984, Mexico ranked fourth in the world in terms of both estimated proved reserves of crude petroleum and crude petroleum production. 1/ Mexico in the same year ranked eighth in the world in terms of estimated proved reserves of natural gas and fifth in terms of its production. 2/

Data on employment in PEMEX are not available, however, it is believed to be one of Mexico's major employers. A decline in Mexican economic activity in 1982 and 1983 resulted in declines in employment and real wages. The manufacturing sector, including refining, accounted for about 12 or 13 percent of total employment 3/ and it is estimated that mining, including crude petroleum and natural gas production, accounted for about 18 to 20 percent. 4/ The importance of the contribution made by PEMEX to maintaining a healthy Mexican economy is often mentioned. 5/

In 1983, PEMEX invested 345 billion pesos 6/ in crude petroleum exploration, drilling, production, and industrial transformation. 7/ In early 1984, PEMEX announced plans that investment would increase to 552 billion pesos in 1984 as part of the Mexican National Industrial Development Plan (NIDP). 8/

The goals of the NIDP include the investment of funds into various areas of economic activity, including the petroleum and petrochemical industries. The following tabulation shows the planned total investment and includes the planned investment for certain key Mexican industries (in billions of pesos): 9/

1/ For statistical data, see the section of this report dealing with the world market for crude petroleum.

2/ For statistical data, see the section of this report dealing with the world market for natural gas.

3/ U.S. Department of Commerce, Foreign Economic Trends and Their Implications for the United States-Mexico, March 1984, p. 7.

4/ Ibid.

5/ Brief submitted by Petroleos Mexicanos, Feb. 19, 1985.

6/ As of Dec. 31, 1983, the exchange rate was as follows:
Free: US $ = 160.61 Mexican Pesos.
Controlled: US $ = 143.88 Mexican Pesos.

7/ PEMEX, Information Bulletin, No. 4, January 1984, p. 2.

8/ Ibid.

9/ Mexico, Industrial Development Plan 1979-1982-1990 (Abridged English Version), 1979, p. 55.

Sector	1979-82	1983-86	1987-90
Total	814.5	1,990.4	2,525.1
Petroleum, petrochemicals	329.9	165.8	396.9
Basic chemicals	4.5	6.7	6.2
Secondary petrochemicals	5.2	23.3	44.4
Fertilizers	20.0	25.4	24.9
Other chemicals	5.8	19.6	34.5

The NIDP states that among the objectives for the plan is the displacement of imports with domestic production to satisfy domestic demand. 1/ The NIDP also states that Mexico will export downstream, value-added products instead of their materials (i.e., crude petroleum and natural gas). The plan also adopts, as an explicit policy, the principle of maintaining the prices of energy for industrial use and basic petrochemicals at a level lower than the international prices. 2/ Also, a 30 percent discount is given on domestic rates for natural gas, residual fuel oil, and electric power to those companies which build facilities in the industrial ports of Coatzacoalcos, Tanpico, Salina Cruz, and Lazaro Cardenas. 3/ A 30 percent discount will also be given on the price of basic petrochemical products when new facilities export no less than 25 percent of their production for a minimum of three years. 4/

Natural Resources Pricing Policy

Since PEMEX is the only entity in Mexico involved in all phases of crude petroleum and natural gas exploration, development, and production, petroleum refining, and the manufacture of many petrochemicals it is difficult to ascertain domestic prices for natural gas and, particularly, for crude petroleum. These materials are usually transferred between different Government entities at unknown prices. For example, the prices at which natural gas is transferred to the Government ammonia industry, or crude petroleum to the refining industry, essentially reflect internal pricing practices and are seldom made public. In general, however, it is believed these transfers occur at below world level prices, but not below the cost of production, which is estimated to be in the range of \$3 per barrel to \$6.50 per barrel. 5/

The Government of Mexico maintains a two-tier industrial pricing policy for petroleum products (including No. 6 fuel oil) and natural gas. These fuels are generally sold to domestic industrial consumers at a price below international market prices and are usually sold for export at international market prices. The National Industrial Development Plan (NIDP) states that fossil fuel prices have traditionally been lower than international prices in

1/ Ibid., pp. 8-16.
2/ Ibid., p. 54.
3/ Ibid., pp. 54 and 56.
4/ Ibid., p. 56.
5/ Department of State Telegram From American Embassy in Mexico, Telegram number 2047, January 1985, p. 2

order to allow for the strengthening of industry by giving it "a substantial margin of protection via input." 1/

In outlining guidelines for the future, the Mexican National Energy Program states that for hydrocarbons, "domestic price levels will be maintained lower than those abroad, except in the case of imported products or of those containing a high proportion of imported inputs." 2/

Authority

Article 27 of the Mexican Constitution of 1917 established that subsurface resources are considered to be the domain of the State. 3/ PEMEX, as the State-owned petroleum entity, was established to administer the nation's hydrocarbon reserves and is defined as a "public decentralized organism of the federal government." 4/ Accordingly, PEMEX is not a private corporation but rather a Government agency. 5/

The Director General of PEMEX and his seven Deputy Directors are appointed by the President of Mexico. PEMEX's budget, as well as lending and borrowing activities, must be approved by the Department of Treasury (Secretaria de Hacienda y Credito Publico), and by the Program and Budget Department (Secretaria de Programacion y Presupuesto). 6/

Article 3 of the Law Regulating Article 27 of the Mexican Constitution as published in the Diario Oficial on November 29, 1958, defines the petroleum industry as encompassing:

"I. The exploration, exploitation, refining, transportation, storage, distribution, and first hand sales of petroleum, gas and products obtained from their refining;

II. The production, storage, transportation, distribution, and first hand sales of synthetic gas;

III. The production, storage, transportation, distribution, and first hand sales of petroleum derivatives which serve as basic industrial raw material." 7/

Article 2 of the Regulations for the Petrochemical Industrial Under the Law Regulating Article 27 of the Constitution as Concerns Petroleum (published in the Diario Oficial on February 9, 1971) describes PEMEX's role in the production of "petroleum derivatives which can serve as basic industrial raw

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1/ Mexico, Industrial Development Plan, 1979-1982-1990, (Abridged English Version), p. 30-34.

2/ Mexico, National Energy Program, 1984-1988, p. 95.

3/ Brief submitted by PEMEX, Feb. 19, 1985.

4/ Organic Law of Petroleos Mexicanos, Article 1, Diario Oficial, Feb. 6, 1971.

5/ Brief submitted by Petroleos Mexicanos, Feb. 19, 1985, p. 3.

6/ Ibid., p. 5.

7/ Ibid., pp. 3-4.

materials." 1/ In general, this law states that only PEMEX can produce primary petrochemicals such as ammonia.

PEMEX is also responsible for the pipeline system that carries crude petroleum, refined products, natural gas, and petrochemical feedstocks throughout the country. In May 1977, plans were announced to build an 850-mile, 48-inch pipeline to carry natural gas from the Reforma fields in the southeast to northern Mexico and the United States. The first phase of the project, covering a distance of 658 miles from Cactus, Chiapas, to Monterrey, was completed in early 1979. The second phase of the project, extending the line from San Fernanco to the U.S. border at McAllen, Texas, was terminated in late 1977, when early United States--Mexico gas negotiations failed. Even though sales resumed, they were again terminated in November 1984 because of price disagreements. In light of these latest facts, the completion of the pipeline may be postponed further into the future. In addition, a 167-mile, 30-inch crude petroleum pipeline is being built from Neuva Teapa to the port under construction at Salina Cruz on the Pacific Ocean. From here, crude petroleum could be available for export to countries in the Pacific Basin as well as for use domestically on Mexico's west coast.

Implementation

Mexico's energy policy is managed by the Secretariat for Energy, Mines, and Parastatal Industries (SEMIP). 2/ Technically, PEMEX is under the direction of SEMIP. The Director of SEMIP is usually the spokesman on energy issues. The Chief Coordinator within the Mexican Government on energy issues is the SEMIP Undersecretary for Energy, who also chairs the committee that oversees the petroleum export and pricing policies. The members of this committee are appointed by the President of Mexico. In addition to SEMIP, this committee is composed of representatives for Mexico's Departments of Treasury, Foreign Relations (SRE), and Commerce (SECOFIN), the Central Bank of Mexico, and PEMEX. 3/ This committee meets monthly and decides the export prices (based on international prices) for crude petroleum, petroleum products, and natural gas as well as the domestic prices. 4/

Bilateral sales agreements are preferred to spot market sales when arranging for crude petroleum sales. Currently, bilateral sales agreements exist with the United States, Canada, France, Japan, Spain, India, and Israel. PEMEX began shipments to Sweden in 1981 and is also committed under the joint Mexican/Venezuelan petroleum facility to provide a total of 80 million barrels per day to Central American and Caribbean countries. Mexico has undertaken this agreement out of concern for the increasing political and economic instability of this region immediately adjacent to its own borders.

Crude petroleum negotiations are often linked to exchanges for technical and financial assistance. For example, Japan is collaborating with Mexico on the construction of petroleum loading facilities at the Pacific port of Salina Cruz and a heavy foundry and forge at Lazaro Cardenas; Sweden is investing in

1/ Ibid., p. 4-5.

2/ U.S. Department of State, "Petroleum Industry Outlook for Mexico," Airgram, No. A53, Aug. 30, 1984, p. 4.

3/ Ibid.

4/ U.S. Department of State, Incoming Telegram - ITC-01, January 1985, p. 1.

Mexico's mining, steel, secondary petrochemicals, paper, and transportation industries.

Examples of pricing policy

The following tabulation shows ranges of prices for heavy fuel oils and natural gas to Mexican industrial consumers under the two-tier pricing system: 1/

Year	Natural gas		Light fuel oil (#2)		Heavy fuel oil (#6)	
	United States	Mexico	United States	Mexico	United States	Mexico
	U.S. dollars per thousand cubic feet		U.S. cents per gallon			
1982	4.06	0.45	.939	.044	.664	.038
1983	4.12	1.06	.921	.108	.672	.093
1984	4.07	1.63	.861	.160	.678	.140

Note.--These were the official prices as of December 1982 and December 1983 and October 1984.

Since the current Mexican administration took office in December 1982, the Mexican Government policy on internal domestic prices has been to raise the prices toward the international price levels, as the above tabulation shows. 2/

Petrochemical prices are targeted at 80 percent of the international prices in order to remain competitive. 3/ Prices for petroleum products and petrochemicals are uniform throughout Mexico and apply equally to all industrial consumers, whether the companies are foreign, domestic or joint ventures. 4/ However, it is believed that superimposed on these prices are discounts allowed to ventures that locate in certain areas of Mexico that the Government wants to develop.

In 1984, Mexican exports of natural gas to the United States were valued at $4.53 per thousand cubic feet, compared with $2.59 per thousand cubic feet for U.S.-produced natural gas. As a result of this price difference and the desire of the United States to negotiate a lower Mexican price, Mexico suspended its exports of natural gas to the United States in November 1984, citing domestic needs. 5/ Mexican exports of crude petroleum to the United States in 1984 were valued at $26.55 per barrel, compared with $26.01 per barrel for U.S.-produced crude petroleum.

1/ Brief submitted by PEMEX, Feb. 19, 1985.
2/ U.S. Department of State - Incoming Telegram, ITC-01, January 1985, p. 1.
3/ Ibid.
4/ Ibid.
5/ Ibid.

Resources Affected

Crude petroleum

Mexican production of crude petroleum increased from 2 million barrels per day in 1980 to 2.7 million barrels per day in 1984 (table 8). A large part of this increase was directed toward export markets. Mexico has continued emphasis on maintaining productive capacity, in a time when world demand has been stagnant, and cutting costs. 1/

Mexican exports of crude petroleum increased from 828,000 barrels per day in 1980 to 1.6 million barrels per day in 1982. By 1984, Mexico's crude petroleum exports decreased to an estimated 1.2 million barrels per day primarily because of the economic conditions in many of the world's nations that have led to a world surplus of crude petroleum (table 8).

In 1982, Mexico began a program to limit exports of crude to a maximum of 1.5 million barrels per day in an effort to help stabilize soft world prices. 2/ The United States, the major market for Mexican crude petroleum exports, was singled out for particular export restrictions in an effort by Mexico to diversify its crude petroleum markets. This restriction limited the amount exported to the United States to 50 percent of total Mexican crude petroleum exports. 3/ However, in 1984, U.S. imports from Mexico rose above 691,000 barrels per day or to about 60 percent of Mexico's exports.

Table 8.--Crude petroleum: Mexican production, exports, imports, and apparent consumption, 1980-84

(In thousands of barrels per day)

Year	Production 1/	Exports 2/	Imports 2/	Apparent consumption
1980	1,960	828	0	1,132
1981	2,390	1,098	0	1,292
1982	2,748	1,596	0	1,152
1983	2,702	3/ 1,303	0	1,399
1984	2,743	3/ 1,153	0	1,590

1/ Derived from annual issues of the "Worldwide Report," Oil & Gas Journal.
2/ Derived from official statistics of the U.S. Department of Energy and the U.S. Department of Commerce.
3/ Estimated.

Mexico does not import crude petroleum. Apparent consumption of crude petroleum increased from 1.1 million barrels per day in 1980 to 1.6 million barrels per day in 1984 (table 8).

1/ U.S. Department of State, "Petroleum Industry Outlook for Mexico," Airgram, No. A53, Aug. 30, 1984, p. 1.
2/ Ibid.
3/ The United States entered a 5-year purchase agreement with Mexico in August 1981, to buy 110 million barrels of crude petroleum for the U.S. Strategic Petroleum Reserve. Purchases, under this contract, averaged 60,000 barrels per day.

Natural gas

Production of natural gas generally follows the trend in crude petroleum production, since about 80 percent of the Mexican natural gas is associated with the production of crude petroleum. Natural gas production increased from 920 billion cubic feet in 1979 to 1.6 trillion cubic feet in 1982 but declined to 1.5 trillion cubic feet in 1983 (table 9). The decrease in 1983 is attributed to inadequate gas gathering and processing capacity.

Mexican natural gas exports decreased from 105 billion cubic feet in 1980 to 76 billion cubic feet in 1983 (table 9). The United States was the only market for Mexican exports of natural gas, via a pipeline that connects to the U.S. pipeline system in Texas. Selling price disagreements caused the cessation of sales in November 1984.

Table 9.--Natural gas: Mexican production, exports, imports, and apparent consumption, 1979-83

(In billions of cubic feet)

Year	Production 1/	Exports 2/	Imports 2/	Apparent consumption
1979	920	0	4	924
1980	1,191	105	3	1,089
1981	1,486	102	0	1,384
1982	1,550	95	0	1,455
1983	1,479	3/ 76	0	1,403

1/ Derived from annual issues of the "Worldwide Report," Oil and Gas Journal.
2/ Derived from official statistics of the U.S. Department of Energy and the U.S. Department of Commerce.
3/ Estimated.

Mexico imported small quantities of natural gas in 1979 and 1980; however, these imports ceased by 1981 in favor of dependence on domestic resources, particularly the associated natural gas produced as Mexican crude petroleum production increased. Apparent consumption of natural gas in Mexico increased from 924 billion cubic feet in 1979 to 1.5 trillion cubic feet in 1982, but declined slightly to 1.4 trillion cubic feet in 1983 with the decrease in crude petroleum production (table 9).

Primary Consuming Industries That Benefit

Ammonia

Mexican industry profile.--Mexico's petrochemical industry is divided by law into two major sectors. The production of basic petrochemicals, such as ammonia, from crude petroleum and natural gas is reserved for PEMEX, the production of secondary petrochemicals is open to private ownership of a company of up to 40 percent. There are, however, differences in definitions of primary and secondary petrochemicals in Mexico than in other countries.

For example, polyethylene and polypropylene are classified as primary petrochemicals and can only be produced by PEMEX. Another exception are fertilizers. Fertilizantes Mexicanos (FERTIMEX) is Mexico's sole producer of ammonia-based fertilizers.

Mexican market.--Mexico's production of ammonia increased from 1.9 million metric tons in 1980 to 2.6 million metric tons in 1984 (table 10). Since Mexico is primarily an agricultural economy, the production of fertilizers is important. The following tabulation shows Mexico's production of certain fertilizers derived from ammonia in 1983 (in thousands of metric tons): 1/

Item	Production
Ammonium nitrate	37,780
Urea	450
Ammonium sulfate	317

Mexican exports of ammonia decreased from 963,000 metric tons in 1980 to 223,000 metric tons in 1982, and then increased to 652,000 metric tons in 1984 (table 10). The United States is the major market for these exports. During 1980-84, Mexico exported a total of 2.7 million metric tons of ammonia; the United States was the market for 77 percent of the total amount exported.

Mexico does not import ammonia, relying on domestic production to satisfy domestic demand. Mexican apparent consumption of ammonia increased from 920,000 metric tons in 1980 to 2.2 million metric tons in 1982, and then decreased slightly to 2 million metric tons in 1984, following the same trend as exports (table 10).

Table 10.--Ammonia: 1/ Mexican production, exports, and apparent consumption, 1980-84

(In thousands of metric tons)

Year	Production 2/	Exports 3/	Apparent consumption
1980	1,883	963	920
1981	2,183	481	1,702
1982	2,469	223	2,246
1983	2,355	366	1,989
1984 4/	2,628	626	1,976

1/ Mexico does not import ammonia.
2/ Derived from the Asociation National de La Industria Quimica, A.C., Anuario de La Industria Quimica Mexicana En 1983, 1984.
3/ Official statistics of PEMEX.
4/ Estimated.

1/ Asociation National de La Industria Quimica, A.C. Anuario de La Industria Quimica Mexicana En 1983, 1984, pp. 357, 359, and 360.

Effects on production costs.--All of Mexico's production of ammonia-based fertilizers is controlled, by law, by FERTIMEX. FERTIMEX has pricing authority over the petrochemicals it produces. However, PEMEX is the sole producer of ammonia. The production of ammonia is both capital and energy intensive. Among the goals of the NIDP is the amount of capital to be invested in the fertilizer industry. Investment was projected to reach 25.4 billion pesos during 1983-86 and 24.9 billion pesos during 1987-90. 1/

It was estimated that if the value of natural gas to industrial consumers in Mexico is equivalent to U.S. natural gas imports from Mexico's Campeche Bay minus transportation costs of about $0.94 per thousand cubic feet 2/, Mexican natural gas would have a wellhead value of about $2 to 2.50 per thousand cubic feet. 3/ However, under Mexico's two-tier pricing schedule for natural gas, the domestic industrial consumers purchase natural gas for $1.71 per thousand cubic feet. 4/ 5/

It is estimated that revenues from the higher export prices offset the low domestic natural gas price paid by industrial consumers. Mexican natural gas exports to the United States are based on the international price. However, Mexico ceased exports of natural gas to the United States in November 1984 when the U.S. price fell below the Mexican contractual price of $4.40 per thousand cubic feet.

The domestic Mexican price of ammonia increased during 1982-84; however, it appears that these internal prices would not recoup the costs of natural gas feedstock. 6/ The following tabulation shows domestic Mexican prices for ammonia: 7/

1/ Mexico, Industrial Development Plan, 1979-1982-1990 (Abridged English Version), 1979, p. 55.
2/ Brief submitted by the Charls E. Walker Associates, Inc., on behalf of the Ad Hoc Committee of Domestic Nitrogen Producers, Feb. 19, 1985.
3/ Ibid.
4/ This is a delivered cost that includes transportation costs.
5/ Brief submitted by PEMEX, Feb. 19, 1985.
6/ Brief submitted by the Charls E. Walker Associates, Inc., on behalf of the Ad Hoc Committee of Domestic Nitrogen Producers, Feb. 19, 1985.
7/ U.S. Department of State, Mexican Petrochemical Industry and Its Outlook: Update, Aug. 24, 1983, p. 8.

	Thousands of pesos per metric ton	U.S. dollars per metric ton
December 1982	4	27
April 1983	6	40
July 1983	6	40
October 1983	6	39
April 1984	6	39
July 1984	9	48

Although the Mexican domestic price of ammonia has been increasing, it does not nearly equal the U.S. domestic price as shown in the following tabulation (in U.S. dollars per metric ton):

	Mexican price	U.S. price
1982	27	143
1983	40	151
1984	41	183

The average delivered price paid in the United States for natural gas, under new contracts, by U.S. ammonia producers averages about $3.50 per thousand cubic feet 1/ compared with $1.71 per thousand cubic feet (as of December 1984) for Mexican natural gas sales to industrial consumers such as FERTIMEX. 2/ Since the production of ammonia and ammonia-based fertilizers is an energy-intensive industry, FERTIMEX appears to enjoy an average cost advantage of about $1.79 per thousand cubic feet.

Since the production of ammonia is solely the responsibility of PEMEX, it is difficult to estimate production costs. However, the following tabulation offers estimated ranges for PEMEX's production costs, assuming a cost of $167 per metric ton of installed ammonia capacity (per metric ton of ammonia produced): 3/

Factors	PEMEX production cost estimates
Energy and feedstocks	$64.98
Other cost	18.00
Depreciation	40.00
Corporate G&A, sales	8.00
Return on investment	40.00
Total	$170.98

1/ Brief submitted by the Charls E. Walker Associates, Inc., on behalf of PEMEX, Feb. 19, 1985, p. 7.
2/ Brief submitted by PEMEX, Feb. 19, 1985, exhibit I.
3/ Brief submitted by the Charls E. Walker Associates, Inc., on behalf of the Ad Hoc Committee of Domestic Nitrogen Producers, Feb. 19, 1985, p. 10, and other sources.

Effects on competitiveness.--Transportation costs are included in the Mexican price of $1.71 per thousand cubic feet; also included are the costs to collect and process the natural gas from the wellhead to the consumer. If transportation cost are about $0.94, the wellhead price of the natural gas is less than $1.00 per thousand cubic feet. 1/ Since the production of ammonia is an energy-intensive industry, the low cost for natural gas allows Mexico to keep their export price for ammonia below the price for U.S.-produced ammonia.

U.S. imports of ammonia from Mexico declined during 1980-84; however, the price per short ton increased by 24 percent, as shown in the following tabulation:

Year	Quantity	Value	Unit value
	Short tons	1,000 U.S. dollars	U.S. dollars per short ton
1980	377,347	42,290	112.07
1981	433,935	56,972	131.29
1982	584,165	73,702	126.17
1983	575,032	69,491	120.85
1984	329,672	48,453	146.97

Mexican ammonia prices, although increasing during 1980-84, have undercut U.S. domestic prices by an average of 12 percent per year.

Effects on resource allocation.--Mexico's NIDP slates investment for the fertilizers industry at 25.4 billion pesos during 1983-86 and 24.9 billion pesos in 1987-90, compared with 20 billion pesos in 1979-82. Mexico is primarily an agricultural nation with only 15 percent of its total land mass being arable. 2/ Of approximately 3.3 million metric tons of fertilizer production in 1983, exports accounted for only 6.5 percent of total production. 3/ Mexico's domestic demand for fertilizers is expected to increase to 2.6 million metric tons by 1990 and 3.2 million metric tons by 1995. 4/ With the goal of satisfying its domestic demand, fertilizer production capacity based on low-cost natural gas is expected to reach 5.3 million metric tons by 1988 and 8.4 million metric tons by 1995. 5/

Mexico's exports of nitrogen could increase by 9.3 percent in 1984-95. 6/ Countries such as Mexico, with large natural gas reserves should continue to gain in importance in the world fertilizer market. Industrial complexes can be built in coastal areas based on low-cost natural gas feedstock, thus enabling Mexico to retain its natural advantage in ammonia production and in the world market.

1/ Ibid.
2/ Fertilizer International, No. 179, May 1984, p. 65.
3/ Ibid.
4/ Ibid., p. 66.

In 1984, Mexico exported about 626,000 metric tons of ammonia. The production of this quantity of ammonia would require approximately 24.4 billion cubic feet of natural gas. This natural gas probably would not have been used to manufacture ammonia except for its low price. This low price makes it possible for Mexico to price the ammonia competitively in export markets even though it had to be transported over significant distances. If the natural gas had not been used to make ammonia it is probable Mexico could have exported the natural gas to the United States for approximately $3.40 per thousand cubic feet instead of pricing it at $1.60 to $1.70 thousand cubic feet to make ammonia.

Carbon black

Mexican industry profile.--There are two producers of carbon black in Mexico: Hules Mexicanos, S.A. (HUMEX) which is 60 percent owned by PEMEX and 40 percent owned by a Canadian company; and NEGROMEX, which is 60 percent controlled by private Mexican interests and 40-percent owned by a large British petroleum company. 1/

The sole source of carbon black feedstock (CBFS) in Mexico is a type of residual fuel oil produced in the catalytic reaction of crude petroleum refined to produced light products. 2/ The heavy fractions that are left after the catalytic cracking of crude petroleum for gasoline and other light products are called catcracker bottoms, which are used as CBFS. Since all petroleum refining is carried out by PEMEX, it is the sole source of CBFS in Mexico. 3/

Mexican market.--Mexican production of carbon black increased from 81,257 short tons in 1980 to 110,784 short tons in 1984 (table 11). Mexican domestic sales of carbon black fluctuated during 1980-84 as shown in the following tabulation (in short tons): 4/

Year	Domestic sales of Mexican carbon black production
1980	79,477
1981	79,282
1982	80,111
1983	69,111
1984	76,913

1/ Submission by Cabot Corp. on behalf of Cabot Corp.
2/ Brief filed by Collier & Hannan, on behalf of the Mexican Carbon Black Industry, Feb. 19, 1985.
3/ Ibid.
4/ Ibid.

Table 11.--Carbon black: Mexican production, exports, imports, and apparent consumption, 1980-84

(In short tons)

Year	Production	Exports 1/	Imports 2/	Apparent consumption	Ratio (percent) of imports to consumption
1980---	81,257	1,233	4,733	84,757	5.6
1981---	84,927	2,626	6,686	88,987	7.5
1982---	88,430	3,363	3,365	88,432	3.8
1983---	94,536	9,406	1,167	86,297	1.4
1984---	110,784	24,873	1,231	87,142	1.4

1/ Exports to the United States.
2/ Imports from the United States.

Source: Brief by Collier & Hannan on behalf of the Mexican Carbon Black Industry, Feb. 19, 1985.

Mexican exports of carbon black to the United States increased sharply from 1,233 short tons in 1980 to 9,406 short tons in 1983 and 24,876 short tons in 1984 (table 11). During the same period, Mexico's carbon black imports from the United States declined from 4,733 short tons in 1980 to 1,231 short tons in 1984.

Mexican apparent consumption of carbon black increased from a low of 84,757 short tons in 1980 to a high of 88,987 short tons in 1981 before declining to 87,142 short tons in 1984 (table 11). Imports as a percent of Mexican apparent consumption declined from a high of 7.5 percent in 1981 to a low of 1.4 percent in 1983 and 1984.

Effects on production costs.--Mexico's prices for petroleum products such as No. 6 fuel oil and CBFS are below the U.S. prices for these products as shown below (in U.S. dollars per barrel): 1/

Year	Mexican domestic CBFS price	U.S. CBFS price
1982-------------	2.08	25.50 - 28.00
1983-------------	2.03 - 7.45	24.00 - 26.50
1984-------------	1/ 5.61	26.50 - 29.00

1/ Estimated from PEMEX, Information Bulletin, No. 4, January 1984, p. 7, which shows the January 1984 price of CBFS at 6900 pesos per liter.

1/ Submission by Cabot Corp., except as noted.

CBFS represents about 76 to 78 percent of the total cost to produce carbon black. It is assumed that the Mexican carbon black industry experiences the same basic costs as the U.S. plants since the Mexican plants were built by U.S. contractors utilizing the same technology in place in the United States. Therefore, the following breakdown of production costs should hold true in Mexico as well as the United States (in U.S. dollars per pound of carbon black produced): 1/

	Price
Energy and feedstock 1/	.16 - .18
Catalyst and chemicals	.01
Electricity	.01
Labor	.01
Maintenance	.01 - .02
Overhead	.01 - .02
Insurance and taxes	.01
Depreciation	.01
Total	$.21 - .23

1/ CBFS and natural gas fuel.

Effects on competitiveness.--Mexican carbon black producers have an advantage in terms of the low price of CBFS and natural gas used for fuel. PEMEX produces the CBFS and does not export it but only sells it to HUMEX and NEGROMEX. 2/ CBFS in Mexico, as shown in a previous tabulation, was priced about 96 percent less than CBFS in the United States in 1982. Although the price of Mexican CBFS has increased slightly since 1982, the prices in 1983 and 1984 were about 80 less than the prices paid for CBFS in the United States.

U.S. imports of carbon black from Mexico increased steadily from 1980 to 1982 before increasing significantly in 1984. The following tabulation shows U.S. carbon black imports from Mexico, derived from official statistics of the U.S. Department of Commerce:

Year	Quantity	Value	Unit value
	Thousands of pounds	Thousands of U.S. dollars	Cents per pound
1980	2,466	186	7.54
1981	5,252	937	17.84
1982	6,727	1,384	20.57
1983	18,812	3,155	16.77
1984	49,746	7,762	15.60

1/ Ibid.
2/ Submission by Cabot Corp. on behalf of Cabot Corp., and submission by Stewart and Stewart, on behalf of Cabot Corp.

U.S. imports of carbon black, which are duty free, accounted for 5 percent of U.S. apparent consumption in 1984. 1/ Mexico is the second largest source of U.S. carbon black imports (Canada is the largest source) and accounted for 32 percent of total U.S. carbon black imports in 1984.

Carbon black is usually shipped in bulk and over land as opposed to sea because carbon black is porous and absorbs moisture. Because of Mexico's proximity to the U.S. border, the United States is the major market for Mexican exports of carbon black.

Effects on resource allocation.--CBFS and natural gas used as a fuel account for about 75 percent of the total production cost of a short ton of carbon black. CBFS, derived from catcracker bottoms, is a valued product of the petroleum refining process that is only used as feedstock to produce carbon black. In Mexico, CBFS, at an average of $4.74 per barrel in 1983, 2/ was priced higher than No. 6 (heavy) fuel oil, which was $3.91 per barrel in 1983. 3/

If Mexican CBFS and natural gas were priced at world levels, it is unlikely that Mexican exports of carbon black could undercut U.S. prices.

Mexico has plans to expand its productive capacity for carbon black to about 800 million pounds or 25 percent of the 1984 U.S. carbon black production capacity. 4/ Although domestic Mexican carbon black consumption is expected to increase in order to displace imports, Mexican exports are also likely to increase. Since it is difficult to transport carbon black over water, and land transport is preferred, the United States will be the likely major market for any increase in Mexican carbon black exports.

Cement

Mexican industry profile.--In 1984, cement in Mexico was produced by 29 plants compared to 28 in 1980. About 20 of these plants are located south of Monterrey, and these have the capacity of producing 75 percent of Mexico's total output of portland cement. There are also approximately 18 cement distributing terminals located throughout the country which are used for storage and shipping by Mexican cement producers.

The Mexican cement industry is comprised of 10 corporate groups. Four of these groups control about 83 percent of the industry. Two other groups, which are workers' cooperatives, control about 11 percent of the industry. The major producers are strategically located in the most important areas of consumption, primarily around the entities of the Federal District, the States of Veracruz, Julisco, and Nueve Leon and the State of Mexico. These five areas in 1983 accounted for about 44 percent of total domestic consumption compared to 50 percent in 1980.

1/ See the major consuming industries, carbon black section of this report from U.S. statistical data.
2/ Submission by Cabot Corp. on behalf of Cabot Corp.
3/ Brief filed by PEMEX on behalf of PEMEX, Feb. 19, 1985, Exhibit 1.
4/ Submission by Cabot Corp. on behalf of Cabot Corp.

Employment of Mexican cement production workers increased from 9,202 workers in 1980 to 13,854 workers in 1981 and then declined 25 percent to 10,372 in 1983. Total employment increased from 12,538 workers in 1980 to 17,632 workers in 1981 and then declined 18 percent to 14,429 in 1983.

Gross capital investment in the Mexican cement industry increased annually from 32.321.6 million pesos in 1980 to 65.150.1 million pesos in 1983. This consistent annual increase in investments is largely a result of the modernization commitments made early in the 1970's. New project commitments were also scheduled to begin in 1984 and 1985. The average annual investment rate in the Mexican cement industry during 1974-84 was 23.4 percent of the total national gross accrued investment, which is one of the highest growth rates recorded in the Mexican national economy. 1/ As a result, total Mexican cement capacity increased about 81 percent from 17.0 million metric tons in 1980 to 30.7 metric tons in 1983. The average capacity of plants in the Mexican cement industry increased 44 percent from 695,000 metric tons in 1981 to 1.0 million metric tons in 1983. During 1981-83 the utilization of Mexican installed capacity decreased from 91.6 percent to 55.7 percent.

Mexican market.--Mexican shipments of cement increased from 17.9 million short tons in 1980 to 21.0 million short tons in 1982 and then decreased 19 percent to an estimated 17.0 million short tons in 1984 (table 12). As in the United States, cement shipments closely follow the trends in construction; the decrease in construction activity in Mexico that continued through 1983 affected cement production. Apparent consumption of Mexican cement increased from 18.0 million short tons in 1980 to nearly 21.0 million short tons in 1982, but decreased 30 percent to an estimated 14.8 million short tons in 1984.

Table 12.--Hydraulic cement and cement clinker: Mexican production, exports, imports, and apparent consumption, 1980-84

(In thousands of short tons)

Year	Shipments	Exports	Imports	Apparent consumption	Ratio (percent) of imports to consumption
1980	17,900	257	347	17,990	1.9
1981	20,073	111	523	20,485	2.6
1982	20,999	270	233	20,962	1.1
1983	17,835	1,209	0	16,626	0
1984	1/ 17,000	2,200	0	14,800	0

1/ Estimated by the staff of the U.S. International Trade Commission.

Source: Mexican National Cement Council.

1/ Mexican National Cement Council, 1983 Yearbook.

As in the United States, the low value-to-weight ratio of cement makes transportation expense an important factor in its delivered cost and creates a regional market. In 1983, trucking accounted for 71.3 percent of shipments (71.0 percent in 1981), railroads 24.4 percent (22.8 percent in 1981) and shipping 4.3 percent (3.3 percent in 1981). In 1984, almost all of the cement and cement clinker exported from Mexico was shipped to California, Louisiana, Texas, Arizona, and Florida, whereas only small quantities were exported to Guatemala and Belize. According to the Mexican Cement Council, exports of cement decreased 57 percent from 257,000 short tons in 1980 to 111,000 short tons in 1982, and then increased substantially to over 2.2 million short tons in 1984. It is believed that all of the exports came from eight plants situated in the north and on the east coast. Due to unused production capacity because of the slump in their economy, the Mexican cement industry has increased marketing efforts in foreign markets. Exports to the United States have continued to increase despite countervailing duties placed on Mexican cement. 1/

In 1983 and 1984, the Mexican National Cement Council reported no imports of cement into Mexico. 2/ Prior to those years, imports decreased from 347,000 short tons in 1980 to 233,000 short tons in 1982. Mexican imports have consisted primarily of special cement mixes or special requirements, that the regional domestic cement plants could not produce.

Effects on production costs

Cement plants in Mexico use a similar range of technology and equipment as those used in United States plants. The building of new plants and the expansion and modernization of exisiting plants has enhanced energy efficiency and reduced production costs for the Mexican cement industry during the last decade. As in the United States, the direct production costs in Mexico vary from plant to plant. The following tabulation contains data on the various factors of production in Mexico. The percent of production costs accounted for by each: 3/

	Dollars per short ton	Percent of total production cost
Raw material----------	$1.25- 1.75	05-05
Fuel------------------	2.50- 4.60	10-13
Power-----------------	2.25- 3.40	09-10
Direct labor----------	4.00- 5.00	16-14
Other costs 1/--------	15.00-20.25	60-58
Total production costs-------------	25.00-35.00	100-100

1/ Includes maintenance, depreciation and other costs.

1/ Final Affirmative Countervailing Duty Determination and Countervailing Duty Order; Portland Hydraulic Cement and Cement Clinker from Mexico, 48 Fed. Reg. 43063 (1983). Five companies had specific countervailing duties imposed against them ranging from 0 to 17.12 percent. The remaining Mexican cement companies had a rate of 6.05 percent imposed against them.

2/ U.S. statistics show shipments of cement to Mexico of about 6,000 short tons ($2.9 million) in 1983 and 3,000 short tons ($1.5 million) in 1984.

3/ Estimated from information received from the U.S. cement industry.

Total Mexican production costs for cement shows an estimated range from $25.00 to $35.00 per short ton, compared to $40.00 to $50.00 per short ton of cement produced in the United States. An important cost difference is in the fuel category. 1/ Mexican fuel production costs to make a ton of cement clinker range from an estimated $2.50 to $4.60 per ton. 2/ This compares to fuel production costs for U.S. producers which range from $6.50 to $11.00 a ton. 3/ Thus, there is an advantage in Mexican fuel costs over U.S. producers' fuel costs ranging from $4.00 to $6.40 a ton of manufactured cement. Mexican fuel costs average about 11.5 percent as a percentage of total production costs, whereas the U.S. costs are about 19 percent.

According to the Mexican National Cement Council the average sale price of cement sold in Mexico was 1,629 pesos per ton in 1981 (approximately U.S. $65.00), 2,360 pesos per ton in 1982 (approximately U.S. $42.00) and 5,102 pesos per ton in 1983 (approximately U.S. $43.00). 4/

Effects on competitiveness.--One of the most important factors considered in the purchasing of cement is the transportation cost. Transportation charges for deliveries beyond 200 to 300 miles are usually such a large factor in the final delivered cost that consumers are forced to search for closer suppliers. Mexican cement producers are able to ship longer distances because of the substantial cost savings realized through lower fuel costs. The fuel cost savings provided to Mexican cement producers translates into the equivalent of an additional marketing radius by rail of 591 miles for those using fuel oil and 530 miles for those using natural gas. 5/ Since U.S. producers also incur high transportation costs in reaching competing markets, the fuel cost savings realized by the Mexican producers has clear competitive advantages. Further, this provides additional pricing leverage for Mexican producers, who also have structural cost advantages in raw materials, electricity, direct labor, and all other costs.

To illustrate the effects of competitive costs between Mexico and U.S. plants the following tabulation shows a comparison of total delivered cost of cement, per ton, as delivered to the Southern California market from Mexico, and a competing U.S. cement plant located in California.

1/ Most of the Mexican cement producers use a No. 6 fuel oil, about 6 plants located near pipelines use natural gas.
2/ Based on fuel cost of $5.06/bbl (No. 6 fuel oil), fuel heat content of 6.09 MBTU/bbl and a plant efficiency of 3.1 and 5.5 MBTU/ton.
3/ Based on fuel cost of $50.00/ton of coal, fuel heat content of 25 MBTU/ton and a plant efficency of 3.1 and 5.5 MBTU/ton.
4/ Based on the average peso rate published by the International Monetary Fund.
5/ Brief submitted by Squire, Sanders and Dempsey, Feb. 26, 1985, p. 2.

Producer	Average production cost 1/	Other costs to market 1/ 2/	Total delivered cost
Mexico	$30.00	$8.00	$38.00
United States	$45.00	$9.00	$54.00

1/ Estimated.
2/ Includes transportation and duties.

These lower Mexican cement prices would likely have a limited impact on further penetration of inland U.S. cement markets, since increased transportation charges would negate the additional Mexican producer savings in energy costs. However, Mexican cement imports are directed at certain regions of the U.S. market, mainly adjacent to the border and along the southern U.S. coast, where Mexican energy savings more than offset the transportation charges to market incurred by Mexican suppliers, and thus provide them with a significant competitive advantage.

In the event Mexican cement producers used fuel oil purchased at world export prices, fuel costs for the production of Mexican cement would be estimated at between $12.73 and $22.58 per ton (depending on production process) or an average of $17.66 per ton. 1/ Average Mexican cement production costs would reach $40.31 per ton, and total delivered costs, in the example shown earlier, would be $48.31, or $5.69 under comparable U.S. delivered costs. Under these circumstances, the marketing area for Mexican cement would be more limited due to the high transportation costs to more inland destinations.

Effects on resource allocation.--The Mexican Government fuel policy provides a very substantial export cost saving to the Mexican cement producers by greatly reducing their fuel costs. This direct fuel savings is shown in the following tabulation.

1/ Based on fuel cost of No. 6 fuel oil at the $25.00 per barrel price available on the free market, fuel heat content of 6.09 MBTU/bbl and a plant efficiency of 3.1 and 5.5 MBTU/ton.

1984 Mexican Cement Exports - 2.2 million tons 1/

Average Mexican fuel production costs 2/	$3.55/ton
Average U.S. fuel production cost 3/	$8.75/ton
Average fuel production costs based on world prices for fuel oil 4/	$17.66/ton
Cost saving to Mexican producers from fuel policy 3/	$5.20/ton
Total cost savings due to the fuel policy on exported cement 5/	$11.4 million

1/ Estimated.

2/ Based on fuel cost of $5.06/bbl (No. 6 fuel oil), fuel heat content of 6.09 MBTU/bbl, and a plant efficiency of 3.1 and 5.5 MBTU/ton.

3/ Based on fuel cost of $50.00 ton of coal, fuel heat content of 25 MBTU/bbl, and a plant efficiency of 3.1 and 5.5 MBTU/ton.

4/ Based on fuel cost of No. 6 fuel oil at the $25.00/bbl price available on the free market, fuel heat content of 6.09 MBTU/bbl and a plant efficiency of 3.1 and 5.5 MBT/ton.

5/ Based on 2.2 million tons x $5.20 per ton cost savings.

Assuming a cost savings of $5.20 per ton on Mexican cement exports, the total cost savings to the Mexican industry amounted to $11.4 million based on 1984 exports. If this fuel cost savings per ton of cement, which is derived from the Mexican Government's energy policy, was added to the cement producers' average total production cost, the adjusted average Mexican production cost of about $35.20 per ton would remain at $9.80 below average U.S. total cement production costs. Since other costs to market are about the same ($8.00 for Mexican producers and $9.00 for U.S. producers), Mexican cement producers would still have a significant delivered price advantage in most markets currently served. However, at a fuel production cost input (estimated at an average $17.66 per ton) based on world prices for fuel oil, Mexican producers would not have exported cement at the 1984 levels. The U.S. marketing area would have been substantially reduced due to the much lower Mexican cost advantage with which to compensate for high transportation costs to many of these markets. It is likely, therefore, that resources directed toward the Mexican cement industry would have been allocated elsewhere in the absence of the Mexican Government's fuel policy, since the cement would have been too costly to be exported to most U.S. markets on a competitive basis.

Float glass

Mexican industry profile.--The Mexican float glass industry is dominated by two producers, both of which are subsidiaries of a holding company for approximately 80 companies involved in glass production or in support services for that industry. 1/ One of the firms, located near Mexico City, started float glass production in 1965, and has an annual capacity of 15 million square meters. The other firm, located in Monterrey, came onstream in 1981 and was the first plant to specialize in float glass production in Latin America. One-third of its production (an estimated 12 million square meters) is intended for export. 2/

The Monterrey plant reportedly has the largest melting furnace in the world; it is able to process up to 4,500 tons of raw material a week and has an annual capacity of 36 million square meters. The total capacity of the two firms (51 million square meters of 2mm thick float glass) is capable of supplying more than 100 percent of internal demand (estimated at 46.2 million square meters in 1982). The Monterrey producer plans to open another float glass facility in 1987. 3/

Mexican market.--The Mexican float glass industry is generally influenced by the same factors affecting the U.S. industry -- the economic conditions of the automotive and construction industries. During 1981-83, the global recession in Mexico significantly reduced output in the manufacturing and construction industries, thereby adversely affecting Mexican shipments of float glass.

The NIDP provided for an annual export growth rate of the cement and glass industries of 0.5 percent during 1978-82 and 3.2 percent during 1982-90. This required additional investment in the cement and glass industries during 1979-82 of 7.9 billion pesos (an estimated $632 million at 1975 prices), a 54.4 percentage increase over independent and programmed investment (what public and private firms would invest on their own initiative). Investment by government-run firms in the cement and glass sector of the Mexican economy amounted to 21.4 billion pesos (an estimated $942 million at December 1978 prices) during 1979-82, while 21.2 billion pesos ($933.1 million) is planned during 1983-86, and 32.5 billion pesos ($1.4 billion) during 1987-90. 4/

Mexican exports of cast, rolled, drawn, or blown glass (including float glass), as reported to the United Nations, fell from $432,000 in 1980 to $412,000 in 1981, before rising to $3.4 million in 1983 (table 13). Exports to the United States accounted for nearly 100 percent of total Mexican exports in 1983 (table 14).

1/ Brief submitted by Stewart and Stewart, on behalf of PPG Industries, Inc., February 19, 1985.

2/ Ibid.

3/ Ibid.

4/ Industrial Development Plan of Mexico, 1979-1982-1990, Abridged version, 1979, pp. 20, 21, and 55.

Table 13.--Cast, rolled, drawn, or blown glass: Mexican exports and imports, 1980-83

Year	Exports 1/	Imports 1/
	1,000 dollars	
1980	432	7,646
1981	412	11,944
1982	1,335	12,525
1983	3,359	8,960

1/ Subgroup 664.4 of the Standard International Trade Classification (SITC) includes cast, rolled, drawn, or blown glass (including flashed or wired glass), in rectangles, surface ground or polished, but not further worked.

Source: Compiled from official statistics of the United Nations.

Table 14.--Cast, rolled, drawn, or blown glass 1/: Mexican exports, by principal markets, 1980-83

(Value in thousands of dollars)

Market	1980	1981	1982	1983
United States	280	233	713	3,340
Panama	0	0	0	18
United Kingdom	0	0	0	1
Sweden	0	0	0	1
Argentina	0	0	243	2/
Brazil	35	94	186	2/
El Salvador	0	11	95	2/
Peru	0	2/	78	2/
All other 3/	109	73	19	2/
Total 4/	423	412	1,335	3,359

1/ Subgroup 664.4 of the Standard International Trade Classification (SITC) includes cast, rolled, drawn, or blown glass (including flashed or wired glass), in rectangles, surface ground or polished, but not further worked.
2/ Not available.
3/ All other reporting countries providing data to the United Nations data system.
4/ Reporting countries.

Source: Compiled from official statistics of the United Nations.

Note.--Because of rounding, figures may not add to the totals shown.

Mexican imports of cast, rolled, drawn, or blown glass (including float glass) rose 64 percent from $7.6 million in 1980 to $12.5 million in 1982, before declining by 28 percent to nearly $9 million in 1984. The United States was the principal supplying country in 1983, with Japan a secondary source (table 15).

Table 15.--Cast, rolled, drawn, or blown glass 1/: Mexican imports, by principal sources, 1980-83

(Value in thousands of dollars)

Country	1980	1981	1982	1983
United States	7,131	11,538	11,143	8,131
Japan	489	382	1,029	797
Singapore	0	0	0	33
Italy	0	0	326	0
Netherlands	0	23	23	0
West Germany	17	2	4	0
Spain	1	0	0	0
Belgium and Luxembourg	8	0	0	0
Total 2/	7,646	11,944	12,525	8,960

1/ Subgroup 664.4 of the Standard International Trade Classification (SITC) includes cast, rolled, drawn, or blown glass (including flashed or wired glass), in rectangles, surface ground or polished, but not further worked.
2/ All reporting countries providing data to the United Nations data system.

Source: Compiled from official statistics of the United Nations.

Note.--Because of rounding, figures may not add to the totals shown.

Effects on production costs.--Mexican float glass producers utilize similar technology to manufacture float glass as other world producers (the Pilkington process). The percent of total production cost for each factor of production is believed to be approximately the same as for the United States, as shown in the following tabulation (percent):

Energy and feedstock	50
Labor	25
Overhead	10
Maintenance	5
Depreciation	5
Insurance and taxes	5
Total production cost	100

In addition, transportation costs for Mexican float glass to the U.S. market are assumed to be the same as for U.S. producers--an estimated 10 percent.

The latest Mexican natural gas price 1/ was 13.99 pesos per cubic meter, or approximately $1.85 per thousand cubic feet. Using a U.S. natural gas

1/ Department of State Telegram from American Embassy in Mexico City, Telegram #02047, January 1985, p. 2.

price 1/ of $3.85 per thousand cubic feet, the Mexican natural gas price is 52 percent lower than the U.S. price.

Assuming that all other production cost factors are comparable to those experienced by the U.S. industry, and using representative prices of $0.20 and $0.636 per square foot for domestically produced float glass, prices for float glass manufactured with lower cost natural gas by Mexican producers would range between $0.164 and $0.52 per square foot. These prices represent a cost advantage to Mexican producers of 18 percent. The estimated prices for U.S. and Mexican float glass do not consider discounted or negotiated prices, which often are lower.

Industry sources allege that the production of certain raw materials, such as those used in Mexico for float glass manufacturing, are subsidized by a program entitled Trust Fund for Non-Metallic Minerals, which provides low-cost loans to producers of these minerals, thereby reducing mineral cost. Information on the magnitude of this alleged raw materials cost advantage is not identified by the industry. 2/

Effects on competitiveness.--Float glass is a physically homogeneous product, with minimal quality differences. Competition in the U.S. float glass market focuses on price and customer service. Considering the importance of price as a competitive factor, imports of Mexican float glass could be considered as having a distinct price advantage in the U.S. market due to the estimated energy cost price differential.

The cost differential is compounded by the estimated wage variance between U.S. and Mexican workers employed by the float glass industry. Although energy and raw materials account for the most significant share of float glass production costs, labor is also an important factor in its production (an estimated 25 percent). The actual wage advantage for Mexican producers, although not identified, has contributed to the lower price of their product in the U.S. market. 3/

This overall production cost advantage is not offset by transportation costs, based upon estimated percentage costs provided by industry sources. Delivered prices for domestically produced float glass range between $0.22 and $0.70 per square foot, which includes a 10-percent transportation cost. The average cost of transportation for Mexican float glass is assumed to be identical to that of U.S. producers, which raises previously estimated prices of this product to a range of $0.18 to $0.572 per square foot. Thus, the increase in prices resulting from estimated transportation costs does not offset the 18-percent price range variance between the U.S. and Mexican

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1/ Brief submitted by Stewart and Stewart on behalf of PPG Industries, Inc., Feb. 19, 1985.

2/ Ibid.

3/ Brief submitted by Stewart and Stewart on behalf of PPG Industries, Inc., Feb. 5, 1985, in connection with the countervailing duty case on float glass from Mexico, which alleges that labor accounted for 30.21 percent of the cost of goods sold in the United States, compared to 3.99 for Mexico.

product, excluding the difference for wages. A tabulation exhibiting these costs is shown below:

Producer	Production cost	Other costs to market	Total delivered cost to market
Mexico	$0.164 to $0.52	$0.016 to $0.052	$0.18 to $0.572
United States	$0.20 to $0.636	$0.02 to $0.063	$0.22 to $0.70

According to industry sources, Mexican producers have substantially discounted their float glass prices to gain entry into various U.S. markets. With an existing estimated price advantage of 18 percent, discounting of any magnitude could markedly increase this advantage in a price-sensitive market such as float glass. An effect of this advantage in the U.S. market is alleged price suppression of U.S. float glass prices. According to industry sources, domestic prices are below their 1982 levels. 1/ The producer price index appears to support the lower price allegation, as the index for plate (window), sheet, and float glass rose from 107.1 in December 1982 to 110.7 in December 1983, before falling to 97.0 in December 1984. 2/

Effects on resource allocation.--The glass industry in Mexico received its first major investment infusion after World War II, during which time glass was relatively scarce. The investment, which increased production capacity, also resulted in the export of Mexican glass to Latin America and the United States. 3/

International trade in float glass is generally limited due to the existence of flat glass plants in many world markets and to the high transportation costs involved. Nearly all of the float glass manufactured in Mexico is consumed internally, with less than an estimated 7 percent exported to world markets. Latin America and the United States remain Mexico's major export markets, principally due to their proximity to the Mexican market.

As indicated earlier, investment in the Mexican cement and glass industries is expected to increase during this decade, with an intent to spur export growth. With the proposed construction of another state-of-the-art float glass facility in Mexico by 1987, the export situation could change. The advantages held by Mexican producers from estimated lower natural gas costs, alleged preferential pricing of other raw material inputs, and lower labor costs could be significant in Mexico's development as a float glass exporter. It is believed that the Mexican float glass industry would have remained competitive in the U.S. market if Mexican producers had incurred a

1/ Brief submitted by Stewart and Stewart, on behalf of PPG Industries, Inc., Feb. 19, 1985.

2/ Producer Prices and Price Index, Bureau of Labor Statistics, Department of Labor.

3/ Area Handbook for Mexico, Thomas E. Weil et al., 2nd ed., 1975.

natural gas production cost input comparable to the higher U.S. natural gas price; this continued competitive status is likely attributable to the Mexican industry's cost advantage that is believed to exist in labor and other raw material inputs, the nature of its border trade with the United States, and the flexible pricing techniques employed by Mexican producers. As a result, it is likely that the resources directed toward the development of the Mexican float glass industry would have been allocated in the same manner in the absence of the Mexican Government's natural resource pricing policy.

Lime

Mexican industry profile.--In 1984 about 144 companies (including about 27 major commercial producers) produced lime throughout 16 Mexican states, although about 80 percent of production is concentrated to just 5 states: Monclona in Coahiula State; Calera in Hidalgo State; Huescalpa and Tamuzulita in Jalisca State, Apasco in Mexico State; and Monterrey in the State of Leon. Two of these lime companies are located virtually on the U.S.-Mexican border. One of them is wholly owned by the Mexican Government, which also holds a 44 percent share in the other. 1/ Although these companies have exported most of the lime entering the United States, other Mexican producers are also located near the border.

Fifteen companies produced 50 to 60 percent of the lime; however, they account for only about 35 percent of total Mexican production capacity, since the rest of the industry is comprised of numerous small producers. A large number of cement and concrete companies are involved in lime production. It is estimated that about 4,000 workers were employed in the Mexican lime industry during 1980-84.

Mexican market.--Mexican production of lime has decreased about 19 percent from 4.8 million short tons in 1980 to an estimated 3.9 million short tons in 1984 (table 16). 2/ Unlike the U.S. industry, Mexican lime production closely follows the trend of the housing and building construction industry, which has been in decline in Mexico and has had a negative effect on lime production.

As in the United States, it is uncommon to ship lime long distances, since the raw material for its manufacture is available in so many localities, and the Mexican lime industry is mainly dependent upon regional markets. Exports of lime from Mexico have increased from an estimated 19,000 tons in 1980 to about 73,000 tons in 1984 (table 16). Almost all of the lime exported from Mexico is shipped to the United States, with small quantities going to Central America. Exports to the United States have continued to increase despite countervailing duties placed on Mexican lime. 3/ Imports of lime into

1/ Brief submitted by Squire, Sanders and Dempsey, Feb. 25, 1983, p. 17.

2/ U.S. Bureau of Mines.

3/ Final Affirmative Countervailing Duty Determination and Countervailing Duty Order: Lime From Mexico, 49 F.R. 35672 (1984). One company had a specific countervailing duty of 55.89 percent ad valorem. An "all other" company rate of 1.21 percent ad valorem was established. Certain producers were excluded from the countervailing duty order.

Mexico are now negligible, declining from an estimated 24,000 short tons in 1980 to 1,000 short tons in 1984, due to Mexican restrictions imposed on lime imports.

Estimated apparent consumption of Mexican lime has decreased about 21 percent from 4.8 million tons in 1980 to 3.8 million tons in 1984, largely due to reduced demand in the Mexican construction market. Other Mexican industries consuming lime in significant quantities were agriculture (sugar processing) and the pulp and paper industry.

Table 16.--Lime: Mexican production, exports, imports, and apparent consumption, 1980-84

(In thousands of short tons)

Year	Production	Exports 1/	Imports	Apparent consumption	Ratio (percent) of imports to consumption
1980	4,795	19	24	4,800	.50
1981	4,960	12	2	4,950	.04
1982	4,400	32	2	4,370	.05
1983	4,000	57	1	3,944	.03
1984	1/ 3,900	73	1	3,828	.03

1/ Estimated by the staff of the U.S. International Trade Commission.

Source: Production statistics compiled from the U.S. Bureau of Mines, and exports compiled from the Mexican Foreign Trade Institute.

Effects on production costs.--As in the United States, the direct lime production costs in Mexico vary from plant to plant. The following tabulation contains estimated data on the various factors of production and the production costs accounted for by each: 1/

	Dollars per short ton	Percent of total production costs
Raw materials	$2.65	18
Fuel	5.91	39
Power	0.41	03
Direct labor	0.45	03
Other costs	5.55	37
Total production costs	14.97	100

Total production costs in Mexico are about $14.97 per short ton or 58 percent lower that the average price of $36.00 per ton for lime produced in

1/ Brief submitted by Squire, Sanders and Dempsey, Feb. 25, 1985.

the United States. It is believed that a cost advantage exists for Mexican lime producers relative to U.S. producers in all components of lime production costs. An important cost difference exists in lime production fuel costs, as Mexican lime producers have an average $12.47 per ton net fuel cost advantage over U.S. lime plants, based on an average U.S. fuel cost component of $18.38 per ton compared with a $5.91 per ton Mexican cost. Mexican fuel costs average about 39 percent of total production costs, whereas the comparable U.S. cost share is about 51 percent.

Effects on competitiveness.--A major factor in the final delivered cost of lime is transportation charges, which usually restrict lime sales to a 300-mile radius of each production plant. Mexican lime producers are able to ship longer distances because of the cost savings realized through the savings in their fuel costs. Since U.S. producers also incur high transportation costs in reaching competing markets, the fuel savings provides Mexican producers with a competitive advantage through additional pricing leverage given their structural cost advantage in all other production inputs.

The following tabulation shows a comparison of estimated total delivered cost per ton for lime, as delivered to the Tuscon, Arizona mining market from a plant located near the border in Sonara, Mexico, and a competing U.S. lime plant at Douglas, Arizona.

Producer	Average production cost 1/	Other costs 1/	Total delivered cost 1/
Mexico	$14.97	$15.53	$30.50
United States	$36.00	$14.00	$50.00

1/ Estimated.

Lower Mexican lime prices would likely have a limited impact on further penetration of inland U.S. lime markets, since increased transportation charges would negate any savings in energy costs. However, Mexican lime imports are directed at certain southern regions of the United States, mainly adjacent to the border, where Mexican fuel savings offset the transportation charges to market and provide a significant cost advantage over competing U.S. suppliers.

In the event Mexican lime producers used fuel oil purchased at world export prices, 1/ fuel costs for the production of Mexican lime would be $30.00 per ton. Estimated Mexican lime production costs would reach $39.06 per ton, and total delivered costs, in the example shown earlier, would be $54.59, or $4.59 over comparable U.S. delivered costs. Under these circumstances, Mexican lime would not be competitive with U.S.-produced lime.

1/ Based on a non-preheated rotary kiln, fuel costs of $25.00 per barrel of #6 fuel oil available on the free market, fuel heat content of 6.09 MBTU/bbl and a fuel consumption of 7.30 MBTU/ton.

Effects on resource allocation.--The Mexican Government fuel subsidy provides a very substantial cost saving to the Mexican lime producers by greatly reducing fuel costs. The direct export lime fuel savings can be shown in the following tabulation.

1984 Mexican lime exports----------------	73,000 tons 1/
Average Mexican fuel production costs---	$5.91/ton
Average U.S. fuel production costs------	$18.38/ton
Average fuel production costs based on world prices for fuel oil-----------	$30.00/ton
Estimated cost savings to Mexican producers due to fuel policy 2/--------	$12.47/ton
Total estimated cost savings on lime due to the fuel policy on exported lime 3/ to the United States.	$892.852

1/ Estimated.
2/ Based on export level of 73,000 tons.
3/ Based on 71,000 short tons x $12.47 per ton estimated cost savings.

Assuming a cost savings of $12.47 per ton on Mexican lime exports, the total cost saving to the Mexican industry amounted to $892,852 based on 1984 exports. If this fuel cost savings per ton of lime, which is derived from the Mexican Government's energy policy, was added to the lime producers' average total production cost, the adjusted average Mexican production cost of about $27.44 ton would remain at $8.56 below average U.S. total lime production costs. Since other costs to market are about the same ($15.53 for Mexican producers and $14.00 for U.S. producers), Mexican lime producers would still have a delivered price advantage in the market place. However, at a fuel production cost input (estimated at $30.00 per ton) based on world prices for fuel oil and a nonpreheated rotary kiln, Mexican producers would not have exported lime at the 1984 levels. The U.S. marketing area would have been substantially reduced due to an inability of Mexican producers to offset transportation costs to these markets, and, in fact, the delivered cost advantage of Mexican producers would not exist. The resources directed toward the Mexican lime industry, therefore, may have been allocated elsewhere in the absence of the Mexican government's fuel policy.

Refining 1/

Mexican industry profile.--PEMEX is the sole operator of petroleum refining facilities in Mexico. As of January 1, 1985, there were 9 petroleum refineries with a reported crude petroleum capacity of about 1.3 million barrels per calendar day. 2/ Only the United States, Canada, and Brazil in the Western Hemisphere and 10 other nations in the Free World had larger refining industries. 3/

1/ See app. G for results of the input/output methodology on the Mexican refining industry.
2/ "Despite Capacity Surplus World Oil Flow, Reserves Climb; Refining Capacity Drops," Oil and Gas Journal, Dec. 3, 1984, p. 74.
3/ Ibid.

Mexican market.--The Mexican market for petroleum products requires a different mix of products than does the U.S. market. In general, the Mexican market requires more of the heavier petroleum products, such as residual fuel oil, than does the U.S. market which stresses the lighter products, such as gasoline. The relative per capita ownership of private automobiles in the two countries accounts for a large part of this difference. As a result, residual fuel oil accounted for about 29 percent of total production of refined products in 1983 or about the same as gasolines which accounted for 28 percent. The following tabulation shows Mexican production, by product, in 1982 and 1983 (in thousands of barrels): 1/

	1982	1983
Gasolines	127,064	129,650
Kerosenes	27,755	24,256
Diesel fuel	84,755	81,745
Residual fuel oil	134,909	134,004
Others	77,666	81,054
Total	1/ 451,648	455,683

1/ This total differs from that in table 17 because it was derived from different sources and different products are included.

Mexican production of refined products increased from 982,000 barrels per day in 1979 to 1.3 million barrels per day in 1982, but declined slightly to 1.2 million barrels per day in 1983 (table 17).

Table 17.--Refined petroleum products: Mexican production, exports, imports, and apparent consumption, 1979-83

Year	Production	Exports	Imports	Apparent consumption	Ratio (percent) of imports to consumption
	Thousands of barrels per day				
1979	982	68	27	941	3
1980	1,254	46	15	1,223	1
1981	1,292	65	8	1,235	1
1982	1,302	43	112	1,371	8
1983	1/ 1,248	2/	2/	2/	2/

1/ Derived from PEMEX, Memoria de Labores 1983, p. 104.
2/ Not available.

Source: Derived from official statistics of the U.S. Department of Energy, except as noted.

Investment in the refining industry is provided for under the NIDP. Investment was planned for a 165.8 billion pesos level during 1983-86 and a

1/ PEMEX, Memoria de Labores, 1983, pp. 102-104.

396.9 billion pesos level during 1987-90. 1/ Thus, it appears the Mexican Government wishes to increase the size of its refining industry, possibly to expand exports of products to gain additional foreign exchange.

The Mexican positive balance of trade in refined products increased in terms of value from $147.6 million 2/ in 1980 to $610.4 million 3/ in 1983 mainly because of the increase in exports as shown in the following tabulation: 4/

Year	Exports	Imports	Trade balance
	------Millions of U.S. dollars-----		
1980------------------	390.7	243.1	147.6
1981------------------	589.0	159.1	429.9
1982------------------	355.9	140.5	215.4
1983------------------	865.8	255.4	610.4

Effects on production costs.--All Mexican refining capacity is controlled by PEMEX. Therefore, PEMEX does not sell crude petroleum in the domestic market to other refineries; rather, it transfers the crude petroleum to its own refineries for processing. As a result, Mexican refineries do not pay a market-determined refiners' acquisition cost such as in the United States but rather, they pay some internal transfer price. 5/ This transfer price is below world price levels but not below the cost of production of the crude petroleum. 6/

In the Mexican domestic market, petroleum product prices are established by a Government committee; however, the Government policy since 1982 has been to gradually raise the domestic price to those prices prevailing in the southern part of the United States or the international levels. 7/ The following tabulation shows consumer prices, less taxes, where applicable for Mexico and the United States for selected petroleum products: 8/

1/ Mexico, Industrial Development Plan, 1979-1982-1990, (Abridged English Version), 1979, p. 55.
2/ U.S. dollars.
3/ Ibid.
4/ "Good Performance from PEMEX," Petroleum Economist, August 1984, p. 289.
5/ Department of State, Telegram from American Embassy in Mexico, Telegram #2047, January 1985, p. 2.
6/ Ibid.
7/ U.S. Department of Energy, International Energy Annual 1983, November 1984, p. 50.
8/ Ibid.

Product	July 1983		January 1984	
	Mexico	United States	Mexico	United States
	U.S. dollars per gallon			
Premium gasoline	.37	1.27	.39	1.22
Regular gasoline	.25	1.06	.29	.98
Auto diesel fuel	.15	.94	.18	.96
Kerosene	.18	.89	.25	1.07
Light heating oil	.06	1.05	.12	1.12
LPG	.10	.66	.12	.77
	U.S. dollars per barrel			
Distillate fuel oil	6.21	36.71	7.61	38.30
Marine diesel fuel	1/	1/	1/	1/
Medium fuel oil	3.24	31.58	6.70	34.48
Heavy fuel oil	2.09	29.57	4.31	30.91
Marine fuel oil	1/	25.79	1/	27.13

1/ Not available.

Although the prices for Mexican products have been increasing, they are still well below U.S. prices. One of the problems Mexico has faced in trying to raise its prices to world levels is the Mexican rate of inflation. Even though the prices in Mexico in pesos have increased more than shown above, a large percentage of the increase is lost when converting pesos to dollars.

Effects on competitiveness.--Competition in the world petroleum products market is based primarily on price, as most of the products are fungible commodities. As a result, any factor that lowers the production cost of petroleum products allows the seller to reduce the price to gain market access or share. If crude petroleum were internally transferred to refining operations within PEMEX at around its estimated production cost of $3.00 per barrel to $6.50 per barrel, the Mexican refining industry would enjoy a large petroleum production cost advantage.

The tabulation above indicates that crude petroleum may be transferred within PEMEX to the refining sector at anywhere from one-quarter to one-fifth the U.S. or world prices. This production cost advantage is apparently reflected in the Mexican domestic prices of petroleum products thereby giving Mexican energy-intensive industries using petroleum products a competitive price advantage in the products they produce vis-a-vis the United States.

Effects on resource allocation.--PEMEX's petroleum products production cost advantage conferred by the availability to PEMEX of lower priced crude petroleum refinery feedstock is not so apparent in the prices of Mexico's petroleum product exported to the United States. In 1984, U.S. imports from Mexico of distillate and residual fuel oils, jet fuel, and naphtha did not differ significantly in prices from similar U.S. imports from other sources.

Under these export circumstances, the effect of the pricing practice on resource allocation is minimized. Mexican petroleum products exports to the United States would have been essentially price competitive even if PEMEX refineries used crude petroleum, priced at world levels.

Investment in the refining industry is expected to increase under the NIDP during 1987-90. Much of the investment is geared toward replacing imports of refined products with domestically produced goods. However, it is likely that increases in refining capacity will also result in increases in exports to the United States and Mexico's neighboring Latin American nations.

Steel

Mexican industry profile.--Mexico, Latin America's second largest steel-producing nation, ranked 20th in the world in raw steel production in 1983, with 63 million short tons, down 1.5 percent from 1982 (table 18). Raw steel output increased to 6.9 million short tons in 1984. 1/

The Mexican steel industry is divided into public and private sectors. The more than 74 enterprises (SIDERMEX) controlled by the Government produce over half of Mexico's total steel output. The three largest companies, the integrated producers, 2/ accounted for 29 percent of total 1983 steel production. Expansion programs begun at the three public integrated companies were delayed by the government's plan in 1982-83 due to Mexico's financial problems including currency and balance of payment problems, a huge foreign debt, and a continuing recession. The plan had called for Mexico's 1983 total capacity of 11 million tons to be increased to 17 million tons and then 23 million tons by 1986 and 1990, respectively. The private sector, composed of two integrated companies and a number of semi-integrated plants, accounted for slightly more than 45 percent of Mexico's steel production in 1983.

Electric furnaces accounted for 46 percent of raw steel output in 1983. Basic oxygen furnaces were the source of 43 percent, and open hearth furnaces accounted for 12 percent. 3/

1/ Metal Bulletin, Nov. 13, 1984.
2/ Integrated steel companies are defined as those companies that produce pig iron (in blast furnaces), as well as steel, in some or all of their plants. These firms generally produce steel in basic-oxygen or open-hearth furnaces, but may also use electric furnaces at some locations. Nonintegrated steel producers are defined as those companies that typically produce raw steel from ferrous scrap or a combination of ferrous scrap and direct reduced iron in electric furnaces.
3/ Dept. of State Airgram from American Consul in Monterrey, Telegram #A-05, August 24, 1984, p. 4.

Table 18.--Raw steel: Mexican production, capacity, and capacity utilization, 1980-84

Year	Production	Production capacity	Capacity utilization
	1,000 tons	1,000 tons	Percent
1980	6,490	1/	1/
1981	6,950	1/	1/
1982	6,400	9,400	68.1
1983	6,302	1/	1/
1984	6,780	1/	1/

1/ Not available.

Source: Department of State Airgram, Aug. 24, 1984; 1984 based on data obtained from Metal Bulletin, Dec. 4, 1984.

Mexican market.--Imports of steel into Mexico increased from 3.0 million short tons in 1980 to 3.4 million short tons in 1982, then fell to 1.0 million short tons in 1984, an overall decline of 67 percent (table 19). Exports rose from 74,000 short tons in 1980 to 1.1 million short tons in 1983.

The contraction in investment, restrictive financing, increased costs of raw materials, and devaluation of the Mexican peso contributed to reductions during 1980-84 in construction, metal-mechanics, and the automobile industries and a resulting decline in steel consumption.

Table 19.--Steel mill products: Mexican production, exports, imports, and apparent consumption, 1980-84

Year	Production	Exports	Imports	Apparent consumption	Ratio of imports to consumption
	1,000 short tons				Percent
1980	5,642	74	3,002	8,570	35.0
1981	5,813	46	2,756	8,523	32.3
1982	5,759	336	3,417	8,840	38.7
1983	4,980	1,092	1,527	5,325	28.7
1984	1/	1/	1,025	1/	1/

1/ Not available.

Source: Production and imports from Department of State Airgram, Aug. 24, 1984; exports compiled from International Iron and Steel Yearbook, 1983.

Mexican steel imports to the United States were the subject of trade complaints in 1983; however, the petitions filed by U.S. producers were withdrawn subsequent to the announcement of a voluntary restraint agreement by the Mexican Government. In December 1984, Mexico was one of seven countries which reached an agreement with the United States limiting its steel shipments to the U.S. market over the following five years. The agreement, effective October 1, 1984, limits Mexico's exports of finished steel at 0.36 percent of apparent U.S. consumption.

Effects on production costs.--Mexico's pricing policies on natural gas have influenced energy consumption in the production of direct-reduced iron (DRI) used in nonintegrated steel production. The direct-reduction process of making iron is a generic name for newly developed technologies which supplant the blast furnace and coke oven as a source of iron for steelmaking. The direct reduction process converts iron ore directly into sponge iron. This product is used in combination with scrap in the electric furnace process. The advantages of using direct reduced iron include a lower capital cost, production of higher purity steel, increased furnace productivity as direct-reduced iron can be continuously used, reduction of variability in product chemistry, and substitution of DRI for scrap in response to scrap shortages or scrap price increases.

Natural gas is the primary fuel consumed in making DRI. Due to the availability of natural gas and favorable Government pricing policies, the Mexican nonintegrated steel industry is viewed as having a cost advantage, particularly in production of DRI as an input for raw steelmaking. Approximately 10,000 BTUs of natural gas are consumed in making 1 ton of DRI. One thousand BTU's per cubic foot of natural gas equals 10,000 cubic feet of natural gas per ton of DRI. At the Mexican internal price of $1.71 per thousand cubic feet, 1/ versus an estimated U.S. price of $4.06 per thousand cubic feet, 2/ this translates into a $2.35 savings to the Mexican industry, per thousand cubic feet, or $23.50 per ton cost savings in DRI production. Since an estimated 1.1 ton of DRI-scrap mixture is used in making 1 ton of raw steel (of which the DRI component would generally not exceed 50 percent), and the finished steel product to raw steel input ratio is 80 percent, then $\$23.50 \times 0.55 \text{ ton} = \frac{\$12.93}{.8} = \$16.16$ savings to the Mexican steel industry per ton of finished steel.

The Mexican nonintegrated steel industry may also benefit from the low cost of oxide pellets, a raw material used to make DRI. According to U.S. industry sources, the price of oxide pellets in Mexico is approximately half of the price paid by U.S. steel producers because of the availability of iron ore from Mexico's deposits. Therefore, oxide pellets, priced at approximately $40.00 per short ton in the United States, and consumed at 1.4 short tons per ton of DRI produced, amount to a cost of an estimated $56.68 per ton of DRI produced. The lower price per ton of oxide pellets in Mexico amounts to approximately a 50 percent savings in the cost of oxide pellet consumption per short ton, or an estimated $28.34 savings.

Effects on competitiveness.--The Mexican nonintegrated steel industry is viewed as having a significant advantage over U.S. producers in the area of labor costs. According to the U.S. Department of Labor, hourly compensation in Mexico during 1982 (latest year available) averaged $2.37 per hour,

1/ Brief submitted by PEMEX on behalf of PEMEX, Feb. 19, 1985, Exhibit I.
2/ See App. D, p. D-12.

compared to $22.74 per hour in the United States. 1/ At an estimated 3 work hours per ton of finished steel product in the nonintegrated industry, 2/ the lower labor cost translates into approximately a $61.11 per ton cost advantage to the Mexican steel producers. The overall production cost advantage for Mexico of approximately $105.61 per ton based on the use of direct reduced iron, labor cost, and oxide pellets can be broken down by factor of production as follows:

$16.16	Energy (natural gas)
28.34	Raw materials
61.11	Labor
$105.61	

Part of the cost advantage is negated by transportation, duties, and insurance costs from the Mexican manufacturing site to the U.S. market. The following tabulation indicates how overall U.S. and Mexican prices per ton of finished steel compare in the U.S. market:

Producer	1983 production cost 1/	Other costs to market 2/	Total delivered cost 3/
Mexico	$179.39	$54.31	$233.70
United States	$285.00	$50.00	$335.00

1/ Mexican production cost is based on information derived from the World Steel Dynamics (WSD) U.S. mini-mill price/cost model adjusted for Mexican energy, labor, and raw materials cost components. The U.S. production cost is based on information derived from the WSD mini-mill price/cost model.

2/ Assuming that transportation, insurance, and other costs from Mexico to the United States are roughly the same as those experienced by the U.S. industry. The Mexican costs do not include U.S. tariffs. The U.S. cost to market represents an estimated cost of an average haul per short ton of wire rods in the southwestern U.S. region.

3/ Total delivered cost for imports from Mexico is based on an estimated production cost and estimated costs to the U.S. market. Total delivered cost of the U.S. product is based on information derived from the WSD mini-mill price/cost model and estimated transportation costs.

Effects on resource allocation.--The Mexican natural gas fuel policy provides a cost savings to the Mexican steel producers who manufacture DRI as a raw steel input by reducing fuel costs. The cost of producing DRI, however, is still considerably above the cost of scrap. Thus, the fuel policy has narrowed the cost differential between DRI and scrap, affecting the viability of the DRI process, encouraging investment in this technology, and enhancing Mexico's price competitiveness.

1/ U.S. Department of Labor, Bureau of Labor Statistics, Office of Productivity and Technology, "Hourly Compensation Costs for Production Workers in Iron and Steel Manufacturing 20 Countries, 1978-83," unpublished data, January 1984.

2/ According to U.S. nonintegrated steel mill representatives.

The cost savings of $16.16 per ton of steel, as a result of energy pricing policies, represents a relatively small component affecting Mexican steelmakers' competitiveness when compared to the overall cost advantage of $105.61, 58 percent of which represents a labor cost advantage. The energy policy is viewed as having relatively little effect on the allocation of resources in Mexico.

Organization of Petroleum-Exporting Countries.

OPEC was founded in 1960 by Iran, Iraq, Kuwait, Saudi Arabia, and Venezuela in order to permit the crude petroleum-exporting nations to present a unified front in their dealings with the major international petroleum companies. 1/ The need for this collective strength arose from the major petroleum companies unilaterally cutting the "posted prices" for Middle East crude petroleum in 1959 and again in 1960. 2/ The first goal of OPEC was to restore the posted prices to their pre-August 1960 level with the ultimate objective of controlling both the supply and the pricing of its members' petroleum. 3/ In so doing, OPEC endeavored to bring a degree of stability and predictability to the "posted prices", which were very important in determining the level of income of Middle East crude petroleum-producing countries. 4/ By the end of 1975, OPEC had reached its current 13-member status with the addition of Algeria, Ecuador, Gabon, Indonesia, Libya, Nigeria, Qatar, and the United Arab Emirates (UAE). 5/

OPEC has had difficulty, particularly over the last 2 years, in maintaining crude petroleum price stability. The crude petroleum price increases of 1973-74 and 1979-80 caused both a decrease in demand and a rise in supplies. The demand decrease was caused both by conservation induced by high prices, as well as the switching to other fuels. The supplies of crude petroleum were increased as non-OPEC nations, such as Mexico and the United Kingdom, discovered additional reserves and found it economically viable to produce in high-cost areas because of the higher prices.

The above scenario has primarily had two effects on industrial development within OPEC. The reduction in crude petroleum exports has caused a decrease in funds to invest. And, at the same time, the decrease in crude petroleum production has caused a decrease in the production of associated natural gas, which is the source of most of the feedstocks that were counted upon to provide the low-cost base for many petrochemical projects.

1/ Richard F. Nyrop. ed., Iran: A Country Study, Washington, D.C., 3rd ed., 1978, p. 446.

2/ Kenneth W. Clarfield, et al, Eight Mineral Cartels: The New Challenge to Industrialized Nations, New York, 1975, p. 9.

3/ James P. Roscow, 800 Miles to Valdez: The Building of the Alaska Pipeline, Englewood Cliffs, N.J., 1977, p. 50.

4/ Marwan Iskandar, The Arab Oil Question, 2nd ed., 1974, p. 9.

5/ Richard F. Nyrop, et al., Area Handbook for the Persian Gulf States, Washington, D.C., 1st ed., 1977, p. 84.

OPEC Industry Profile

Many of the OPEC nations have developed, or are in the process of developing, industries to utilize their natural resources of crude petroleum and the associated natural gas, which was previously flared, in order to diversify their industrial base. Saudi Arabia, Kuwait, Indonesia, are Venezuela are mentioned in relation to certain key points individually later in this section.

Although Ecuador, Iran, Iraq, Libya, Qatar, and the United Arab Emirates (UAE) have plans for new or expanded petrochemical and other industrial production, these nations' projects, even if completed, may not have a major effect on world markets. 1/ Industry sources report that Gabon has little industrial development but may become a marginal petrochemical producer; as such, it would be unable to satisfy Gabon's own domestic demand for most products, thus making the export of significant quantities of petrochemicals improbable. 2/ Iran and Iraq continue at war, while the UAE has had plans since the 1970's for a complex at Ruwais to make petrochemicals. 3/

Saudi Arabia

Historically, the State of Saudia Arabia, according to Article 1 of the Mining Code, "governs the exploitation of mineral wealth in Saudi Arabia . . . Ownership of all minerals is vested in the State, not in the surface owner or discoverer." 4/ However, "petroleum, natural gas, and derivatives, thereof . . . " were specifically excluded from the scope of this code. 5/

As of 1981, there were five companies involved in basic energy product industries in Saudi Arabia, three of which were dedicated to the production of crude petroleum and natural gas, refining, and exports of both the crude materials and the refined petroleum and natural gas products. 6/ These three firms were specifically restricted from dealing in the Saudi domestic market, which was the purview of Petromin 7/ and Gasco. Petromin, a State-owned organization established by King Saud in 1962, began assuming control over the Saudi domestic petroleum distribution from one of the three firms at that time, and, since that time, has also branched out into other petroleum and gas industries. 8/ As nationalization of the crude petroleum and associated

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1/ "Chemical Boom in the Middle East Oilfield," Manufacturing Chemist, January 1982, p. 15.

2/ This is based on information developed during fieldwork during previous investigations.

3/ "Third World Petrochemicals: How Much Market Clout," Chemical Business, March 1983, p. 13.

4/ Kingdom of Saudi Arabia, Ministry of Petroleum and Mineral Resources, Directorate General of Mineral Resources, Bulletin 1 : Mineral Resources of Saudi Arabia, A Guide for Investment and Development.

5/ Ibid.

6/ Business International S.A., Saudi Arabia Issues for Growth, an Inside View of an Economic Power in the Making, August 1981, p. 45.

7/ General Organization for Petroleum and Minerals.

8/ U.S. Department of Energy, Energy Industries Abroad, September 1981, pp. 149-157.

natural gas recovery operations continued, Petromin and the Ministry of Petroleum and Mineral Resources are thought to have assumed control of these operations. As such, the Saudi Government is believed to have complete control over these industries. However, one of the companies formerly operating in Saudi Arabia, made up of shares of U.S.-based multinationals, still operates, although now under the supervision of Saudi Government agencies.

Petromin owns the associated gas produced along with the crude petroleum recovery operations, which is processed through the Saudi Arabian Master Gas System (completed in 1982). 1/ Gasco, also a State-owned organization, is responsible for the distribution of liquid petroleum gas for Saudi domestic consumption.

The largest energy company in Saudi Arabia is Aramco, originally formed by four U.S. energy companies and the Saudi Arabian Government. The Arabian Oil Company, a joint venture between the Saudi Government, the Kuwaiti Government, and private Japanese interests, and a private U.S. energy company with operations in the Saudi/Kuwait Neutral Zone, are estimated to have together accounted for only approximately 2 percent of Saudi crude petroleum production in 1982. 2/ Overall, Saudi Arabian crude petroleum production has trended downward since 1980, as the Saudi Government has assumed the role of the "swing producer" of the OPEC membership in order to support the OPEC world marker price for crude petroleum. 3/

Kuwait

The Government of Kuwait established the Kuwait Petroleum Corporation (KPC) through Law 6 of 1980 (Jan. 21, 1980). KPC is designed to be the umbrella organization directly responsible to the Kuwait Ministry of Oil for all operations involving hydrocarbons, including exploration, production, marketing, transportation, refining, and petrochemicals. Existing companies such as the Kuwait Oil Company (KOC), the Kuwait National Petroleum Company (KNPC), the Kuwait Oil Tankers Company (KOTC), and the Petrochemical Industries Company (PIC), became subsidiaries of KPC according to Law 6. KPC has the autonomy to pursue commercial energy projects both in Kuwait and abroad. The Kuwait Government reviews KPC's financial activities, while the Supreme Petroleum Council and the Ministry of Oil issue policy directives . 4/

Indonesia

Indonesia is the only East Asian member of OPEC. Although, like other OPEC member nations, there is one central State company, Pertamina, responsible for all upstream and downstream domestic petroleum and natural gas

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1/ Aramco, The Master Gas System September 1981, pp. 149-157.

2/ U.S. Department of Energy, International Energy Annual, 1983, September 1984.

3/ U.S. Department of Energy, Energy Industries Abroad, September 1981, pp. 149-157.

4/ Ibid., 139-142.

activities. 1/ Pertamina also exercises supervisory control over any foreign petroleum service company's operations. Pertamina reports directly to a board of commissioners chaired by the Indonesian Government's Minister of Mining. 2/

Nigeria

Nigeria, the largest crude petroleum producer in Africa, has 12 energy companies conducting either exploration or recovery operations, although the Nigerian National Petroleum Corporation (NNPC) holds at least 60 percent of the shares of all of the energy operations. 3/ NNPC was formed in 1977 from the Nigerian National Oil Company and Ministry of Petroleum Reserves. The chairman of the NNPC reports directly to the President of the Federal Republic. 4/ One major multinational company, acting as joint venture partner with the NNPC, currently accounts for more than half of the petroleum-related activity in Nigeria. 5/

As of 1983, the associated natural gas produced in Nigeria was being flared at a rate of approximately 2 billion cubic feet per day. Reportedly, less than 1 percent of the associated gas is recovered and used primarily for generating power. 6/

Venezuela

The Venezuela Government nationalized the entire Venezuelan energy industry by enacting the Organic Law Reserving to the State the Industry and Commerce of Hydrocarbons, which took effect on Jan. 1, 1976. 7/ This action was the culmination of a 60-year effort by the Venezuelan Government to assume greater control of their natural resources. The controlling organization, Petroleos de Venezuela (PDV) evolved from the State-owned Corporacion Venezolana de Petroleo (CVP), itself established in 1960. Four main energy companies exist in Venezuela; each of these acts as a subsidiary of PDV. These four operating companies were formed from what at one time were an assortment of U.S.-based and other multinationals operating in Venezuela. Two of these companies each represent what was once one U.S.-based multinational, one represents a combination of two multinationals' operations, and the remaining company represents a merging of three U.S.-based companies' operations. Again, all of these companies report to PDV.

1/ Ibid., p. 215.

2/ Ibid.

3/ U.S. Department of Commerce, Marketing in Nigeria, April 1983, P.5., and U.S. Department of Interior, Mineral Industries of Africa, March 1984, p. 99.

4/ U.S. Department of Energy, Energy Industries Abroad, September 1981, pp. 139-142.

5/ U.S. Department of Energy, International Energy Annual, 1983, September 1984.

6/ Ibid.

7/ Petroquia 1984, pp. 24-29, and U.S. Department of Energy, Energy Industries Abroad, September 1981, pp. 51-56.

Natural Resources Pricing Policy

The world price of crude petroleum is determined by a complicated relationship of classical economic supply/demand theory and the actions of a cartel, namely OPEC. During 1973-75, the OPEC member nations' control of the pricing of world crude petroleum (and therefore all energy materials) was at its maximum, as world prices for crude petroleum were increased by decrees issued from OPEC summit meetings. 1/ The resulting economic feedback from this first crude petroleum price shock, along with the second crude petroleum price shock of 1979, related to the Iranian Revolution, 2/ contributed to a decline in both U.S. and world demand for crude petroleum and petroleum product imports from OPEC member nations. Average annual OPEC crude petroleum prices, therefore, have receded from the high of $34.50, achieved in 1981, to $28.70 for 1984. The following tabulation shows average OPEC official f.o.b. prices for crude petroleum for 1979-84: 3/

Year	Price (per barrel)
1979	$18.67
1980	30.87
1981	34.50
1982	33.63
1983	29.31
1984	28.70

The pricing policies of OPEC set in their Ministerials has no set relationship to any particular nation's internal policies. The following section concentrates on individual member nations' natural-resource-pricing policies.

Saudi Arabia

Internal natural resource pricing policies of Saudi Arabia are reported to be either unavailable or else informal, even in the context of contractural negotiations with non-Saudi joint venture partners involved in the Saudi domestic industrial development. However, the practices of Petromin, the State-owned domestic company that controls the associated natural gas recovered during the crude petroleum recovery process, are well documented. 4/ Also, it has been reported that officials of the Saudi Arabic Basic Industries Corporation (SABIC) have stated that the price of natural-resource-based feedstock is determined by the Saudi Arabian Government. 5/

1/ OPEC oil ministers meet at Ministerial Summits, at which time OPEC official marker prices are set by mutual agreement.

2/ Some analysts feel that there may be up to an 8-year delay between the world price shock and the appearance of direct economic effects.

3/ Central Intelligence Agency, International Energy Statistical Review, Jan. 29, 1985, p. 20.

4/ U.S. Department of Energy, Energy Industries Abroad, September 1981, p. 149, and confirmed by various industry sources.

5/ "The Saudi's Are Coming!," CPI Purchasing, March 1985, pp. 46-48.

The goals of the industrial development based on a Saudi domestic price of 50 cents per thousand cubic feet for natural gas used as feedstock or fuel, are not explicitly stated as part of their pricing practice. However, according to SABIC, the projected market distribution for petrochemicals produced in Saudi facilities is intended to be 10 percent for the Saudi domestic market, 20 percent for the United States, 22 percent for Europe, 20 percent for Japan, and 28 percent for the rest of the world. 1/

Authority.--The practice of setting internal natural resource prices by Petromin began, to a limited degree, with its creation in 1962 and continued increasing until Petromin assumed full control during the 1970's. 2/ Petromin is reported to be viewed as a profit-making company in the course of negotiations with potential buyers for its natural gas feedstock. Petromin apparently prices their natural or petroleum-based feedstock at levels deemed necessary to recoup its own costs for: (1) the process of preparation or, for the associated natural gas, separation from the crude petroleum and processing, and (2) the amortized costs of the Saudi Master Gas System. 3/ There does not appear to be any obligation assumed by the purchaser of the feedstock (natural-resource-based) materials to price their downstream products at less than world levels.

Implementation.--Petromin, the agent that sets production levels and prices, also approves investment and allocates revenues throughout the petroleum and natural gas sectors. 4/ The current Minister of Petromin has assumed the role of primary negotiator with the petroleum companies involved in nondomestic marketing of natural resources, as well as the role of the Chief Saudi representative at OPEC meetings. 5/

Examples of pricing policy.--The primary industries benefiting from Saudi Arabian raw materials that have their prices set by Petromin are the petrochemical industries, as shown in the following tabulation: 6/

Saudi company	Product	Annual capacity (metric tons)
Saudi Petrochemical Co., (SADAF). 1/	ethylene	656,000
	ethylene dichloride	454,000
	styrene	295,000
	ethanol 2/	281,000
	caustic soda	377,000
Saudi Yanbu Petrochemicals (YANPET). 3/	ethylene 4	455,000
	LLDPE 5/	205,000

See footnotes at end of tabulation.

1/ Mr. Abdulaziz al-Zamil, Middle East Economic Survey, Feb. 8, 1982, p. 4.
2/ Ibid.
3/ Based on conversations with U.S. and other nations' industry representatives.
4/ U.S. Department of Energy, Energy Industries Abroad, September 1981, p. 151.
5/ Ibid.
6/ "A Saudi Scorecard," CPI Purchasing, March 1985, pp. 48-49.

Saudi company	Product	Annual capacity (metric tons)
	HDPE 6/	96,000
	ethylene glycol	220,000
Al-Jubail Petrochemical Co. (KEMYA). 7/	LLDPE 5/	270,000
Saudi Methanol Co. (AR RAZI). 8/	Methanol	600,000
National Methanol Co. (IBN-SINA) 9/	Methanol	650,000
Arabian Petrochemical Co. (PETROKEMYA) 10/	ethylene	500,000
Eastern Petrochemical Co.	LLDPE 5/	130,000
(SHARQ) 11/	ethylene glycol	300,000
National Industrial Gas Company 12/	oxygen	
	nitrogen	
Al-Jubail Fertilizer Co. (SAMAD) 13/	Urea	500,000
National Plastic Co. (IBN HAYYAN) 14/	vinyl chloride	300,000
	poly vinylchloride	200,000
Gulf Petrochemical Industries	ammonia	330,000
Co. 15/	methanol	330,000
Saudi European Petrochemical Co. 16/	MTBE 17/	500,000

1/ Feedstocks are ethane (natural gas-based from Petromin or Aramco), salt and benzene (purchased from multinational owned refinery).

2/ U.S. company purchased 50 million metric tons to replace output of shutdown facility in Texas.

3/ Joint ventures.--50/50 with U.S.-based multinational; ethane feedstock.

4/ Onstream December 1984.

5/ Linear low-density polyethylene.

6/ High density polyethylene.

7/ Joint venture.--50/50 with other U.S.-based multinational; ethylene feedstock from SADAF; onstream March 1985.

8/ Joint venture.--50/50 with Japanese producers; methane feedstock.

9/ 2 U.S. partners each hold 25 percent.

10/ 100 percent owned by SABIC; expected to be onstream 7/85.

11/ Output to be marketed by Japanese consortium; ethylene feedstock from PETROKEMYA; onstream August 1985.

12/ Saudi private-sector company.

13/ 50/50 partnership with Taiwan Fertilizer Co.; output to be marketed in Far East.

14/ South Korean firm has 15 percent ownership; ethylene feedstock from PETROKEMYA; ethylene dichloride feedstock from SADAF; onstream 1986.

15/ Plant to be located in Bahrain (one-third partner); Petrochemical Industries Co. of Kuwait also one-third partner.

16/ Newest joint venture of SABIC, schedule for 1988; butane feedstock from PETROMIN and methanol from SABIC affiliates.

17/ Methyl-tert-butyl-ether.

These projects are all assumed to be based on 50-cent-per-thousand-cubic feet associated natural gas-based feedstocks and natural gas for fuel. 1/ It is primarily this low price for natural gas and natural gas-based feedstocks that has led to the large expansion in facilities to produce petrochemicals made from these feedstock. Few facilities in the tabulation use aromatic-based feedstocks such as benzene, toluene, and the xylenes. It is possible that as Saudia Arabia expands its refining capacity, more aromatic-based feedstocks for petrochemical conversion will become available. This could mean additional capacity to produce a whole range of petrochemicals based on benzene, toluene, and xylene.

Nigeria

Major General Mahammed Buhari, the head of the Nigerian military Government, which took control late in 1983, immediately reasserted Nigeria's allegiance to OPEC and also its determination to honor the nation's outstanding debts. 2/ Policies regarding natural resources, particularly those for the export-oriented production of crude petroleum, figure prominantly in Nigeria's plans. Although Nigerian production of crude petroleum could be increased by more than 100 percent, Major General Buhari has attempted to restrain increases in crude petroleum production in order to support the OPEC world marker price. 3/

Because of the nature of the military Government, there are no official (or public) authorizing documents concerning crude petroleum or natural gas pricing. Also, Nigeria is primarily a high cost-of-production crude petroleum producer, partly owing to difficult geography as well as relatively small fields, necessitating a greater number of wells in a general area. 4/

Domestic consumption accounted for only approximately 14 percent of Nigerian crude petroleum production. 5/ Nigeria's first refinery in Port Harcourt began operations in 1965; a second refinery at Warri opened in 1978. However, the output of these two plants did not reach nameplate capacity and also did not meet Nigeria's domestic demand. 6/ A third refinery became operational (though not fully operational) in 1980; however, specific domestic needs for petroleum products still needed to be met by imports. 7/ Plans for further industrial development using energy resources have not yet reached fruition, including plans for LNG production and export facilities. 8/ At present, there are only 12 commercial users of natural gas in Nigeria; power generation by the State-owned NEPA accounted for 95 percent of total domestic gas sales. Nearly 84 percent of the associated natural gas produced in 1983

1/ Ibid., confirmed by several industry sources.

2/ "Nigeria's New Strongman May Enforce IMF Austerity," Business Week, Jan. 16, 1984, pp. 94-98.

3/ Ibid., and "Oil Policy Under the Generals," Petroleum Economist, February 1984, pp. 55-57.

4/ "Oil Policy Under the General," Petroleum Economist, February 1984, pp. 55-57.

5/ Central Intelligence Agency, International Energy Statistical Review, Jan. 29, 1985, p. 3.

6/ The American University, Nigeria: A Country Study, pp. 171-173.

7/ Ibid.

8/ "Oil Policy Under the General," Petroleum Economist, February 1984, pp. 55-57.

was flared. 1/ A Government decree banning the flaring of associated gas was suspended within several weeks, as there was little alternative for the facilities producing the gas. 2/

Venezuela

PDV, the State-owned holding company in Venezuela that controls planning, coordination, and supervision of the petroleum industry, is chaired by the Minister of Energy and Mines. As chairman, the Minister votes the stock and has the legal power to set company policy. 3/

PDV also controls the Venezuelan petroleum refining industry, and therefore, does not have set prices for internal use of crude petroleum to make refined petroleum products. Domestic prices for all petroleum products were recently increased to provide additional funds for PDV and the central Government. 4/ Other reasons given were to restrain domestic petroleum demand and to reduce the disparity between domestic and international petroleum prices. Gasoline prices increased by 167 percent, from approximately 9 cents per gallon to 25 cents per gallon (at the free-market exchange rate). 5/ This translates into a current domestic price of $10.50 per barrel of gasoline. Assuming that the cost of operating a refinery in Venezuela is roughly equivalent to the corresponding costs in the United States. The cost of a barrel of crude petroleum for the refinery would be approximately $7.00-8.00. 6/

Other OPEC nations

In the other OPEC nations, the Governments either directly or through State-owned or State-affiliated energy companies, control or set domestic prices for these materials. In most cases, the major use for the petroleum and natural-gas-based products consumed in these nations is the generation of power. These nations, in many cases, remain reliant on imports of refined petroleum products. For example, Indonesian Government investment in domestic refining capacity was planned to increase, doubling the industry in size during 1981-85. 7/ Prices for the crude petroleum to be supplied to these refineries would probably not be set at a particular level, and probably not costed. However, for accounting purposes, the crude petroleum could be considered to be valued at world market levels, as the product would be replacing imports of comparable material.

1/ Ibid., p. 57.

2/ Ibid.

3/ Venezuelan Petroleum Industry, Developments and Outlook, December 1984, p. 45.

4/ U.S. Department of Commerce, Foreign Economic Trends and Their Implications for the United States, September 1984, p. 6.

5/ Ibid., Venezuelen currency equivalent, from Bs 1.125 to Bs 3.0. Price is for premium gasoline.

6/ U.S. refinery cost are approximately $2 to $3 .

7/ The American University, Indonesia: A Country Study, 1983, p. 156.

Other refinery expansions based on low-cost, available energy materials are export oriented and designed to produce a product that is competitively priced on the world markets. The domestic price of the feedstock materials for these plants may be estimated by examining the range of exported products costs and subtracting production and transportation costs.

The range of operating costs for most Persian Gulf refineries is between $1.50 and $2.00 per barrel, as the refineries are among the most efficient, modern facilities in the world and are equivalent to the best U.S. Gulf Coast refineries. 1/ Also, there are little or no raw material transport costs, as these refineries, in almost all cases, are built adjacent to the major energy-material-producing areas. 2/ Per barrel transportation costs from the Persian Gulf to the major consuming areas 3/ can range from $1 (to Japan) to more than $3. Therefore the equivalent refiner acquisition cost would be the market price of the product less the $2.50 to $5.00 for operating and product transportation costs and, also, less the profit and depreciation costs of the unit itself. Average world petroleum product prices from Persian Gulf refineries ranged from $30 to $35 per barrel during 1984. This yields a maximum cost for crude petroleum feedstock for these refineries of $25 to $30 per barrel. Unofficial reports have placed Saudi domestic prices at approximately 30 percent of U.S. prices; other OPEC nations' domestic prices are probably between 30 and 60 percent of the U.S. price.

1/ OPEC Downstream Project Resource Systems Institute, The Changing Structure of the World Refining Industry, for presentation to the U.S. Department of Energy, Jan. 23, 1985.

2/ Ibid.

3/ United States, Japan, and Western Europe.

Resources Affected

The natural resources affected by the pricing policies of OPEC member nations are both crude petroleum and natural gas. The development of industries dependent on these raw materials for feedstock has, in some cases, allowed production of the raw material to continue despite decreasing world demand for the crude materials, especially from the OPEC nations. Table 20 shows OPEC production, net trade, and consumption of crude petroleum during 1980-84.

Table 20.--Crude petroleum: OPEC member nations' production, net trade balance, and consumption, 1980-84

(In thousands of barrels per day)

Year	Production	Net trade 1/	Consumption 2/
1980	26,891	24,031	2,860
1981	22,646	19,659	2,987
1982	18,868	15,618	3,250
1983	17,562	14,101	3,461
1984	3/ 16,431	4/	4/

1/ Presumably all exports, no significant imports.
2/ Data for October 1984 from Central Intelligence Agency, International Energy Statistical Review, Jan. 29, 1985, p. 3.
3/ Ibid., p. 2.
4/ Not available.

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

Total crude petroleum production by the OPEC nations declined steadily during 1980-84, from 26.9 million barrels per day in 1980 to approximately 16.4 million barrels per day in 1984 (table 20). As a reference case, OPEC production averaged 31.0 million barrels per day in 1973. 1/

Domestic consumption of crude petroleum in OPEC nations has increased, primarily because of increasing domestic energy/power demands as industrial development proceeds.

Because of the cartel behavior exhibited by OPEC during the 1970's, OPEC member nations have, in most cases, become suppliers of last resort for crude-petroleum-importing nations. Certain OPEC nations have experienced severe financial and economic strains attempting to meet obligations as revenues from crude petroleum exports declined. Development of downstream industries based on associated natural gas has been used as one strategy to attempt to generate more revenue for these nations as the volume of recovered crude petroleum declined.

1/ Central Intelligence Agency, International Energy Statistical Review, Jan. 29, 1985, p. 2.

Table 21 shows the available data for OPEC member nations' production, imports, exports, and consumption of natural gas for 1980-84. Available data tend to verify the trends being observed and reported by industry analysts. Less natural gas is being flared and reinjected into the producing crude petroleum wells, and more is being processed and converted into either electricity or usable and exportable petrochemical products. A more significant increase in domestic natural gas consumption, particularly in Persian Gulf nations, was expected in 1984 and 1985, although no data are yet available.

Table 21.--Natural gas: OPEC production, imports, exports, and consumption, 1980-84

(In millions of cubic feet per day)

Year	Production	Imports	Exports 1/	Consumption
1980	9,357	0	2,700	6,657
1981	9,406	0	2,300	7,106
1982	9,817	0	2,640	7,177
1983	11,107	0	2/	2/
1984	2/	2/	2/	2/

1/ Between 25 and 40 percent of these exports are estimated to be in the form of LNG, primarily to Japan.
2/ Not available.

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

Primary Consuming Industries That Benefit

Ammonia

Saudi Arabian industry profile.--The Saudi Arabia ammonia industry is made up of two domestic plants; one of which became operational in 1969, and the other late in 1983. 1/ Construction of a new facility located in Bahrain that will be one-third owned by SABIC is expected to be completed and operational early in 1986. 2/ The two domestic Saudi plants have a combined capacity of 530,000 metric tons per year, with all of the product material to be used as feedstock for Saudi urea production facilities, built immediately adjacent to these ammonia facilities.

Saudi Arabian market.--Actual growth in the demand or need for fertilizers in order to supply growing food needs in developing nations in

1/ U.S. International Trade Commission , The Probable Impact on the U.S. Petrochemical Industry of the Expanding Petrochemical Industries in the Conventional Energy-Rich Nations, USITC Publication 1370, April 1983, pp. 54-55, and European Chemical News, July 30, 1984, p. 17.
2/ "A Saudi Scoreboard," CPI Purchasing, March 1985, pp. 48-49.

Africa and Asia is expected to account for much of the increasing supply of Saudi-produced ammonia. However, both trade and domestic use of the ammonia is in the form of the downstream product urea. Table 22 shows the available date for production and consumption of Saudi Arabian ammonia; table 23 shows available data concerning production, exports, and consumption of Saudi-produced urea.

Table 22.--Ammonia: Saudi Arabian production, imports, exports, and consumption, 1980-84

(In thousands of metric tons of nitrogen)

Year	Production	Imports	Exports 1/	Consumption
1980	2/ 170,000	0	-	2/ 170,000
1981	171,200	0	-	171,200
1982	171,600	0	-	170,600
1983	2/ 300,000	0	-	2/ 300,000
1984	2/ 400,000	3/	-	2/ 400,000

1/ All ammonia produced in Saudi Arabia is used to produce urea.
2/ Estimated.
3/ Not available, but may be assumed to be zero.

Source: Nitrogen, various issues.

Table 23.--Urea: Saudi Arabian production, exports, and consumption, 1980-84

(In thousands of metric tons of nitrogen)

Year	Production	Exports	Consumption
1979 1/	137,500	133,900	9,200
1980 1/	151,827	131,338	15,000
1981	157,400	132,600	21,000
1982	2/	3/ 292,260	2/
1983	4/ 426,000	3/ 362,404	3/ 64,000
1984	2/	2/	5/ 150,000

1/ Fertilizer International, February 1981, p. 11.
2/ Not available.
3/ Europa Chemie, June 6, 1984, p. 268.
4/ Estimated.
5/ Estimated rate of consumption, European Chemical News, July 30, 1984, p. 17.

Source: Nitrogen, May 1982, except as noted.

As can be seen from the data on the previous tables, both the Saudi domestic and export markets have grown substantially in order to accommodate the increased production. The major foreign markets for the Saudi-produced urea are China, Taiwan, and certain developing nations in Africa and Asia. 1/

Effects on production costs.--The natural resource used to produce ammonia is the associated natural gas produced along with crude petroleum recovery operations. The cost of the natural gas to the Saudi ammonia industry is reported to be set by Petromin and has been reported to be 50 cents per thousand cubic feet. 2/ Since the natural gas used for the production of ammonia is associated natural gas, and would otherwise be flared, the comparison of production costs which follows is an estimate of the Saudi comparative advantage in producing this associated natural gas. The production cost structure for ammonia produced in Saudi Arabia would be within the ranges shown in the following tabulation (per short ton):

Energy & feedstock----------	$12.00 - $19.00
Labor and maintenance-------	6.50 - 9.50
Overhead--------------------	1.10 - 1.70
Depreciation----------------	13.00 - 19.50
Insurance and taxes---------	2.00 - 3.00
All other-------------------	10.40 - 12.30
Total------------------	45.00 - 65.00

These cost figures, compared with the comparable U.S. production costs ($92 to $170), indicate that the cost of the natural gas used as energy and feedstock make up a much smaller share of the Saudia ammonia production costs (25 to 30 percent) than the comparable costs for the U.S. industry (67 to 78 percent). Also, total production costs to the Saudi industry ranged from approximately 35 to 50 percent of the total production costs to U.S. producers.

Effects on competitiveness.--The major costs not included in the previous discussion were transportation costs. The following tabulation shows the ocean transportation costs for urea 3/ between areas with major ports involved in the petrochemical trade (in thousands of dollars): 4/

1/ Europa Chemie, June 6, 1984, p. 268.

2/ "The Saudi's Are Coming," CPI Purchasing, March 1985, pp. 46-48, and confirmed by industry sources.

3/ All Saudi ammonia is processed to urea before it is exported.

4/ United Nations Industrial Development Organization, Transport Costs for Shipping Petrochemicals, July 20, 1982, pp. 94-126; all costs shown are per round trip.

	Fuel cost	Port cost	Canal tolls	Total voyage cost
Bulk urea loaded in Saudi Arabia and discharged in--				
United States (New Orleans)------	286	19	48	353
Western Europe (Italy)-----------	175	21	48	244
Western Europe (Rotterdam)-------	228	24	48	300
Japan (Yokohama)-----------------	240	22	-	262
Bagged urea loaded in Saudi Arabia and discharged in --				
United States (New Orleans)------	223	31	29	283
Western Europe (Italy)-----------	152	36	29	217
Western Europe (Rotterdam)-------	187	41	29	257
Japan (Yokohama)-----------------	199	38	-	237

Urea is normally shipped in bagged form in lots of 10,000 to 14,000 metric tons. The Saudi transportation costs, as allocated for a short ton of urea, would be as follows (per short ton):

From Saudi Arabia to:	
New Orleans----------------	$20.20 -$28.30
Italy----------------------	15.50 - 21.70
Rotterdam------------------	18.35 - 25.70
Japan----------------------	16.90 - 23.70

The U.S. transportation costs for bagged urea from a Gulf of Mexico port to Italy, Rotterdam, and Yokohama, both per (round trip) voyage, and per short ton urea, are shown in the following tabulation: 1/

	Per voyage	Per short ton
From the U.S. Gulf Coast to:		
Italy-------------------	$227,000	$16.20 -$22.70
Rotterdam---------------	192,000	13.70 - 19.20
Japan-------------------	316,000	22.50 - 31.60

By the application of transportation costs to the ammonia production prices, total costs are determined. The following tabulation shows a simulated version of comparative costs between the U.S. industry's product and the Saudi-produced ammonia f.o.b. major markets (in dollars per short ton): 2/

1/ Ibid.

2/ United Nations Industrial Development Organization, Transport Costs for Shipping Petrochemicals, July 20, 1982, pp. 94-126; all costs shown are per round trip.

	U.S. ammonia		Saudi ammonia
Production cost	$92 -$170		$45 -$65
Transportation to:			
U.S. Gulf Coast	-		20 - 28
Italy	16 - 23		15 - 22
Rotterdam	13 - 20		18 - 26
Japan	22 - 32		16 - 24
Duties:			
U.S. Gulf Coast		Free	
Italy		(11.1%)	
Rotterdam		(4.5%)	
Japan		(4.2%)	
Total cost f.o.b.:			
U.S. Gulf Coast	92 - 170		65 - 93
Italy	120 - 215		66 - 97
Rotterdam	109 - 199		69 - 96
Japan	199 - 211		63 - 93

Effects on resource allocation.--If the natural gas feedstock that went into the production of ammonia in Saudi Arabia were to be priced at world market levels, the cost to the Saudi producer of ammonia would be increased significantly. Current world natural gas prices range from $4.00 to $4.50 per thousand cubic feet. 1/ Saudi energy and feedstock costs would increase to a range between $96.00 and $170.00 per short ton of ammonia. Therefore, total production costs would be anticipated to range from $129 to $220 per short ton. Saudi-produced ammonia would remain on a competitive level with U.S.-produced ammonia in Mediterranean markets and would probably retain a competitive advantage over U.S. ammonia in Japanese markets. However, Saudi ammonia would not have an advantage in U.S. markets.

The total difference between the world price of the natural gas feedstock used to produce ammonia and the price set by Petromin, assuming a 100-percent utilization rate for all existing Saudi capacity, would range between $44 million and $80 million. However, if the Saudi ammonia industry did not use the natural gas, it would instead be flared and not used at all.

Ethylene

Saudi Arabian industry profile.--By yearend 1985, Saudi Arabian ethylene capacity is expected to be approximately 1.6 million metric tons per year, distributed fairly evenly among three major Saudi petrochemical producer, each with their own world-scale facilities--SADAF, YANPET, and PETROKEMYA. 2/ Two of these companies are SABIC joint ventures. SADAF is a joint venture with a multinational petroleum company's Saudi subsidiary. Their facility, which employed U.S. officers for startup procedures, has now begun replacing them

1/ U.S. Department of Energy, Natural Gas Monthly, January 1985, March 1985, p. 22.

2/ "A Saudi Scoreboard," CPI Purchasing, March 1985, pp. 46-51.

with Saudi nationals who have been trained in the United States. 1/ YANPET is a 50/50 joint venture with a U.S.-based multinational, although 85 percent of the funding is Saudi-sourced. 2/ PETROKEYMA is 100 percent owned by SABIC.

Saudi Arabian market.--All of the ethylene produced in Saudi Arabia will be consumed within the downstream Saudi petrochemical industry. The ethylene produced in the SADAF and YANPET ethylene facilities will be transported directly to adjacent downstream petrochemical plants for use in those facilities to produce such derivatives as ethylene dichloride, ethanol, polyethylene, and ethylene glycol. Two other SABIC joint venture companies producing downstream petrochemicals (SHARQ and IBN HAYYAN) will use the ethylene output of PETROKEMYA to produce polyethylene, ethylene glycol, vinyl chloride monomer, and polyvinylchloride. 3/

One ethylene plant began production in 1984, another in January 1985, and the third is anticipated to be onstream in July 1985. 4/ There are as yet no production, trade, or consumption data available.

Effects on production costs.--Again, as in the other basic petrochemical industries located in Saudi Arabia, the Saudi ethylene industry is based on 50 cent per thousand cubic feet natural gas feedstock supplied by PETROMIN. Since the natural gas used for the production of ethylene is associated natural gas, and would otherwise be flared, the comparison of production costs which follows is an estimate of the Saudi comparative advantage in producing this associated natural gas. The production costs to the Saudi ethylene industry are expected to be within the ranges shown in the following tabulation (in cents per pound ethylene produced):

Feedstock and fuel 1/	1 - 3
Utilities	1 - 2
Labor	1 - 2
Maintenance	3 - 5
Overhead	1 - 3
Other (insurance, taxes, etc.) 2/	2 - 4
Total production costs	7 -19

1/ No byproduct from natural-gas-based ethane feedstock used by Saudi producers.
2/ Tax holiday of 5 years from date of start of operations.

The data in the previous tabulation shows that natural gas feedstock and fuel costs in relation to total production costs are significant lower for the Saudi ethylene producer (13 to 18 percent) than for the U.S. ethylene producer (45 to 60 percent). These Saudi costs are approximately one-sixth of the comparable U.S. costs. Overall, Saudi ethylene production costs range from approximately 35 to 60 percent of U.S. ethylene production costs.

1/ Ibid.
2/ Ibid.
3/ Ibid.
4/ Ibid.

Effects on competitiveness.--Transportation costs for the major downstream derivatives of ethylene may be best summarized by first examining a "dry" derivative and then a "wet" derivative. For example, the transportation costs for "dry" polyethylene would be roughly equivalent to those for urea. The transportation cost per metric ton of polyethylene from a Saudi port and from a Gulf of Mexico port to major ports trading in petrochemicals, is shown in the following tabulation (per metric ton): 1/

	From Saudi Arabia	From U.S. Gulf
To:		
U.S. Gulf---------	$100 -$180	-
Italy-------------	138 - 150	$140 -$160
Rotterdam---------	150 - 170	100 - 120
Japan-------------	140 - 160	160 - 180

Transportation costs for "wet" ethylene glycol are reported to be 70 percent of the costs of transporting methanol. 2/ The costs to the Saudi and U.S. ethylene glycol producer for transportation to major markets are shown in the following tabulation (per metric ton):

	From Saudi	From U.S. Gulf Coast
To:		
New Orleans---------	$20 - 22	-
Italy---------------	15 - 17	$16 -$18
Rotterdam-----------	18 - 21	14 - 17
Japan---------------	17 - 19	20 - 22

The following tabulation shows the transportation costs combined with production costs and duties to provide an estimated of the costs of ethylene f.o.b. major port (in cents per pound):

1/ Compiled from various industry sources.
2/ Nations Industrial Development Organization, op. cit.

	U.S. ethylene	Saudi ethylene
Production costs	20 - 27	7 - 19
Transportation costs to:		
U.S. gulf coast----	-	7 - 10
Italy--------------	6 - 9	5 - 8
Rotterdam----------	4 - 6	6 - 8
Japan--------------	7 - 10	6 - 9
Duties:		
United States------	free	
Italy--------------	free	
Rotterdam----------	4.5%	
Japan--------------	7.5%	
Total cost f.o.b.:		
U.S. gulf coast----	20 - 27	14 - 29
Italy--------------	26 - 36	12 - 27
Rotterdam----------	25 - 35	13 - 29
Japan--------------	29 - 40	13 - 31

Effects on resource allocation.--If the natural gas used in the ethylene production process in Saudi Arabia were priced at the world level instead of being set at 50 cents per thousand cubic feet by Petromin, the Saudi costs for fuel and feedstock for producing 1 pound of ethylene world be between 8 and 15 cents. This would increase the total production cost to 14 to 31 cents per pound of ethylene produced. The share of total production cost for which fuel and feedstock costs account would increase from a range of 13 to 18 percent to a range of 45 to 60 percent, and the overall competitive advantages of the Saudi ethylene producers owing to low-priced natural gas would be significantly diminished. Saudi Arabia needs the low-priced natural gas for its ethylene to have an unequivocal price advantage over U.S.-produced ethylene in the U.S. Italian, Rotterdam, and Japanese markets. At world-level natural gas prices, Saudi-produced ethylene is only marginally competitive with U.S.-produced ethylene in the same markets.

The difference in total value between the costs of the natural gas used to produce ethylene in Saudi Arabia using the world price of the natural gas and the Petromin price, ranges between $210 million to $425 million, assuming 100-percent-capacity utilization and all Saudi capacity is operational. 1/ However, there is now no other industrial outlet available for Saudi natural gas, and it therefore would have to be flared and would have no economic value.

Methanol

Saudi Arabian industry profile.--Two modern, efficient world-scale methanol plants began operating in Saudi Arabia during 1983-85. The first, a 50-50 joint venture between SABIC and a consortium of Japanese methanol producers known as the Saudi Methanol Company, began production during 1983-84. The methanol produced in this facility is being shipped to the Far

1/ As of yet, not all Saudi ethylene capacity is onstream.

East, where it is replacing shutdown Japanese methanol capacity. 1/ The other methanol project, called the National Methanol Company was targeted to come onstream early in 1985, but actually began operating during the summer of 1984. The two SABIC partners in this venture are two U.S. petrochemical companies, each with 25-percent shares. 2/ Together, these plants have a capacity of more than 1.2 million metric tons per year, and, according to industry analysts, are currently operating above nameplate capacity.

Saudi Arabian market.--Until a plant which uses methanol as feedstock to produce methyl-tert-butyl-ether begins production in 1988, there would only be negligible domestic demand for the Saudi-produced methanol. Exports will be to the Far East (Japan, Taiwan) and to Western Europe. No hard production or export data for methanol are yet available; however, if the plants operate at expected rates, Saudi production and exports of methanol will approximate Saudi nameplate capacity, approximately 1.2 million metric tons.

Effects on production costs.--The Saudi methanol industry, as are all of the developing petrochemical industries in Saudi Arabia, is based on Petromin-owned natural gas feedstocks, which are sold to the methanol producers at a reported 50 cents per thousand cubic feet. 3/ Since the natural gas used for the production of methanol is associated natural gas, and would otherwise be flared, the comparison of production costs which follows is an estimate of the Saudi comparative advantage in producing this associated natural gas. The production costs to the Saudi methanol industry are expected to fall within the ranges shown in the following tabulation (in cents per gallon of methanol produced): 4/

Energy and feedstock-----	4.7 - 5.5
Catalyst and chemical---	.5 - 1.0
Labor--------------------	.3 - .6
Maintenance--------------	1.0 - 2.5
Overhead-----------------	6.0 - 9.0
Other (includes depreciation, insurance, taxes 1/---------------	8.0 - 12.0
Total production cost--------------	23.5 - 36.6

1/ Tax holiday of 5 years from date of beginning operations.

As can be seen from the data in the previous tabulation, energy and feedstock costs may represent from 15 to 25 percent of Saudi methanol producer's production costs. The U.S. methanol industry's energy and feedstock cost (28 to 37 cents per gallons) account for 60 to 75 percent of their total production costs (41 to 56 cents per gallon). The overall production costs of the Saudi producers are only 55 to 70 percent of U.S. production costs.

1/ "A Saudi Scorecard," CPI Purchasing, March 1985, p. 49.
2/ Ibid.
3/ "The Saudi's are Coming," CPI Purchasing, March 1985, pp. 46-51.
4/ Compiled from information gathered from various industry sources.

<u>Effects on competitiveness</u>.--Annual transportation costs for long-haul methanol tankers (usually 35,000 or 55,000 dead weight tons) for certain routes to major markets are shown in the following tabulation (in thousands of dollars):

	Numbers of round trips	Brokers costs	Port changes	Canal tolls	Total costs 1/
Saudi Arabia to:					
Italy-----------	10-12	2,068	143	875	3,241
Rotterdam-------	7-9	2,037	253	656	3,086
New Orleans-----	5-7	2,137	164	596	2,946
Japan-----------	7-9	2,167	194	-	2,896
U.S. gulf coast to:					
Italy-----------	9-11	2,095	116	-	2,211
Rotterdam-------	9-11	1,984	312	-	2,296
New Orleans 2/--	39-40	947	484	-	1,432
Japan-----------	5-7	2,407	185	326	2,918

1/ May not total due to rounding.
2/ From other U.S. Gulf Coast location.

The costs shown in the following tabulation are the transportation costs allocated per metric tons of methanol delivered to major markets (per metric ton):

	From Saudi Arabia	From U.S gulf coast
To:		
New Orleans-------------	$29 -$31	$8 -$10
Italy-------------------	22 - 24	23 - 25
Rotterdam---------------	27 - 29	21 - 23
Japan-------------------	25 - 27	29 - 31

The following tabulation shows how these transportation costs and duties, when added to production costs of the methanol producers in the United States and Saudi Arabia, yield the following estimates of methanol costs f.o.b. major ports (per metric ton): 1/

1/ United Nations Industrial Development Organizations op. cit., pp. 70-93.

	U.S. methanol	Saudi methanol
Production costs--	$93 -$124	$77 -$92
Transportation costs to:		
U.S Gulf Coast--	8 - 10	29 - 31
Italy-----------	23 - 25	22 - 24
Rotterdam-------	21 - 23	27 - 29
Japan-----------	29 - 31	25 - 27
Duties:		
United States---	18.4%	
Italy-----------	11.1%	
Rotterdam-------	4.5%	
Japan-----------	4.9%	
Total cost f.o.b.		
United States---	93 - 124	125 - 146
Italy-----------	128 - 166	109 - 129
Rotterdam-------	119 - 154	108 - 127
Japan-----------	127 - 163	106 - 125

Effects on resource allocation.--Assuming the natural gas used either as a feedstock or a fuel were both priced at current world market prices, Saudi feedstock and fuel costs would increase to between 35 and 48 cents per gallon of methanol produced. Total Saudi production costs for methanol would increase to between 53 and 79 cents per gallon. Saudi-produced methanol would probably not be competitive in the world market without the feedstock and fuel price advantage. The difference between the world value of the natural gas used to produce the methanol and the price, as set by Petromin (30 to 42 cents per gallons) works out to between $121 million and $169 million, assuming 100 percent utilization of Saudi methanol capacity for 1 year. However, there are no Saudi domestic alternative uses for the natural gas, and it would have to be flared.

Refining

Saudi Arabian industry profile.--The Saudi Arabian refining industry, as of the beginning of 1984, consisted of crude petroleum refining capacity of 920,000 barrels per day production. 1/ Of the six refineries, which accounted for this capacity, only four are located in Saudia Arabia; two are located in the Neutral Zone (shared with Kuwait). 2/ The output of these refineries is either used within Saudia Arabia or by other Persian Gulf nations.

Three additional major export refineries, which have joint ventures between Petromin and multinational petroleum companies, are either entering full-scale operation, start-up phase, or final construction phase. 3/

1/ "Worldwide Report," Oil & Gas Journal, Dec. 31, 1984, pp. 136 and 144.
2/ Ibid.
3/ Platt's Oilgram News, Mar. 14, 1985.

Together, these refineries will add another 825,000 barrels per day of refining capacity to the Saudi petroleum products industry. Two small refineries (300,000 barrels per day total capacity), which had reached only the planning stage, have recently had their construction postponed indefinitely. 1/

Saudi Arabian market.--Table 24 shows all of the available information regarding petroleum product production, trade, and Saudi domestic consumption for 1980-84.

Table 24.--Petroleum products: Saudi Arabian production, imports, exports, and apparent consumption, 1980-82

(In thousands of barrels per day 1/)

Year	Production	Imports	Exports	Apparent consumption
1980	902	33	538	397
1981	852	38	510	380
1982	888	35	539	384

1/ Not available.

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

Saudi production of petroleum products was fairly stable during 1980-82, ranging from a low of 852,000 barrels per day in 1981 to a high of 902,000 barrels per day in 1980. Apparent consumption also remained steady at approximately 380,000 to 397,000 barrels per day. The majority of the imports of petroleum production are from Saudi-owned refineries located in the Neutral Zone, while Saudi exports went mainly to other Persian Gulf nations and certain developing nations in Africa.

Effects on production cost.--There are no reported crude petroleum prices 2/ available for the natural resource material (crude peteoleum) used as feedstock for the refineries, since Petromin has significant influence in both the pricing of the products of the domestic refining industry and the allocation of crude petroleum for the refining industry. The following tabulation shows a range of production costs, which comprise the costs for operating Saudi refineries (per barrel of product): 3/

Operating costs	$1.20 -$1.30
Energy cost	.25 - .35
Total direct cost 1/	1.45 - 1.65

1/ Not including crude petroleum feedstock costs.

1/ OPEC Downstream Project Resource Systems Institute East-West Center, op. cit.

2/ Equivalent to U.S. producers' crude petroleum acquisition costs.

3/ OPEC Downstream Project Resource Systems Institute East-West Center, op. cit, and various industry sources.

Effects on competitiveness.--In order to assess the competitiveness of the Saudi producers of petroleum products, transportation costs to various major market ports need to be added to the direct costs. The following tabulation shows transportation costs for one barrel of petroleum products shipped from either the Yanbu 1/ or Jubail 2/ refineries (per barrel): 3/

	Yanbu	Jubail
U.S. gulf coast-----	$2.20 -$2.50	$3.10 -$3.30
Rotterdam-----------	1.80 - 2.00	2.60 - 2.80
Japan---------------	2.10 - 2.20	1.30 - 1.40

Transportation costs from U.S. gulf coast ports to major markets are estimated to be within the ranges shown in the following tabulation (per barrel): 4/

Rotterdam-----------	$1.80 -$2.20
Japan---------------	2.10 - 2.50

As stated in an earlier section of this report, U.S. refiner acquisition costs averaged $28.70 per barrel of petroleum product in 1984, and the U.S. refining and marketing costs are estimated to have been between $3.40 and $3.50 per barrel of petroleum products. Taken together, these figures yield average petroleum products costs to the U.S. refining industry f.o.b. major market ports, as shown in the following tabulation (in dollars per barrel):

f.o.b.:	
U.S. gulf coast-----	$32.10 -$32.20
Rotterdam-----------	33.90 - 34.40
Japan---------------	34.20 - 34.70

In order to compare relative U.S. and Saudi refining industry costs, one must netback a Saudi crude petroleum cost. The maximum netback cost 5/ of crude petroleum feedstock for the Saudi petroleum product industry can be determined by taking their product value 6/ and subtracting their direct costs and transportation costs. The calculation is as follows (per barrel):

1/ Red Sea port.
2/ Persian Gulf port.
3/ OPEC Downstream Project Resource Systems Institute East-West Center, op. cit, and United Nations Industrial Development Organization, op. cit.
4/ Compiled from information provided by various sources.
5/ Cost of crude petroleum feedstock plus any profit over costs.
6/ OPEC Downstream Project Resource Systems Institute East-West Center, op. cit, and various industry sources.

Saudi product value 1/	$32.30 -$34.00
Minus:	
Direct cost	1.45 - 2.50
Transportation costs and duties: 2/	
U.S. gulf coast 3/	2.20 - 2.50
Rotterdam 3/	1.80 - 2.00
Japan 4/	1.30 - 1.40
Saudi crude petroleum netback cost for product shipped to:	
U.S. gulf coast	28.35 - 28.65
Rotterdam	28.85 - 29.05
Japan	29.45 - 29.55

1/ As of September 1984.
2/ Average duties on petroleum products: United States--$0.11 per barrel; Rotterdam--5 percent; and Japan-8 percent.
3/ From Yanbu.
4/ From Jubail.

These data indicate that, for this particular period, 1/ any prospective Saudi petroleum product exports to the markets shown (United States, Rotterdam (spot market), or Japan) would have a cost advantage when compared with the cost of the similar U.S. product if the accounting procedure by which Petromin costs its crude petroleum feedstock would be less than $28.35 per barrel. The difference between $28.35 and the true Saudi cost would be the amount of price advantage enjoyed by Saudi refiners when compared with U.S. refiners.

Effects on resource allocation.--The effects within the Saudi domestic industry's resource allocation are not dependent on actual returns of income, but instead on furthering the industrial development and broadening of the Saudi industrial base. As such, the other nonfinancial goals for the Saudi refining industry may be considered to be of more importance than maximizing their return on their investment. However, it is probable that Saudi-produced petroleum products would be price-competitive in the international marketplace regardless of domestic feedstock and fuel cost advantages.

1/ Likely to be typical of short-term world crude petroleum/petroleum product pricing structure.

U.S.S.R. 1/

Soviet Industry Profile

In the U.S.S.R. the economy is centrally planned and the Government is the sole producer of crude petroleum, petroleum products, natural gas, and their derivatives. The U.S.S.R. does not have a single minister of energy, but rather energy is controlled by a committee consisting of the ministers of all 14 ministries involved in the fuels sector. The chairman of the State Planning Committee of the U.S.S.R. Council of Ministers (Gosplan) heads this committee. 2/ This structure gives the Government total control over all facets of the industry. 3/

In 1983, more than 60 percent of the U.S.S.R.'s annual crude petroleum production came from the West Siberian crude petroleum complex, compared with about 10 percent in 1970. 4/ The Western Siberian fields located in Tyumen Province (five separate production associations) and Tomsk Province contain about 75 percent of the U.S.S.R.'s proved and probable crude petroleum reserves. 5/ Western Siberia is expected to account for about 63 percent of Soviet crude petroleum production in 1985 and up to 75 percent by 1990. 6/ Thus, an increasing portion of U.S.S.R. production is expected to be relatively high in cost because of the hostile environment at the well sites.

1/ The exchange rate of the Soviet ruble is for official purposes only and does not reflect actual ruble/dollar ratios for traded goods. However, independent research by Western scholars has made it possible to approximate the purchasing power of the Soviet ruble. A noted Western authority on the U.S.S.R. stated that an approximate purchasing power would be 1.5 ruble per U.S. $1.00 on Soviet imports from the West in the late 1970's. For Soviet exports, this same noted source offered an exchange rate of 0.55 ruble per U.S. $1.00. This information is based on a USITC staff member's telephone conversation of April 18 and April 22, 1985 with Edward A. Hewitt, Soviet expert for the Brookings Institution of Washington, D.C. However, the values which appear in the U.S.S.R. section of the study are those which were reported in the sources cited. No attempt was made to convert these values on the basis of the above reported approximate exchange rate.

2/ Edward A. Hewett, Energy, Economics, and Foreign Policy in the Soviet Union, The Brookings Institution, 1984, pp. 9, 10, and 11. This source states "that there are separate ministries controlling the production of gas, coal, oil, and electricity and heat; other ministries produce and supply equipment to the energy ministries. Exploration activities are divided among a Ministry of Geology and the energy-producing ministries."

3/ U.S. Department of Commerce, Foreign Economic Trends and Their Implications for the United States: U.S.S.R., International Marketing Information Series, FET 84-91, September 1984, p. 7.

4/ Ibid.

5/ Ibid.

6/ David Wilson, Soviet Oil and Gas to 1990 and Geoffrey Drayton, The Market for LPG in the 1980's, Cambridge, Mass., 1982, pp. 2, 9, and 10; and, Steven A. Schneider, The Oil Price Revolution, John Hopkins University Press, 1983, pp. 373-379.

The production of natural gas, like crude petroleum, is moving eastward into Siberia. In the mid 1970's, 40 percent of the U.S.S.R.'s natural gas production came from the Ukraine, the North Caucases, and the Komi A S.S.R. In 1980, the amount of natural gas produced in western areas, such as the Ukraine, declined to less than 20 percent of the total and is scheduled to decline to only 10 percent of the U.S.S.R.'s total natural gas output in 1985. 1/ Again the hostile climate of Siberia should make the newly discovered natural gas more expensive to produce.

Statistics are not separately available for employment in the capital-intensive crude petroleum, petroleum products, and natural gas industries in the U.S.S.R. 2/ However, infrastructure problems in the energy-rich provinces of Siberia, such as a lack of adequate housing, combined with severe winter conditions where temperatures reach 50 degrees below zero, have intensified a worker shortage resulting from a slowdown in the growth of the working age population in the U.S.S.R. 3/ For example, the labor turnover rate in Siberia's Tyumen Province is reported to be about 20 to 22 percent. 4/ High labor turnover means many crude petroleum field workers are inexperienced. Because of these worker shortages and other problems, the Soviet Government has found it necessary to increase the productivity of its crude petroleum and natural gas operations through expensive equipment modernization in an effort to continue the annual increase in the level of production of crude petroleum and natural gas.

The U.S.S.R.'s gross fixed capital investment in the fuel and power industry, which includes crude petroleum and natural gas, amounted to 15.5 billion rubles (US$20.2 billion) in 1980, 16.6 billion rubles (US$21.18 billion) in 1981, and 17.7 billion rubles (US$23.0 billion) in 1982. 5/ Thus, the fuel and power industry represented 32.6 percent, 33.5 percent, and 34.8 percent, of total industrial investment in 1980, 1981, and 1982,

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1/ U.S. Department of the Interior, Mineral Industries of the U.S.S.R., reprinted from Mining Annual Review 1984; and, edited by Abraham S. Becker, Economic Relations With the U.S.S.R.: Issues for the Western Alliance, Lexington Books, 1983, Chapter 4: "Soviet Energy Prospects and Their Implications for East-West Trade," by Ed A. Hewett, pp. 49-68.

2/ Wharton Econometric Forecasting Associates, Centrally Planned Economies Outlook, October 1984, pp. 59-67; and The Europa Year Book 1984: A World Survey, vol. 1, London, 1984, p. 872. "Industry" in the U.S.S.R. comprises manufacturing (except printing and publishing), mining and quarrying, electricity, gas, water, logging and fishing.

3/ Central Intelligence Agency, Handbook of Economic Statistics, 1984, Aug. 1, 1984, pp. 66 and 67.

4/ Ann Goodman and Geoffrey Schleifer, "The Soviet Labor Market in the 1980's," Soviet Economy in the 1980's: Problems and Prospects, Part 2, Joint Economic Committee, Congress of the United States, Dec. 31, 1982; U.S. Department of Commerce, Foreign Economic Trends and Their Implications for the United States: U.S.S.R.; International Marketing Information Series, FET 84-91, September 1984, p. 7; and, David Wilson and Geoffrey Drayton, op. cit., p. 112.

5/ Central Intelligence Agency, Handbook of Economic Statistics, 1984, Aug. 1, 1984, pp. 66 and 67.

respectively. The fuel and power industry has been increasing in importance and is expected to continue that trend as internal industrial development progresses and the U.S.S.R. continues to use crude petroleum and natural gas exports to enhance relations with other Council for Mutual Economic Assistance (CMEA) nations and to earn hard currency. The fuel and power industry is one of three industries designated to receive preferential consideration for capital investments. 1/

Natural Resources Pricing

In the U.S.S.R. most prices are established arbitrarily by administrative decision rather than by the market place. 2/ As a nonmarket economy, the U.S.S.R. does not have to consider profit margins when pricing its crude petroleum, as do companies in the West. An official U.S. source reports that in the U.S.S.R. efforts to raise hard currency generally take precedence over supporting the market price. 3/ The U.S.S.R.'s crude petroleum policy is straightforward: to export as much crude petroleum as possible for hard currency, but leaving enough to meet its own needs and those of the CMEA countries and other socialist clients, and to fulfill obligations to other soft currency customers. Official U.S. sources report that resale of crude petroleum imported from OPEC has played a major role in the U.S.S.R.'s ability to increase sales to the West. 4/

Within the U.S.S.R., price structures for energy include enterprise wholesale price, industrial wholesale price, and a consumer price. 5/ In 1981, the cost of production price for crude petroleum was approximately $4.62 per barrel. To this enterprise wholesale price a "turnover" tax (if one is levied), a transportation charge, and a profit to the intermediary wholesale price is added in order to determine what industrial users pay for energy. By comparison to the U.S.S.R.'s cost of production price for crude petroleum, the

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1/ A report entitled "On the State Plan for the Economic and Social Development of the U.S.S.R. for 1985 and the Fulfillment of the Plan in 1984," presented by N.K. Bayabakov, Chairman of the U.S.S.R. Gosplan at a joint session of U.S.S.R. Supreme Soviet of the Union and Soviet of Nationalities, Moscow, Nov. 27, 1984, FBIS Daily Edition: Soviet Union, Nov. 28, 1984, p. 6; "Oil and Gas: Soviet Energy Management," Industrial Development, November/December 1983, pp. 27; and, Foreign Economic Trends and Their Implications for the United States, op. cit., FET 84-91, September 1984, p. 10.

2/ Joint Economic Committee Congress of the United States, U.S.S.R: Measures of Economic Growth and Development, 1950-1980, Dec. 8, 1982, pp. 33-38. This source states that profits as a percent of productive fixed and working capital in 1972 amounted to 26.0 percent for the crude petroleum extraction industry, 21.8 percent for the crude petroleum refining industry, 46.0 for the gas industry, and 19.8 percent for chemicals. The aggregated average for all industries was 19.3 percent.

3/ Excerpts from an unclassified memo dated Feb. 19, 1985 from the U.S. Central Intelligence Agency to a member of the Commission staff regarding this investigation.

4/ Ibid.

5/ Hewett, op. cit., pp. 134-137.

world market price per barrel was $33 in 1981. 1/ Although no 1981 data is available on prices charged to industrial users, 1967 information put these values on a comparable scale with world prices. Prices paid by consumers in 1967 for petroleum products such as motor gasoline were at then world market prices, or about $0.34 per gallon. However from 1970-81, the prices of Soviet-produced petroleum products remained at 1967 levels while world prices increased due to the 1974 and 1979 oil crises. 2/

U.S.S.R. exports of petroleum products are priced at world market price, except those to the CMEA countries. In the case of trade between CMEA nations, the price is set in bilateral bargaining sessions and lags behind world market prices.

The U.S.S.R. also employs "planning" prices in its calculations. Planning prices are hypothetical prices used by planners to evaluate alternative means of satisfying specific energy demands. Before resources are committed to a project, prices and other variables are mathematically manipulated to determine the most cost-effective course of action. Projects are periodically reviewed to take into account new circumstances.

When world demand is high and the market is strong, Soviet crude petroleum prices are among the highest. When crude petroleum demand is low, as in recent years, the Soviets appear to fix the price just low enough to maintain sales, regardless of whether they undercut general world level prices. 3/ The leaders in the U.S.S.R. economic hierachy hold the view that the balance between supply and demand internally is the function of the state's planning committees, and not the function of market prices. 4/

In the U.S.S.R. prices are intended to cover average production costs and a profit markup averaging about 15 percent of input costs. 5/ However, since

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1/ Ed A. Hewitt, op. cit., pp. 134-139; and Joint Economic Committee, Congress of the United States, U.S.S.R.: Measures of Economic Growth and Development, 1950-1980, Dec. 8, 1982, p. 35. This latter source reports that a "turnover" tax is effectively an excise tax levied mostly on consumer goods. It is characterized as a tax on consumers' income.

2/ Ibid.

3/ This information was developed during field work for this study.

4/ Alec Nove, The Soviet Economic System, London, 1977, p. 179; and Constantin A. Krylov, The Soviet Economy: How It Really Works, Lexington, Mass, 1979, pp. 27-29.

5/ Robert G. Jensen, Theodore Shabad, and Arthur W. Wright, Soviet Natural Resources in the World Economy, Chicago, 1983, pp. 597-602. This source reports that the last major revision took place in 1967. All fuels were badly underpriced compared with either cost or productivity prior to the price reform of 1967. The Joint Economic Committee, Congress of the United States, Soviet Economy in the 1980's: Problems and Prospects, Part 1, Dec. 31, 1982, p. 76 reports that a major revision of the industrial wholesale prices in the U.S.S.R., took place on Jan. 1, 1982 for the first time since 1967. This source, p. 77, further states that "in the case of crude oil prices, which are to rise 2.3 times, the number of oil regional price zones has been cut from 17 to three; within each price zone the base price will be set so as to cover costs of the highest cost producer."

most input costs are also established by the Government these costs can be set at any level; the input costs can be manipulated so that, regardless of the selling price, a 15 percent return can be maintained. 1/ Prices in the U.S.S.R. do not serve to allocate resources. Instead they allow the various ministries to judge the effectiveness of management and also serve to encourage the attainment of economic goals. In the U.S.S.R. the relative price of Soviet goods does not correspond to the relative cost of resources used in production. Furthermore, the product's price frequently varies according to the purchaser. It is reported that price differences in the U.S.S.R. are especially prevalent in the fuel and power industry. 2/

The U.S.S.R's pricing policy on crude petroleum and natural gas is difficult to follow because these materials are essentially transferred from operation to operation, all of which are Government controlled. 3/ Although it is difficult to ascertain the prices at which natural gas passes to Soviet ammonia producers, 4/ the U.S.S.R.'s technical press reportedly implies that natural gas delivered in the U.S.S.R. costs $2.00 per 1,000 cubic feet (or one million BTU's), compared with a U.S. domestic user price of $3.50 to $4.00 per 1,000 cubic feet (Appendix H contains the methodology). 5/ Another source reports that in the U.S.S.R. there is a price difference of about $3.30 per 1,000 cubic feet between the external price and the internal price for natural gas (Appendix H contains the methodology). 6/ This source reports that the external contract price for Soviet natural gas sold in Europe is $6.17 per 1,000 cubic feet; the internal price for natural gas sold in the

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1/ Jensen, Shabad, and Wright, op. cit., pp. 598 and 599. This source states that on a regional basis, fuel prices are differentiated to reflect both transportation costs and the scarcity value of certain fuels. The structure of user prices within a given region reportedly is supposed to reflect the possibility of substituting one fuel for another.

2/ Joint Economic Committee, Congress of the United States, U.S.S.R: Measures of Economic Growth and Development, 1950-1980, Dec. 8, 1982, pp. 33-38.

3/ Industry sources contacted during this investigation generally agreed that in the U.S.S.R.'s dealings with the West, it has had an "Ad Hoc" policy regarding the selling price of crude petroleum. That is, the price is generally somewhat lower than the world market price, ensuring quick sales. These industry sources stated that the U.S.S.R. usually sells enough crude petroleum in Western markets to secure the "hard" Western currency needed to cover Soviet purchases of essential imports; and, The Joint Economic Committee, Congress of the United States, Soviet Economy in the 1980's: Problems and Prospects, Part 1, Dec. 31, 1982, pp. 76 and 77.

4/ Based on information furnished to the Commission in a brief submitted Feb. 19, 1985 on this study by Charls E. Walker Associates, Inc., Washington. This brief was furnished on behalf of the Ad Hoc Committee of Domestic Nitrogen Producers (Appendix H contains the methodology).

In terms of trade with the United States, ammonia is a very important commodity for the U.S.S.R. For additional information see USITC reports, Anhydrous Ammonia From the U.S.S.R., USITC Publication 1006, October 1979; and USITC Publication 1051, April 1980.

5/ Ibid.

6/ Economic Consulting Services Inc., Effects of Potential Countervailing Duties on the Price of Ammonia and Urea Fertilizers in the U.S.A., Washington, D.C., July 1984.

U.S.S.R. is estimated by this same source to be $2.85 per 1,000 cubic feet. Another source reports that the price for Soviet natural gas in Western Europe may now be as low as $3.60 to $3.80 per 1,000 cubic feet. 1/ Industry analysts studying the ammonia industry have also estimated U.S.S.R. natural gas prices by back calculating using average U.S. gulf landed prices for U.S.S.R. exports of ammonia. By this method a U.S.S.R. natural gas price for the input into a typical U.S.S.R. ammonia plant in the $.50 to $.60 per 1,000 cubic feet range is obtained (Appendix I contains the methodology). In summary, estimates of the price of natural gas charged to ammonia producers range from $0.50 to $2.85 per 1,000 cubic feet. While all estimates of domestic prices would appear to be below the estimated export contract prices referenced above, this cannot be stated unequivocally due to the stated limitations in the netback methodology (see p. 2), the fact that these figures have not been corrected to reflect transportation costs from the U.S.S.R. to Western Europe, and other possible shortcomings in the statistical data available on the U.S.S.R.

Using a similar technique, averaging U.S. gulf landed prices for U.S.S.R. petroleum imports results in a crude petroleum prices in the range of $26.75 per barrel to $28.46 per barrel for the third quarter of 1984, compared with a U.S.S.R. posted crude petroleum price of $27.75 per barrel (Appendix J contains the methodology). If refining costs in the U.S.S.R. are assumed to be in the U.S. range (about $3 per barrel), the average crude petroleum input to U.S.S.R. refining capacity decreases to $23.75 to $25.46 per barrel, a range well below the posted U.S.S.R. price. 2/

The above indicators of U.S.S.R natural gas and crude petroleum pricing are not inconsistent with the previously stated U.S.S.R. practice of pricing these commodities at a level adequate to consumate a sale. The ammonia and petroleum products are presumably sold at the highest U.S. gulf landed prices. Then all costs are backed out of these prices, and the natural gas and crude petroleum inputs probably priced so as to not show an overall loss and perhaps to even reflect a small margin.

Resources Affected

Resources that are directly affected by U.S.S.R. natural resource pricing practices are crude petroleum and natural gas. 3/ Increases in production of crude petroleum and natural gas occurred in the U.S.S.R. to make energy-intensive products, such as ammonia and petroleum products, for export because of these U.S.S.R. pricing practices. The quantities of crude petroleum and natural gas involved could be considered equal to those quantities used to make ammonia, petroleum products, and other energy intensive items the sale of which resulted in a discounted netback price for crude petroleum or natural gas.

1/ "Ruhrgas Settles Price for Supplies of Siberian Gas," Financial Times, Sept. 4, 1984, p. 5. These figures represent quoted prices of Siberian natural gas at the West German and Italian borders.

2/ See analysis of U.S.S.R. refining industry for a further discussion of this method of calculation.

3/ Other resources such as water and manpower are also indirectly affected.

Crude petroleum

Available data indicate an upward trend in crude petroleum production, exports, imports, and apparent consumption during 1980-84 as shown in the following tabulation (in thousands of barrels per day). 1/

Year	Production	Exports	Imports	Apparent consumption	Ratio (percent of imports to consumption
1980	12,050	3,279	1/	-	-
1981	12,080	3,224	98	8,854	1.1
1982	12,252	3,389	197	9,060	2.2
1983	12,388	2/ 3,590	2/ 255	9,053	2.8
1984	12,230	1/	1/	-	-

1/ Data not available.
2/ Preliminary.

The general upward trend in production reflects the desire of the U.S.S.R. to increase crude petroleum production in order to meet growing internal demand, supply fellow CMEA member countries, and, through trade, obtain hard Western and Japanese currency. 2/ That crude petroleum production has not increased faster, and actually declined in 1984, reflects continuous problems associated with increasing production in hostile environments and problems from waterflooding in some of the established fields/wells. 3/ However, 1984 was the first year in which Soviet crude production declined from the preceding year since World War II. 4/

Exports have maintained an upward trend while imports have also risen, through at a much slower pace. The imports are apparently needed to balance the shortfall in production during a period of growing exports. Consumption has increased steadily. However, it must be remembered that the crude petroleum is used to make refined petroleum products. While an increasing share of these refined petroleum products were used locally during 1979-82, exports of petroleum products were also increasing during this period. Certain price and netback aspects of these exports were previously discussed.

1/ Production, Oil & Gas Journal, annually in December issue; exports and imports, Central Intelligence Agency, International Energy Statistical Review, Jan. 29, 1985, pp. 23 and 24.

2/ U.S. Department of Commerce, Foreign Economic Trends and Their Implications for the United States U.S.S.R., FET 84-91, September 1984 pp. 3-7 and 9-12.

3/ Water injected into wells is sometimes used to push crude petroleum to the surface; while this technique usually increases the yield from a well the associated water presents recovery problems and can infiltrate other fields and wells.

4/ "Soviet Oil Output Shows a Decline," Washington Post, Apr. 3, 1985, pp. A1 and A14; and, "Gridlock for the Soviet Economy," Fortune, Apr. 15, 1985, pp. 142-144.

Natural gas

Available data indicate general upward trends in the production, export, and apparent consumption of natural gas during the 1980-84 period. However, imports have shown a downward trend during this period. These data are shown in the following tabulation for the period 1980-84 (in thousands of cubic feet per day): 1/

Year	Production	Exports	Imports	Apparent consumption	Ratio (percent of imports to consumption
1980----	41,905	5,298	300	36,907	0.8
1981----	44,986	6,001	201	39,186	0.5
1982----	48,453	5,899	201	42,755	0.5
1983----	51,838	6,093	194	45,939	0.4
1984----	56,770	1/	1/	-	-

1/ Data not available.

The subsititution of natural gas for crude petroleum in the U.S.S.R. is being promoted as a way to satisfy additional energy needs within the U.S.S.R. and the CMEA nations and free crude petroleum for hard currency exports. For example, the Eleventh Five-Year Plan (1981-1985) calls for natural gas production to reach a range of 58.0-61.9 million cubic feet per day by 1985. 2/ The Eleventh Five-Year Plan (1981-85) calls for six new natural gas pipelines to be built. The fourth pipeline to be built, the Urengoy-Uzhogorod export pipeline, was completed in 1983, but work on the compressor stations for this line was not completed as of the end of 1984. 3/

1/ Central Intelligence Agency, International Energy Statistical Review, Jan. 29, 1985; except for 1984, production data which comes from a speech "On the State Plan for the Economic and Social Development of the U.S.S.R. for 1985 and the fulfillment of the Plan in 1984," by N.K. Baybakov, Chairman of Gosplan, which was made before the U.S.S.R. Supreme Soviet on Nov. 27, 1984, FRIS Daily Edition: Soviet Union, Nov. 28, 1984, p. 7. In this speech Mr. Baybakov projects natural gas production in the U.S.S.R. in 1985 will exceed 61.1 million cubic feet per day.

2/ U.S. Department of the Interior, Mineral Industries of Europe and the U.S.S.R., December 1984, pp. 129-131: "The Fuel-Energy Base in Siberia," Industrial Development, November/December 1983, p. 11; The U.S. Department of Commerce, Foreign Economic Trends and Their Implications for the United States: U.S.S.R., FET 84-91, September 1984. However, this source doubts that the U.S.S.R. will reach its projected natural gas production level of 58.0 million to 61.9 million cubic feet per day for 1985. The U.S. Department of Commerce states that compression stations are behind schedule for the fourth of six natural gas pipelines.

3/ U.S. Department of Interior, Mineral Industries of the U.S.S.R., (reprinted from Mining Annual Review 1984), pp. 11 and 12; "The Fuel-Energy Base in Siberia," Industrial Development, November/December 1983, p. 11; and, "Oil and Gas: Soviet Energy Management," Industrial Development, November/December 1983, pp. 26-29.

Future increases in the availability of natural gas could cause the U.S.S.R. to explore uses for natural gas other than as a fuel. In this regard, natural gas and its components are the feedstocks for many petrochemicals including ethylene, methanol, and ammonia. The U.S.S.R. is already a major international source for ammonia and could become the same for ethylene derivatives and methanol.

Primary Consuming Industries That Benefit

The beneficiary industries include all industries obtaining crude petroleum and natural gas at below world prices. In this section we have concentrated on the ammonia and refining industries because U.S. imports of products from these industries are of significance.

Ammonia

Soviet industry profile.--The ammonia industry in the U.S.S.R. is under the direction of the recently created Ministry of Fertilizer Production. 1/ The establishment of this ministry may mean an increasing emphasis on ammonia and fertilizer production within the U.S.S.R., which could increase Soviet food production, but could also result in increasing ammonia and/or fertilizer exports. Ammonia, like other large-volume, commodity-type petrochemicals is capital intensive, rather than labor intensive. However, with a declining work-age labor force, the U.S.S.R. reportedly is not pressing for labor intensive output. 2/ Employment data in this industry is not available.

Ammonia capacity has been increasing in the U.S.S.R. From 1976-80, the U.S.S.R. started operation at 20 ammonia plants, and by 1980, these plants had an ammonia capacity reported to be about 20.3 million short tons. The U.S.S.R. ammonia capacity is scheduled to reach 27.3 million short tons by 1985, with the addition of 17 new plants. 3/

One of the largest ammonia complexes in the world is located at Togliatti. This complex has six ammonia plants, four of which were built during 1976-80. 4/ This complex is scheduled to be further expanded during the 1980s and is reported to have accounted for about half of the increase in

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1/ "Five-Year Plan Goals Beyond Reach in Soviet Union and Eastern Europe," Chemical & Engineering News, Dec. 17, 1984, p. 56; N.K. Baybakov, Chairman of the U.S.S.R. Gosplan, report to the Supreme Soviet entitled "On the State Plan for the Economic and Social Development of the U.S.S.R. for 1985 and the Fulfillment of the Plan in 1984" FBIS Daily Edition: Soviet Union, Nov. 28, 1984, pp. 4 and 7, Moscow, Nov. 27, 1984; and, N.K. Baybakov, "Topical Interview: Portrait of the Year, The Policy is Intensification," FBIS Daily Edition: Soviet Union, Jan. 14, 1985, pp. 51, 52 and 57.

2/ Based on information developed during field work for this study.

3/ U.S. Department of the Interior, Minerals Yearbook, vol. I, 1983, pp. 638-642; U.S. Department of Interior, Nitrogen (Ammonia), reprint from Bulletin 675; Joint Economic Committee, Congress of the United States, Soviet Economy in the 1980's: Problems and Prospects, Part 2, Dec. 31, 1982; pp. 162-169; Wilson and Drayton, op. cit., pp. 156 and 157; and, "Five-Year Plan Goals Beyond Reach in Soviet Union and Eastern Europe," Chemical and Engineering News, Dec. 17, 1984, p. 55.

4/ Ibid.

ammonia capacity in the U.S.S.R. during 1980-85. Much of the ammonia output from the Togliatti complex is transported to Odessa for export. The U.S.S.R. is scheduled to add two new world-scale (500,000 short tons) ammonia plants between 1989-2000. 1/

Soviet market.--Ammonia production in the U.S.S.R. has increased at an average annual rate of 3.6 percent during 1980-84, while exports have grown at an average annual rate of 0.2 percent during this period as shown in the following tabulation (in thousands of short tons):

Year	Production	Exports	Consumption 1/
1980----------------	16,900	2,874	14,026
1981----------------	17,300	2,806	14,494
1982----------------	17,565	2,086	15,479
1983----------------	19,465	2,474	16,991
1984 2/-------------	19,500	2,900	16,600

1/ Imports are reported to be negligible or nil.
2/ Estimated.

Domestic consumption of ammonia in the U.S.S.R. increased irregularly during 1980-1984 from 14.0 to 16.6 million short tons, or at an average annual rate of 4.3 percent. Much of the ammonia exports to Western nations are tied to bartering arrangements where Western technology and sophisticated equipment are frequently part of the compensation arrangements. Thus, it is difficult to assign a true value to these exports.

U.S. imports of anhydrous ammonia for fertilizer (TSUSA item 480.6540) from the U.S.S.R. and the U.S.S.R.'s total ammonia exports are shown in the following tabulation for 1980-84 (in thousands of short tons): 2/

Year	Exports to the United States	Total exports	Exports to the United States as percent of total
1980---------	1,103	2,874	38.4
1981---------	796	2,806	28.4
1982---------	605	2,086	29.0
1983---------	642	2,474	25.9
1984---------	974	1/ 2,900	1/ 33.5

1/ Estimated.

1/ Based on information furnished by Occidental Chemical Agricultural Products, Inc., Tampa, Fla.
2/ U.S. imports complied from official statistics of the U.S. Department of Commerce. Data on the U.S.S.R. furnished by Occidental Chemical Agricultural Products, Inc., U.S.S.R. Value of Natural Gas, Tample, Fla., March 28, 1985, Occidential Chemical Agricultural Products, Inc., "Department of Commerce Position Paper and Ammonia Protective Legislation," Sept., 25, 1984; information developed during a visit by Occidental Agricultural Products, Inc. representatives with Commission staff members on Mar. 29, 1985; and, a telephone conversation on Apr. 1, 1985 between a representative of Occidental Chemical Agricultural Products, Inc., and a Commission staff member.

The U.S.S.R. accounted for as little as 24 percent (1983) and as much as 47 percent (1980) of the volume of U.S. imports of anhydrous ammonia. In 1984, the U.S.S.R. accounted for 30 percent of the total volume of these imports.

The U.S.S.R.'s exports of ammonia, as a share of its ammonia production, declined from about 17.0 percent in 1980 to about 11.9 percent in 1982, and then climbed to an estimated 14.8 percent in 1984. 1/

The U.S.S.R. is reported to be the world's leading exporter of ammonia. From 1980 to 1984, the U.S.S.R. accounted for a high of 36.2 percent of the world's total ammonia exports in 1980 to a low of 27.8 percent in 1982. In 1984, the U.S.S.R. accounted for 34.9 percent of world ammonia exports. 2/ Although the United States is the largest single importer of ammonia from the U.S.S.R., the U.S.S.R.'s total ammonia exports to Western Europe were more than double that to the United States in each year during 1980-84. Eastern European countries received about 10 percent of the U.S.S.R's ammonia exports in each year during 1980-84.

Official data are not available for U.S.S.R. imports of ammonia, but these imports are believed negligible by U.S. industry sources. Therefore, during 1980-84, consumption of ammonia in the U.S.S.R. is estimated to have ranged from about 83 percent to about 88 percent of annual ammonia production.

Effects on production costs.--Natural gas prices have a major bearing on the cost of ammonia, as natural gas accounts for 70 percent to 80 percent of the production cost of ammonia. If natural gas in the U.S.S.R. is charged into ammonia production at a nominal charge of $0.50 per 1,000 cubic feet, then ammonia in the U.S.S.R. should be priced at $75 per short ton, FOB plant, compared with a range of $157 to $175 per short ton, f.o.b. plant, in the United States (Appendix H and Appendix I contain the methodology). 3/

U.S. industry sources have furnished the Commission with independently developed data concerning USSR gas value at the wellhead (Appendix K contains the methodology). 4/ After applying actual surrogate costs for terminalling, ocean freight, pipeline transportion, and plant conversion costs, the estimated value of natural gas in the USSR is about $2.71 per thousand cubic feet (Appendix K contains the methodology). U.S. costs for terminalling 500,000 short tons of ammonia in Taft, Louisiana in 1984 were $4.40 per short

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1/ Occidental Chemical Agricultural Products, U.S.S.R. Value of Natural Gas, Mar. 28, 1985, Occidental Chemical Agricultural Products, "Department of Commerce Position Paper on Ammonia Protective Legislation," Sept. 24, 1984; a telephone conversation with a representative of Occidental Chemical Agricultural Products; and, U.S. Central Intelligence Agency memo, dated Feb. 19, 1985, to a USITC staff member on this investigation.

2/ Ibid.

3/ Charls E. Walker Associates, brief to the Commission, Feb. 19, 1985, on behalf of the Ad Hoc Committee of Domestic Nitrogen Producers; and, Charls E. Walker Associates, submission of Mar. 20, 1985 and Mar. 21, 1985. (Appendices H and I contains the methodology).

4/ Occidental Chemical Agricultural Products, Inc., U.S.S.R. Value of Natural Gas, Mar 28, 1985 based on the collection of data from the following sources: The British Sulphur Corporation; SRI International; Blue, Johnson Associates; and Fertecon. (Appendix K contains the methodology).

ton. The average 1984 ocean freight cost aboard a 50,000 ton vessel from Odessa in the U.S.S.R. to Taft, Louisiana was approximately $14.95 per short ton of ammonia. The surrogate terminalling cost calculated for Odessa, U.S.S.R. was $1.20 per short ton; terminal throughput of ammonia in Odessa is limited only by the loading rate and available shipping. A surrogate pipeline rate of $25.66 per short ton of ammonia was developed for the U.S.S.R. based on a comparable ammonia pipeline in the United States. (Ammonia is piped 1,512 miles from Togliatti to Odessa: the delivery system has an annual capacity of 2.8 million short tons).

The U.S. company that barters ammonia with the U.S.S.R. now has a one-year contract, which is in effect through December 1985, and has ammonia delivered, on a cost and freight basis, to its gulf coast terminal. The effective price ranges were between $3 and $5 per short ton above the prevailing 1984 average gulf coast price paid for U.S.-produced ammonia.

Effects on competitiveness.--Ammonia is a fungible product and is sold principally on the basis of price. Natural gas represents about 80 percent of the total production cost of ammonia. If, as reported by one industry source, the U.S.S.R. valued associated natural gas in 1984 at the wellhead at $2.71 per thousand cubic feet; 1/ the U.S.S.R. was disadvantaged in its ammonia production compared to the United States, where the average wellhead price per natural gas was estimated at $2.59 per thousand cubic feet for 1984. However, if the U.S.S.R. prices natural gas at 50 cents per thousand cubic feet (a nominal charge) or up to $2.00 per thousand cubic feet, as another source states, then the U.S.S.R. would enjoy a distinct production cost advantage over U.S. ammonia producers in term of energy and feedstock costs, since in 1984 there were 35.98 million BTU's (36,000 cubic feet) of natural gas consumed per short ton of ammonia in the United States. 2/ For technical reasons, it is not practical to estimate the quantity of natural gas required to produce a given volume of ammonia. 3/

Therefore, any feedstock advantage the U.S.S.R. may enjoy related to natural gas allows them, through their countertrade partner, to compete successfully in the United States in spite of the long distance from the U.S.S.R.'s ammonia complex to the port of exit, plus the ocean insurance and freight costs incurred to reach the U.S. gulf ports. However, the U.S. barter partner of the U.S.S.R. reportedly does not enjoy this cost advantage, as its cost and freight (C & F) delivered contract gulf coast price of ammonia in

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1/ Occidental Chemical Agricultural Products, Tampa, Fla., Inc., U.S.S.R. Value of Natural Gas, Mar. 28, 1985, p. GRS6: 36:3. This source states that the Togliatti Complex, the U.S.S.R.'s major ammonia facility, is near to Kuybyskev, a major crude petroleum producing region in the U.S.S.R. Therefore, most of the natural gas to the ammonia complex is likely to be associated gas.

2/ Charls E. Walker Associates, Inc., written submissions to the Commission staff on Mar. 20, 1985 and Mar. 21, 1985; a U.S. Central Intelligence Agency memo of Feb. 19, 1985 to a staff member concerning this study; and, a telephone conversation on Apr. 2, 1985 with a representative of the Fertilizer Institute in Washington.

3/ Natural gas density varies with temperature and location.

1984 exceeded the average, delivered domestic market price in the gulf coast that year by several dollars (Appendix K). 1/

Effects on resource allocation.--The input price the U.S.S.R. assigns to natural gas allows them to export it as a liquid derivative, ammonia, as well as transport it via pipeline to Europe. Ammonia requires a much smaller diameter pipe for transport than does natural gas; this smaller diameter pipe is less expensive and can be fabricated within the U.S.S.R. Further, by converting natural gas to its derivatives, broadens the U.S.S.R.'s export potential to U.S. and other non-European markets. Ammonia also is a value-added material compared with its starting material--natural gas--and permits the U.S.S.R. to obtain a greater value per unit of export.

Refining

Soviet industry profile.--The refining industry in the U.S.S.R. is Government-owned. Information is closely guarded, and detailed information on the refineries is not available. 2/

The capacity for the U.S.S.R.'s refining industry increased steadily from 10.9 million barrels per day in 1980 to 11.7 million barrels per day in 1983, or at an average annual rate of 2.4 percent. The U.S.S.R. has 38 refineries located nation-wide from Angarsk to Yarosliv. Separate statistics are not available for the individual refineries. 3/

Petroleum refineries are located principally in the area of the Volga, Azerbaijan, and the North Caucasus. In addition, there is a refinery at Omsk, the only one in Western Siberia, the area that furnishes most of the U.S.S.R.'s crude petroleum. In the past, the U.S.S.R. refinery policy was to expand existing capacity. Now, in order to ease the strain on its railroad system, the U.S.S.R. has undertaken a policy of constructing new refineries nearer to the crude petroleum fields. 4/ This should mean additional refineries in Western Siberia.

1/ Occidental Chemical Agricultural Products, Inc., U.S.S.R. Value of Natural Gas, Tampa, Fla., Mar. 28, 1985, pp. GRS6:33:8 and GRS6:33:15.

2/ David Wilson, Soviet Oil and Gas to 1990 and Geoffrey Drayton, The Market for LPG in the 1980's, Cambridge, Mass., 1982, pp. 47-58; International Petroleum Encyclopedia 1983, Tulsa., OK., 1983, p. 340; and The Europa Year Book 1984: A World Survey, vol. I, England, 1984, pp. 875 and 876.

3/ U.S. Department of Energy International Energy Annual 1983, tables 21; International Petroleum Encyclopedia 1983, Tulsa, OK, 1983, pp. 329 and 240. This source reports that the U.S.S.R.'s refining capacity increased from 11.6 million barrels per day in 1982 to 11.7 million barrels per day in 1983, or by about 0.9 percent; worldwide refining capacity declined from 81.4 million barrels per day in 1982 to 77.1 million barrels per day in 1983 or by 5.3 percent; and, from Wilson & Drayton, op. cit., 1982, pp. 47-82.

4/ Separate data are not available for employment in the crude petroleum refining industry in the U.S.S.R. However, growth in Soviet manpower will decline in all sectors of the economy in the upcoming years due to low birth rates in the U.S.S.R. This was drawn from Joint Economic Committee, Congress of the United States, Allocation of Resources in the Soviet Union and China-1983, Part 9, June 28, 1983 and Sept. 20, 1983, p. 104. Therefore, increased worker productivity is imperative, even in a capital-intensive industry such as the refining industry.

Investment data are not separately available for the refining industry; but, as was discussed earlier, investment in the fuels and power industry has increased steadily in recent years to 17.7 billion rubles ($23.0 billion) in 1982, an increase of 14.2 percent over 1980. In spite of these increased expenditures, the growth of capital productivity is slowing. 1/ This is indicated by a declining output-capital ratio since 1970 for the fuel industry and for all industries as shown in the following tabulation (1970=100):

Year	Fuel industry	All industries
1970----------	100.0	100.0
1975----------	93.0	94.7
1977----------	87.3	90.9
1979----------	77.8	85.2
1980----------	72.6	82.4
1981----------	68.3	79.3

Source: Joint Economic Committee, Congress of the United States, Allocation of Resources in the Soviet Union and China-1983, part 9, June 28 and Sept. 20, 1983, p. 104.

However, investment is apparently continuing in the crude petroleum refining industry. The eleventh Five-Year Plan (1981-85) calls for raising the share of light and medium petroleum products from 50 percent of the total annual output of petroleum products to 60 to 65 percent. This plan also calls for all diesel fuel to be low in sulfur material by 1985. A further objective of the Eleventh Five-Year Plan is a major increase in the production of lube oil additives. 2/

Soviet market.--The following tabulation, compiled from official U.S. statistics, shows the U.S.S.R.'s production, foreign trade, and consumption of petroleum products for 1979-1982: 3/

1/ Joint Economic Committee, Congress of the United States, Allocation of Resources in the Soviet Union and China-1983, Part 9, June 28, 1983 and Sept. 20, 1983, pp. 102-108; Joint Economic Committee, Congress of the United States, Soviet Economy in the 1980's: Problems and Prospects, Part 1, Dec. 31, 1982, pp. 431-456; and, Joint Economic Committee, Congress of the United States, Soviet Economy in the 1980's: Problems and Prospects, Part 2, Dec. 31, 1982, pp. 323-348.

2/ Joint Economic Committee, Congress of the Soviet Economy in the 1980's: Problems and Prospects, Part 1, Dec. 31, 1982, pp. 367-390; and, David Wilson and Geoffrey Drayton, op. cit., p. 56.

3/ U.S. Department of Energy, International Energy Annual, various years, tables 14-18.

(In thousands of barrels per day)

Year	Production	Exports	Imports	Apparent consumption	Ratio (percent) of imports to consumption
1979----	9,326	764	15	8,578	0.2
1980----	9,825	926	15	8,914	0.2
1981----	9,981	971	19	9,027	0.2
1982----	10,219	985	19	9,253	0.2

The above data indicate that exports of petroleum products have increased during the period 1979-82, particularly since 1980. It is possible that this trend reflects a policy of trying to increase exports, including hard currency exports, at a time when it was probably difficult to increase crude petroleum exports and remain within world price levels due to a crude petroleum surplus.

Effects on production costs.--Crude petroleum prices have a direct impact on the cost of production of petroleum products. As developed in the U.S. refining section of this report, analysis of recent data indicates that perhaps as much as 80 to 85 percent of the value on petroleum product sales goes to cover energy and feedstock costs. If crude petroleum prices for sales within the U.S.S.R. were available, a comparison could be made. However, since the crude petroleum, the production facilities, and the refineries are Government-owned, the crude petroleum is simply passed from wellhead to refinery.

An indication of internal transfer price for crude petroleum may be obtained by taking published prices of U.S.S.R. petroleum product sales and backing out freight cost to the markets to obtain a refinery netback figures indicated in the following tabulation (per barrel): 1/

1/ Brief submitted by Charls E. Walker Associates, Inc. on behalf of Ashland Oil, Inc., Feb. 19, 1985.

Refinery structure	From the U.S.S.R. to market in:	Sales realization	Freight from U.S.S.R. to market	Net-back to U.S.S.R.	Posted price of crude petroleum at the U.S.S.R.'s sellers source	Balance
Topping--						
Reforming 1/---	Italy	$27.23	$0.67	$26.57	$27.75	-$1.18
	Rotterdam	27.99	1.25	26.75	27.57	-1.00
	New York City	28.80	1.75	27.05	-	-
Cracking 2/---						
	Italy	$29.18	$0.71	$28.46	27.75	0.71
	Rotterdam	29.69	1.34	28.35	27.75	0.60
	New York City	30.64	1.88	28.76	-	-

1/ Products made by these processes are usually the simpler products that sell at prices lower than those made by cracking processes.

2/ Products made by this process are lighter products, such as gasoline, that have fewer substitutes and command higher prices.

Note.--Data reflect September 1984 market.

This tabulation indicates that, in the case of petroleum products produced by topping and reforming operations, the netback from the sales of these products was not sufficient to cover the input of crude petroleum at official U.S.S.R. export prices. 1/ In the case of petroleum products produced by cracking, a more valuable type of product, the netback more than covered the cost of the crude petroleum. However, refinery costs have not been subtracted from the sales realizations. If this were done there is even greater cause to believe that crude petroleum prices are being discounted in order to make sales of petroleum products at the reported figures.

Effects on competitiveness.--The analysis in the previous section indicates that crude petroleum for refining may have been available in the U.S.S.R. for as low as $23.50 per barrel in the third quarter of 1984. At the same time the U.S. refiners' acquisition cost of crude petroleum was approximately $28.69 per barrel. 2/ A $5 per barrel crude petroleum price advantage, if entirely reflected in the price of petroleum products, would mean an average differential of almost $.12 per gallon. With products selling at the U.S. refinery for between $.68 per gallon for residual oil and $.90 per gallon for gasoline and No. 1 distillate, there is a significant cost

1/ Brief submitted by Charls E. Walker Associates, Inc. on behalf of Ashland Oil, Inc., Feb. 19, 1985.

2/ Energy Information Administration, U.S. Department of Energy, Monthly Energy Review, November 1984, February 1985, p. 89.

advantage for the U.S.S.R., which should aid that country in entering a market and expanding its market share. 1/

Effects on resource allocation.--The pricing of crude petroleum at below market prices, or even to out-of-pocket production costs levels, gives the U.S.S.R. petroleum refining industry a competitive advantage. 2/ This practice allows extreme price flexibility for the marketing of products in export markets. The prices of petroleum products can be adjusted to essentially any level necessary to enter a market or enlarge a market share.

In addition, all U.S.S.R. industries, and in particular those that are energy intensive, that use petroleum products will also have a competitive advantage, if similar pricing practices are followed when they enter the export market. Not only do the exports of petroleum products enjoy a competitive advantage because of U.S.S.R. crude petroleum pricing practices, but essentially all energy-intensive exports derive a benefit from such pricing policies. It is likely, therefore that some resources now directed toward the Soviet refininery industry would have been allocated elsewhere in the absence of government ownership which passes the crude petroleum through from wellhead to refinery. Most of the refined products would have been too costly to be exported to many market on a competitive basis.

China

Chinese Industry Profile

China is a planned, nonmarket economy. As is typical of a nonmarket economy, market forces are secondary, and other factors became more important in determining prices and supply and demand allocations.

Although crude petroleum and natural gas reserves and their development are controlled by the State, China does encourage foreign investment in these resources. 3/ For example, foreign firms have been invited to participate in the development of China's potential offshore crude petroleum reserves. Through 1984, crude petroleum companies from nine nations were involved in

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1/ Energy Information Administration, U.S. Department of Energy, Petroleum Marketing Monthly, October 1984, p. 7.

2/ Brief to the Commission, from Charls E. Walker Associates, Inc., on behalf of the Ad Hoc Committee of Domestic Nitrogen Producers, Feb. 19, 1985.

3/ A. Doak Barnett, China's Economy in Global Perspective, Washington, D.C., 1981, pp. 410, 411, 442, 423, 457, 461, 464 and 465; Jan S. Prybyla, The Chinese Economy: Problems and Policies, 2nd ed.-revised, Columbia, S.C., 1981, pp. 217, 237-241; Chu-Yuan Cheng, China's Economic Development: Growth and Structural Change, Boulder, Colorado, 1982, pp. 6, 7, 365, and 460; Christopher Howe, China's Economy: A Basic Guide, New York City, 1978, pp. 40, 95, 98, 109, 110; U.S. Department of Commerce, China's Economy and Foreign Trade 1981-85, May 1, 1984, many pages; U.S. Bureau of Mines, Mineral Industries of China (reprinted from Mining Annual Review 1984) whole report; and, Wharton Econometric Forecasting Associates, China's Sixth Five-Year Plan (1981-85), Dec. 14, 1982.

Chinese offshore exploration efforts, to which these firms have already committed $300 million to $500 million. 1/

Although China's onshore crude petroleum reserves are widely distributed throughout 19 provinces and 122 producing fields, five major fields account for most of China's crude petroleum output. 2/ The major crude petroleum-producing-provinces are Heilong-jiang, Shandong, and Hebei, which together accounted for 75 percent of China's total crude petroleum output in 1983. Much of China's crude petroleum reserves, like those in the U.S.S.R., are located in areas distant from China's industrial and coastal regions. Therefore, much of China's onshore territory has not been exhaustively explored for crude petroleum. 3/ In contrast, China's nonassociated natural gas reserves are concentrated mainly in the Sichuan Province, which alone accounted for 44 percent of China's natural gas output in 1983. 4/

China's investment in capital construction for fuel and power projects during the Sixth Five-Year Plan (1981-85) is reported to have amounted to $30 billion out of a total of $115 billion. Petroleum was allocated $9 billion, or 30 percent, of the $30 billion. 5/

Energy, together with agriculture, transportation, and education and science are considered strategic priorities for promoting China's economy. However, China has found it necessary to stress conservation in its domestic energy consumption as a means of offsetting a virtual levelling in the production of crude petroleum. 6/ China's Sixth Five-Year Plan lists the following energy saving steps to be undertaken: (1) tighten management of energy resources; (2) readjust the industrial setup, the organization of enterprises, and the product mix; and (3) carry out technical change with

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1/ Wharton Econometric Forecasting Associates, Centrally Planned Economies Outlook, vol. 5, No. 2, October 1984, pp. 131-145.

2/ Committee on Energy and Commerce, U.S. Congress, China's Offshore Oil Development and the Energy Security of the Pacific Rim, Feb. 28, 1984, p. 15.

3/ Steven A. Schneider, The Oil Price Revolution, The John Hopkins University Press, 1983, pp. 377-379.

4/ Chu-Yuan Cheng, op. cit., pp. 6 and 7; Howe, op. cit., pp. 109 and 110; and, U.S. Department of the Interior, Mineral Industries of China (reprinted from Mining Annual Review 1984), pp. 1-3.

5/ U.S. Department of the Interior, Mineral Industries of China, (reprinted from Mining Annual Review 1984), p. 1. The U.S. Department of Commerce, China's Economy and Foreign Trade 1981-85, September 1984, p. 21, reports that petroleum's allocation under the Sixth Five-Year Plan 1981-85 is 15,470 million yuan (or U.S.$7,235 million) which represents 6.3 percent of the overall total.

6/ U.S. Department of Energy, Energy Industries Abroad, pp. 240-242; The Sixth Five-Year Plan of the People's Republic of China for Economic and Social Development 1981-85, Beijing, China, 1st ed., 1984, Chapter 10; and, The Conference Board, Centrally Planned Economies: Economic Overview 1983, June 1983, pp. 32-34.

an emphasis on energy conservation. The Government of China reportedly intends to focus on the development of light industry and consumer goods as opposed to concentrating on heavy industries development, which has been the mainstay of China's economic policy for nearly 30 years. Heavy industry tends to be more energy intensive than light industry. 1/ In the past China has suffered from two major problems where energy is concerned: first, there has been an inefficient utilization of energy by the economy; and second, too much attention has been paid to short term goals such as the following year's level of production. In the past, too little attention was paid to both the depletion of crude petroleum fields and the improvement in recovery methods in these areas.

Natural Resources Pricing Policy

The authority for pricing goods of national importance, such as crude petroleum and natural gas, resides with the Central Government in China. 2/ The setting of prices appears to be separated from annual economic plan management or investment planning. 3/

The Chinese Government reportedly does not enumerate its price-setting principles; however, the history and structure of prices indicate that price stability is given a high priority. From past Chinese practices, official sources have deduced that the accounting cost of domestic production is given greater weight in price setting than the opportunity cost in overseas markets. 4/ It is further reported by international sources that wide profit margins are built into the prices of products for use outside of the industrial sector; however, this is less true for intermediate products consumed primarily by industry. 5/ The Chinese Government also attempts to achieve price unity within geographic regions.

In China, energy pricing appears to be used chiefly to accrue and distribute earnings, rather than to influence supply and demand. Reportedly, however, little is known about the distribution of these revenues. Some of the revenue is reinvested in capital construction, and some of the revenue is used to purchase raw materials. However, the bulk of the revenue presumably is sent to the provincial and national governments. 6/

1/ U.S. Department of Commerce, Foreign Economic Trends and Their Implications for the United States: China, FET84-37, March 1984, pp. 5, 6, 7, 11, 12, and 13; and, U.S. Department of Commerce, China's Economy and Foreign Trade 1981-85, September 1984, pp. 1, 2, and 9-22.

2/ U.S. International Trade Commission, China's Economic Development Strategies and Their Effects on U.S. Trade, USITC Publication 1645, February 1985, pp. 18 and 39.

3/ A World Bank Country Study, China: Socialist Economic Development, vol. II, August 1983, pp. 196 and 197; and, A World Bank Country Study, China: Socialist Economic Development, vol. I, August 1983, pp. 53 and 54.

4/ A World Bank Country Study, China: Socialist Economic Development, vol. II, August 1983, pp. 196 and 197; and, A World Bank Country Study, China: Socialist Economic Development, vol. I, August 1983, pp. 53 and 54.

5/ Ibid.

6/ Ibid.

China's policy on pricing crude petroleum and natural gas has at times created problems, such as inefficient utilization of available energy resources, since the pricing policy is based on the market labor theory of value, and thus tends to understate the relative worth of raw material inputs. 1/ As a result, energy prices in China are on the whole lower than international prices. 2/ In addition, internal transactions and the internal prices for crude petroleum and natural gas are largely insulated from external transactions and international prices. 3/ The State control of crude petroleum and natural gas prices remains in effect and there appears to be no immediate plan to change. However, this pricing system has been impacted by recent changes such as the profit retention plan which began in 1978. 4/ This plan stresses profit generation as it permits certain enterprises to retain a portion of its profits rather than remit them to the State. The profit retention system reportedly brought into focus China's price structure, which undervalues raw materials and overvalues finished goods. Therefore, over the past few years, prices for many Chinese commodities, including energy, have become two-tiered. For example, purchasers may pay the low State price (set by the Central Government) for goods allocated under their quota, but additional supplies are often purchased at negotiated rates, which may be substantially higher. 5/ The expansion of this system has led, in effect, to a degree of price reform in part of the energy sector. 6/ The combined average prices for some goods including coal and fuel oil have apparently increased under this dual system. In addition, it has been reported that some factories have been increasing the use of barter to obtain items, including fuels. In some cases, these factories may be paying higher prices because of the variability of values given to bartered items by bartering partners. 7/

1/ A memo from the U.S. Central Intelligence Agency to a staff member of the Commission regarding the subject investigation, Feb. 19, 1985. The market labor theory of value relates value of a product to the amount of labor used in producing that good.

2/ Ibid.

3/ Jan S. Prybyla, op. cit., p. 217 and, A. Doak Barnett, op. cit., p. 464.

4/ U.S. Department of Commerce, China's Economy and Foreign Trade 1981-85, September 1984, pp. 11-15; and, Wharton Econometric Forecasting Associates, Centrally Planned Economies Outlook, vol. 5, No. 2, October 1984, pp. 136-138.

5/ This information is based on declassified portions of a classified report supplied by the U.S. Department of State and prepared by the U.S. Embassy, Beijing, in February 1985.

6/ Contract terms for offshore crude petroleum are confidential; however, there is a so-called "X" factor which the Chinese use to determine the foreign firms profit. It comes after royalty and taxes of 17.5 percent are taken out. The operating costs are estimated at 12.5 percent. The foreign firms and China split the "X" factor, profit, based on a predetermined formula. This was drawn from Committee on Energy and Commerce, U.S. Congress, China's Offshore Oil Development and the Energy Security of the Pacific Rim, Feb. 28, 1984, pp. 21 and 22.

7/ This information is based on declassified portions of a classified report supplied by the U.S. Department of State and prepared by the U.S. Embassy, Beijing, in February 1985.

The growing emphasis now being placed on profits in China indicate that price reforms may be inevitable. 1/ However, State plans to remove or reduce energy subsidies beginning in 1985 will require political fortitude, for such a program could raise production costs, reduce profits, and increase the rate of inflation in China. 2/ The Chinese Government has already introduced a more flexible system in the form of "negotiated prices" for certain agricultural products and for "small industrial commodities." 3/ Under this system, the impact of price reforms may possibly be more finely tuned than under the former plan.

An industry source reported that in 1984, the wellhead price for crude petroleum in China was about $20 or more per barrel less than in the United States. 4/ In 1983, the actual U.S.domestic average wellhead price for crude petroleum was $26.19 per barrel, therefore, a comparable price in China would be in the $5 to $7 per barrel range. 5/ This industry source also reported that the wellhead prices of natural gas in China are between two-fifths and one-half of U.S. wellhead prices. In 1983, the average U.S. wellhead price of natural gas was $2.59 per thousand cubic feet; therefore, a comparable price for natural gas in China would be between $1:05 and $1.30 per thousand cubic feet. 6/ Since average production costs in China may be close to these levels and energy is priced low, these price estimates appear reasonable.

1/ U.S. Department of Commerce, Foreign Economic Trends and Their Implications for the United States, FET 84-37, March 1984, pp. 13 and 14.

2/ Ibid., This source cites the following examples, for coal, to illustrate the subsidization of energy consumption. On the international market, the price of three tons of coal roughly equals one ton of wheat. In China, one ton of wheat commands the same price as 15 tons of coal. Similarly, on the international market, the price of a ton of coal is equivalent to that of two thousand kilowatt hours of electricity. But in China, the same amount of electricity is priced at the same level as 11 tons of coal. China's energy subsidy for industry has indeed spurred production, but it has also led to waste and squandering of precious energy resources.

3/ U.S. Department of Commerce, China's Economy and Foreign Trade 1981-85, September 1984, pp. 11-15.

4/ A memo, dated Feb. 19, 1985, from the Central Intelligence Agency to a Commission staff member regarding the subject investigation. This source reported that below market pricing of Chinese exports results from marketing strategies that have little to do with internal cost considerations. For example, A. Doak Barnett, op. cit., p. 464, states that China has sold small quantities of crude petroleum at "Friendship Prices" to Southeast Asian nations; U.S. Department of Commerce, The People's Republic of China: A New Industrial Power with A Strong Mineral Base, 1975, p. 38; and, also based on information developed during fieldwork on the subject investigation.

5/ U.S. Department of Energy, Monthly Energy Review, November 1984, February 1985, part 9, p. 89. This source reports that the U.S. refiner's composite acquisition cost for crude petroleum was $28.99 per barrel in 1983. Also based on information developed during fieldwork on the subject investigation.

6/ Ibid.

Resources Affected

Crude petroleum has continued to be an important source of energy over the years in China, even though attempts have been made to expand coal and natural gas use in order to free crude petroleum for hard currency exports. In spite of these efforts, natural gas has not become a major energy source in China. However, it continues to have great potential as China's estimated proved reserves of natural gas as of Jan. 1, 1985, amounted to 30.9 trillion cubic feet or about one percent of the world total.

The following tabulation (in thousands of barrels per day) from official U.S. sources shows China's production, exports, imports, and apparent consumption of crude petroleum, 1979-83: 1/

Year	Production	Exports	Imports	Apparent consumption	Ratio (percent) of imports to consumption
1979	2,123	267	0	1,856	-
1980	2,113	265	0	1,848	-
1981	2,024	277	10	1,757	0.6
1982	2,044	304	13	1,753	0.7
1983	2,120	300	1/	1/	1/

1/ Not available. However, the value of China's imports of petroleum and petroleum products under SITC division 33 in 1983 amounted to $4,351 million (f.o.b. value), or 12 percent less than the $4,931 million in 1982. This was drawn from U.S. Department of Commerce, China's Economy and Foreign Trade 1981-85.

China's production of crude petroleum was nearly level over the period 1979-83, while exports of crude petroleum climbed irregularly from 267 million barrels per day in 1979 to 300 million barrels per day in 1983 or by more than 12 percent. The increase in exports of crude petroleum during a period of zero growth in production and negligible imports is attributed to a national commitment to move from heavy industry, which is very energy intensive, to investments in light industry, featuring consumer goods, as well as to increased usage of other energy sources. By maintaining its export level of crude petroleum, China, while assuring itself of a continuing supply of hard Western currency, has also suffered because of the worldwide decline in the

1/ U.S. Department of Energy, International Energy Annual, several years, table 14; U.S. Central Intelligence Agency, Handbook of Economic Statistics 1984, September 1984; and International Energy Statistical Review, January 15, 1985.

price of crude petroleum. 1/ For example, the average landed cost of crude petroleum in the United States declined from $36.52 per barrel in 1981 to $28.93 in 1983, and for the first 11 months of 1984 averaged $28.50 per barrel. 2/

The following tabulation from official U.S. sources shows the natural gas actually collected and utilized as fuel or raw material by China during 1979-83 (in millions of cubic feet per day): 3/

Year	Production
1979	1,402.7
1980	1,380.0
1981	1,216.4
1982	1,126.0
1983	1,126.0

Natural gas production, which supplies about 3 percent of China's energy needs, declined by nearly 20 percent during 1979-83. This decline has been attributed to the depletion of China's main natural gas reserves at the Sichuan natural gas fields, while there has been a simultaneous slow down in production of natural gas obtained simultaneously with crude petroleum, or associated gas. China's Sixth Five-Year Plan, 1981-85, calls for the addition of 93,275 million cubic feet of natural gas capacity during this period, but provides for no separate investment allocation. 4/

1/ U.S. Department of Commerce, Foreign Economic Trends and Their Implications for the United States: China, FET 84-37, March 1984, pp. 5 and 6; U.S. Department of Commerce, China's Economy and Foreign Trade 1981-85, September 1984, pp. 2, 3, 18, 19, 20, 21, 23-25; and, Wharton Econometric Forecasting Associates, Centrally Planned Economies Outlook, Vol. 5, No. 2, October 1984, pp. 131-144.

2/ U.S. Department of Energy, Monthly Energy Review, November 1984, February 1985, p. 89.

3/ Production from the U.S. Central Intelligence Agency, Handbook of Economic Statistics, 1984, September 1984, p. 134. The U.S. Department of Energy, International Energy Annual, various years, table 25, revealed that China was neither and exporter nor an importer of natural gas.

4/ U.S. Department of Commerce, China's Economy and Foreign Trade 1981-85, September 1984, pp. 3, 20 and 21; U.S. Department of the Interior, Mineral Yearbook 1982, Vol. 1: Metals and Minerals, 1983, pp. 640-641; U.S. Department of the Interior, Nitrogen (Ammonia) A Chapter From Mineral Facts and Problems, 1985 Edition, (Preprint from Bulletin 675) pp. 1-4; U.S. Department of the Interior, The Mineral Industry of China, (preprint from the 1982 Bureau of Mines Minerals Yearbook) p. 9; and, information obtained from the Ad Hoc Committee of Domestic Nitrogen and Charls E. Walker Associates, Inc., a representative for the group during a meeting with Commission staff members on Mar. 12, 1985.

Primary Consuming Industries That Benefit

Refining

This section covers China's petroleum refining operations to the extent it is known. China, like the U.S.S.R., reports their refining capacity in terms of thousands of barrels per day (i.e. 1,810) of crude petroleum and does not break the capacity down according to the type of refinery operation; that is, by catalytic cracking or catalytic reforming. 1/

In addition to the refining industry, other energy intensive industries also benefit from China's energy resources pricing practices. The petrochemical industry, for example, has been expanding in China. Although most of its output has been earmarked to satisfy domestic market growth and import substitution, it appears that China has the natural resource base to support a petrochemical industry capable of having an impact in international markets.

Chinese industry profile

China has 33 medimum-to-large state-owned refineries with an annual, aggregate capacity of 2 million barrels per day at Anshan, Chin-Hsi, Dairen, Fushun, Hangchow, Karamai-Tushantzu, Lanchow, Lenegu, Maoming, Nanchung, and Nanking. 2/ China is adding to its refining capacity at Anging, Daqing, Nanjing, Shanghai, and Shengli; all of these facilities are under construction and many of them are scheduled to begin operations this year or in 1986, In many instances, these refining facilities are being constructed in conjunction with a petrochemical project, such as an ammonia plant or a polypropylene plant. 3/ These petrochemical facilities often utilize products and by-products of refining operations as energy sources and raw materials.

Industry sources report that financing for refinery expansion is included in the Five-Year Plan petroleum investment allotment. Under the Sixth Five-Year Plan, China's petroleum investment allotment is 15,470 million yuan (or about U.S. $7,735 million). 4/

Employment is not separately reported for petroleum refining in China, however, refining is a capital intensive, highly automated industry that requires few personnel per unit of output. Industry sources believe that China must increase its efforts to modernize and revamp its refineries by increasing their efficiency and the diversity of the crude petroleum inputs that they can handle, and also expand the range of petroleum products that

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1/ International Petroleum Encylopedia 1983, Tulsa, Okla., pp. 204, 205, and 334.

2/ Ibid.

3/ Hydrocarbon Processing, section 2, "HPI Construction Boxscore," pp. 32 and 33.

4/ U.S. Department of Commerce, China's Economy and Foreign Trade 1981-85, September 1984, pp. vii, viii, 20, and 21.

they can produce in order to maximize its crude petroleum potential and offshore discoveries. 1/

Chinese market

China's production, exports, imports, and domestic consumption of refined petroleum products in 1979-82, as reported by the U.S. Department of Energy are shown in the following tabulation (in thousands of barrels per day): 2/

Year	Production	Exports	Imports	Apparent consump- tion 1/	Ratio (per- cent) of imports to consumption
1979	1,882	0	1	1,883	2/
1980	1,879	48	3	1,834	2/
1981	1,575	77	2	1,675	2/
1982	1,419	80	3	1,661	2/

1/ Apparent consumption includes internal consumption, refinery fuel and loss, and bunkering. These data were confirmed by telephone with an official of the U.S. Department of Energy.
2/ Less than 0.5 percent.

China's production of refined petroleum products declined from about 1.9 million barrels per day in 1979 to about 1.4 million barrels per day in 1982, or by about 26 percent. This decline in the production of refined products is in line with China's slight decline in crude petroleum output during this period from 2.1 million barrels per day in 1979 to 2.0 million barrels per day in 1982. In spite of increasing domestic demand, China increased its exports of refined petroleum products during 1979-82 in order to obtain the additional hard currency China needs to purchase Japanese and Western machinery and technology for energy exploration and development.

The United States has been an important market for China's exports of crude petroleum and petroleum products, as shown in the following tabulation

1/ A. Doak Barnett, op. cit., 1981, pp. 468-471; The Sixth Five-Year Plan of the People's Republic of China for Economic and Social Development 1981-1985, Beijing, China, 1st ed., 1984, pp. 92-94; based in information developed during fieldwork on this study; and, International Energy Annual 1983, Tulsa, Okla., 1983, pp. 204-206.
2/ International Energy Annual, various years, tables 14-18.

of U.S. imports of gasoline and total crude petroleum and petroleum products from China: 1/

Year	Gasoline	Total petroleum and petroleum products	Ratio (percent) of gasoline to total
1979	$ 21,615	$96,436	22.4
1980	81,809	132,442	61.8
1981	258,744	295,428	87.6
1982	336,884	580,172	58.1
1983	308,895	419,635	73.6
1984	303,072	606,625	50.0

Nearly all U.S. imports of gasoline from China enters the U.S. west coast market, according to Chinese sources. 2/ The United States imports, on the average, about 80 to 90 percent of China's total annual gasoline exports. 3/ On a volume basis, China's exports of gasoline to the United States have represented about 18 to 19 percent of the total volume of China's exports of refined petroleum products. 4/

Effects on production costs

The refining industry in China reportedly obtains most of its crude petroleum at $5 to $7 per barrel, or at approximately $22 to $24 per barrel

1/ However, Japan is China's number one market for crude petroleum and refined products, from U.S. Department of the Interior, The Mineral Industry of China, (preprint from the 1982 Bureau of Mines Mineral Yearbook), pp. 10 and 11; U.S. Central Intelligence Agency, International Energy Statistical Review, Jan. 29, 1985, p. 27; and, U.S. Department of Commerce, China's Economy and Foreign Trade 1981-85, September 1984, p. 47 for 1979-1983 U.S. imports from China; 1984 U.S. import data from information developed by Office of Data Systems, U.S. International Trade Commission, Feb. 14, 1985, for the Office of Economics, U.S. International Trade Commission.

2/ Derived from USITC report 1645, China's Economic Development Strategies and Their Effects on U.S. Trade, February 1985; and a brief submitted on Mar. 6, 1985 to the Commission by the China National Chemicals Import and Export Corporation (Sinochem) on Tariff Classifications of Motor Fuel Blending Stocks, Investigation No. 332-103.

3/ Based on information obtained during a telephone conversation on Mar. 14, 1985, with an official of Sinochem (Mr. Jiang).

4/ Derived from USITC report 1645, China's Economic Development Strategies and Their Effects on U.S. Trade, February 1985; and, A brief submitted on Mar. 6, 1985 to the Commission by the China National Chemicals Import and Export Corporation (Sinochem) on Tariff Classifications of Motor Fuel Blending Stocks, Investigation No. 332-103.

less than the composite acquisition cost of crude petroleum paid by U.S. refiners in 1983 and 1984. 1/ Therefore, even though China's worldwide sales of refined petroleum products such as gasoline, diesel fuel, and kerosene are at, or near, world prices, it could significantly reduce prices in order to increase market penetration. 2/ China reportedly sells the gasoline it exports to the U.S. west coast market at a price level which is competitive with U.S. domestic product prices in that region. 3/

Generally, it is difficult to assess China's production cost savings resulting from its pricing practices for energy materials. Since prices of goods besides natural resources also are administrated, the discrepancies in the prices of these goods may either add to or reduce the cost savings provided by the relatively low-cost crude petroleum or natural gas used as energy sources or as feedstocks in China. 4/

Effects on competitiveness

China, like the U.S.S.R., is pragmatic with respect to its trade of crude petroleum and petroleum products with Western nations and Japan. These goods are priced at or near world prices--low enough so as not to lose any major sales; yet high enough to insure that China's foreign exchange exports will furnish a maximum of Western or Japanese hard currency to permit China to continue purchasing priority technology and equipment.

According to an official U.S. Government source, distortions in the Chinese internal pricing system (including those previously discussed) and Beijing's current practice of basing export prices on existing world prices, make it difficult to estimate the net cost savings stemming from China's natural resource pricing practices and reduces the ability to analyze China's potential competitive advantage. 5/ The same source indicates that if the Chinese priced exports according to internal costs rather than by using world prices as a base, their price competitiveness in world markets would stem largely from the low-cost wage structure that benefits all of China's industry, with lesser benefits from internal distortions, including natural resource pricing practices.

1/ Based on information developed during fieldwork for this investigation; and, U.S. Department of Energy, Monthly Energy Review, November 1984, published February 1985, part 9, p. 89.

2/ This information is based on a declassified portion of a classified report supplied by the U.S. Department of State and prepared by the U.S. Embassy, Beijing, in early 1985.

3/ In 1984, China supplied the United States with 10 percent of the quantity and value of its imported gasoline. The average unit value for the imported Chinese gasoline was $28.99 per barrel or 69 cents per gallon. Also based on information contained in Sinochem brief, Mar. 6, 1985, to the Commission on investigation 332-203, Tariff Classification of Motor Fuel Blending Stocks.

4/ Memo, dates Feb. 19, 1985, from the U.S. Central Intelligence Agency to a Commission staff member on the subject investigation.

5/ Ibid.

China's transportation sector is considered inadequate and a hinderance to overall, long-term economic growth. This is especially true of its railroads and port facilities. 1/ More than 90 percent of China's foreign trade moves by water and China's ports are heavily dependent on railways to distribute cargoes. China as a whole now has fewer berths than the port of New York, and only 143 of its berths can receive ships of 10,000 dead weight tons or larger. However, China is attempting to improve its transportation network. For example, current Chinese plans call for the completion of 54 new berths in 1985 out of a planned total of 132 new deep water berths in 15 ports. The remainder are to be completed between 1986-1990. China's limited railroad system is to have 2,067 kilometers (1,278 miles) of new track added during 1981-1990. A total of 20,000 to 30,000 kilometers (12,400 to 18,600 miles) of new railroads are to be built by the year 2000, by which time 15,000 kilometers (9,300 miles) of existing track are to be electrified.

In China, prices in the various transport sector are set by administrative order from the relevant authority. 2/ Once in place, prices tend to remain fixed over long periods of time; for example, the railway tariffs have not been unchanged in over 15 years. Official international sources report that the relationship between railroad prices and costs is difficult to interpret in a nonmarket economy. 3/ However, as long as railroads maintain their near monopolistic role in China, prices much higher than cost can be imposed. 4/ It has been reported by an international source that transportation agencies in China could benefit substantially from the analytical cost determination techniques and procedures which have been developed, for example, in certain Western countries. 5/ At present, transportation costs do not play an important role in market signalling and managerial incentives. For example, there now exists regional cross-subsidization since freight rates are uniform throughout China.

Effects on resource allocation

China's refineries now enjoy an acquisition cost advantage compared with their U.S. counterparts of between $20 to $25 per barrel for crude petroleum. However, China reportedly has not exploited this cost advantage in its exports

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1/ U.S. Department of Commerce, Foreign Economic Trends and Their Implications for the United States: China, FET 84-37, March 1984, pp. 11-13; and, U.S. Department of Commerce, China's Economy and Foreign Trade 1981-85, September 1984, pp. 7, 18-22.

2/ A World Bank Country Study, China: Socialist Economic Development, vol. II, August 1983, pp. 290, 291, 320, 321, 350-353, 383, 444-448, and 454-456; and, A World Bank Country Study, China: Socialist Economic Development, vol. I, August 1983, pp. 54, 129-135, 149, and 150.

3/ Ibid.

4/ Ibid.

5/ A World Bank Country Study, China: Socialist Economic Development, vol. II, August 1983, p. 290.

of gasoline to the United States, its principal refinery export to this country, which is priced near market levels. 1/

Past Chinese energy policies have fostered small, locally designed plants that are inefficient and uneconomical. 2/ China's current Five Year Plan (1981-85) attempts to direct the economy towards energy conservation by accelerating the growth of light industry and shutting down energy inefficient plants. Although China's Government will continue to control prices of crude petroleum and natural gas, internal prices reportedly will rise to or near the existing world level as part of China's conservation effort. 3/ The Chinese Government realizes that crude petroleum and natural gas are nonrenewable natural resources and, once depleted, are gone forever. Therefore, in order for China to utilize these resources most efficiently and economically, China must export crude petroleum, natural gas, and their derivatives to the West and Japan at the highest price per unit possible without the loss of sales. China reportedly will continue to make minor exports of these resources available at so-called "Friendship Prices" to neighboring countries in Southeast Asia.

Chronic underpricing of natural resources combined with little incentive for conservation have led, until recently, to high energy consumption rates and misallocation of China's energy resources. 4/ The recognition of the misallocation of resources has led the Chinese Government to reconsider its practices.

1/ Sinochem, on p. 4 of its brief of Mar. 6, 1985, to the Commission on its investigation on Tariff Classifications of Motor Fuel Blending Stocks, No. 332-203, states that : "China has never 'dumped' gasoline in the U.S. market, and will never do so in the future. Chinese gasoline always has been priced at competitive levels by reference to U.S. West Coast postings, competitive conditions, and market prices."

2/ Joint Economic Committee, Congress of the United States, Allocation of Resources in the Soviet Union and China - 1983, part 9, June 28 and Sept. 20, 1985, pp. 151-154; U.S. Department of Energy, Energy Industries Abroad, September 1981, pp. 241-244; World Bank, China: Socialist Economic Development, vol. 1, August 1983, pp. 188-195; World Bank, China: Socialist Economic Development, vol. II, August 1983, pp. 193-205; and, U.S. Department of Commerce, China's Economy amd Foreign Trade, 1981-85, September 1984, pp. 2, 3, 17-22.

3/ A memo dated Feb. 19, 1985 from the U.S. Central Intelligence Agency to a Commission staff member on the subject investigation. This CIA memo further states that energy prices in China will rise over the next few years as part of China's energy conservation efforts. Therefore, future internal energy prices are not likely to provide any special competitive advantage for China's exports.

4/ A memo dated Feb. 19, 1985 from the U.S. Central Intelligence Agency to a Commission staff member on the subject investigation. This CIA memo further states that energy prices in China will rise over the next few years as part of China's energy conservation efforts. Therefore, future internal energy prices are not likely to provide any special competitive advantage for China's exports.

Other Non-OPEC Nations

Other non-OPEC nations that have crude petroleum and natural gas resources are developing their energy-intensive industries as a way to back-out imports and to increase exports. Included among these new producer nations are Trindad and Tobago, Singapore, Thailand, Malaysia, New Zealand, and Australia.

The Far Eastern nations are developing petrochemical and refining industries in an area of huge growth potential. It is an area, however, also under study by many of the world's other new producers as a market for their exports. Competition could intensify, particularly if the market does not fullfill its growth potential. For this eventuality or until its potential is reached, Malaysia is reportedly investigating exporting methanol to Europe. 1/

Because of its proximity to U.S. shores, Trinidad and Tobago are covered in detail in this section. In addition to its geographic location, which could result in lower transportation costs to the U.S. market, Trinidad and Tobago benefits from the Caribbean Basin Initiative (CBI) program. 2/

Trinidad and Tobago, with estimated proved reserves of 540 million barrels of crude petroleum remaining as of January 1, 1985, produced about 169,000 barrels per day of crude petroleum in 1984. 3/ Trinidad and Tobago has two refineries, with the combined capacity to process 320,000 barrels per day of crude petroleum. 4/ Trinidad and Tobago also has estimated proved reserves of 10.6 trillion cubic feet of natural gas. 5/

The National Energy Corporation (NEC) was established on October 18, 1979, to act as a holding company for energy-based industrial development projects of the Trinidad Government. The NEC coordinates several production companies as service entities that constitute the nation's energy sector. Its primary aim is to translate national economic objectives and policies emanating from the Government into programs of action. 6/

Although the Government intends to become increasingly involved in the petroleum industry, foreign investment is still allowed. 7/ In addition to the Trinidad and Tobago Oil Company (Trintoc), which is the national petroleum company of Trinidad and Tobago, non-Government affiliated petroleum producers include companies wholly owned by U.S. petroleum companies, multinational petroleum companies based in other developed nations, and other joint ventures between these companies and local firms. 8/

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1 "Third World Petrochemicals: How Much Market Cost?," Chemical Business, March 1985, p. 15.

2/ The CBI is designed to allow the duty-free entry into the United States of certain goods from the nations located in the Caribbean area.

3/ "Worldwide Report," Oil & Gas Journal, Dec. 31, 1984, p. 75.

4/ Ibid.

5/ Ibid.

6/ U.S. Department of Energy, Energy Industries Abroad, September 1981, p. 46.

7/ Ibid.

8/ Ibid, p. 45.

Trinidad and Tobago, whose exports to the United States are eligible for duty-free status under the Carribean Basin Initiative, was the ninth largest source of U.S. imports of crude petroleum in 1984. The nation has also developed a petrochemical industry based on its natural resources, which, although limited in the number of products, has some world-scale capabilities. Trinidad is expected to continue to increase its exports of petrochemicals in the future. These exports are expected to be based on natural gas available to domestic industrial users at approximately $1.00 per thousand cubic feet. This comparative advantage is related to the fact that there is no current economic alternative use for the associated natural gas. If future liquefied natural gas markets develop, Trinidad and Tobago has been indicated as a possible source. 1/

Ammonia in Trinidad and Tobago

The ammonia industry in Trinidad and Tobago is made up of 2 plants owned by a joint-venture company of the Government and a large U.S. chemical company. This U.S. company also produces ammonia in the United States. This Trinidadian company's product is based on low-cost natural gas available from the NEC of Trinidad and Tobago; the cost for the natural gas averages approximately $1.00 per thousand cubic feet. 2/ Its other costs are fairly similar to the costs of modern U.S. ammonia facilities, and its product enters the United States free of duty. The ammonia produced in Trinidad that entered the United States in 1984 had an average unit value of $154.59, which made it higher valued than most other ammonia imports. The average unit value of all U.S. ammonia imports in 1984 was $144.32.

U.S. imports of ammonia from Trinidad and Tobago increased from 332,818 short tons in 1980 to 814,289 short tons in 1984. Trinidad and Tobago accounted for 25 percent of total U.S. ammonia imports in 1984. Trinidad and Tobago was the third largest exporter of ammonia to the United States in 1984, ranked behind the Soviet Union and Canada. Mexico was the fourth largest U.S. ammonia source in 1984.

Methanol in Trinidad and Tobago

The Trinidadian methanol industry is composed of one plant, based on $1.00 per thousand cubic feet natural gas, owned by and run by the NEC. This facility has an annual capacity of 350,000 metric tons. 3/ The methanol produced in this plant is reported to be purely export oriented, with approximately 60 percent to go to the United States, and the remainder, to Western Europe. Trinidadian methanol enters these markets free of duty. Otherwise, its cost structure is similar to that of other new methanol plants that have come onstream since 1983. 4/

1/ Society of Petroleum Engineers, World Liquefied Natural Gas (LNG) Trade, December 1983, p. 1.

2/ According to a report attributed to a participant in a different joint venture petrochemical project in Trinidad. Contracted rates are reported to be $0.90 and $1.25 per thousand cubic feet.

3/ Based on information compiled from various industry sources.

4/ Ibid.

Trinidadian methanol entered the U.S. market for the first time in 1984 and was priced similarly to Canadian methanol. Trinidad accounted for approximately 11 percent of 1984 U.S. methanol imports and is expected to increase its share in subsequent years.

Steel in Trinidad and Tobago

The steel industry in Trinidad and Togabo consists of two companies built in 1984. A state-owned integrated facility, which began production in 1980, will become a joint venture in 1985 between the government (60 percent ownership) and a U.S.-owned construction engineering firm and steel company (40 percent ownership). This facility currently produces direct-reduced iron (DRI) pellets, continuous cast steel billets, and wire rod. A privately-owned trading company, which built a rolling mill in 1984, produces structural steel. The steel industry in Trinidad and Tobago has an annual production capacity of 882,000 short tons, and is currently operating at 40 percent of capacity. 1/

On the basis of availability of flare gas obtained from its crude petroleum reserves, Trinidad and Tobago has developed a steel industry based on no-cost natural gas feedstock for DRI output used in the manufacturing of wire rod and as an energy source for reheating furnaces in the production of billets. U.S. imports of steel mill products from Trinidad and Tobago increased from 6,010 short tons in 1981 to 66,616 short tons in 1984. Trinidad and Tobago, whose exports to the United States are eligible for duty-free status under the Caribbean Basin Initiative, was the 27th largest source of U.S. imports of steel mill products in 1984, and accounted for less than one percent of total U.S. steel imports that year.

MAJOR COUNTRY ANALYSIS OF METAL ORES PRICING PRACTICES

Metal ores pricing 2/

Due to the vertical integration of the mining industry, there is a preponderance of internal trade within companies and consequently metal ores and concentrates are often not traded at market prices. 3/ Internal transfer prices for these metal-bearing materials are established as a function of production factors, such as ore grades and labor rates, and tax considerations.

Ores and concentrates that are transferred within a vertically integrated company or, to a lesser degree, sold under long-term contracts have stable prices that are highly confidential and are relatively unaffected by fluctuations in the open market. The transfer or transaction prices used in these arrangements can be adjusted according to contractual specifications, such as escalation clauses, but are only weakly responsive to actual market movement. As a result, these prices are lower than market prices when demand is strong, and higher when the market is soft. Moreover, premiums are paid for the security of supply inherent in these arrangements, especially with the direct ownership of the raw materials that comes with vertical integration.

1/ Information obtained from sources at Metal Bulletin, New York.

2/ Much of this section is drawn from Trading in Metals, ed. Trevor Tarring and Peter Robbins, Metal Bulletin Books Limited, 1983.

3/ Further detail of the structure of the ores and concentrates and metal markets appears in Appendices E and F.

Metal ores and concentrates which are sold in the market are priced primarily by the major producing companies and dealers. In general, producers' prices apply to large, long-term purchases, and dealers' prices apply to smaller contracts and spot purchases.

Ores and concentrates vary in their richness (of both primary and byproduct metals) and in their impurities content. These quality variances contribute greatly to the price disparities found in the market and to the differences in profitability among the producers. Various methods are used to adjust prices to reflect the differences in ore grade.

Prices are most commonly based on customer specifications with premiums or discounts for variance from the specifications. Another method is for the ores and concentrates to be sold at a price per ton or pound of contained metal, metal oxide, or metal sulfide. The price can also be obtained by a formula based on a "returning" or "treatment" charge, the fee asked by a smelter for treating ores and concentrates supplied by a firm not having smelting capabilities. This pricing method can be used as a basis for the smelter to purchase the metal-bearing materials or for the ores and concentrates to be treated "on toll" (known as customs smelting) under which the refined metal is returned to the supplier. Treatment charges remain relatively stable in long-term supply agreements, changing only when metal prices begin to differ significantly from the basis price in the contract. The least used pricing method is one where ores and concentrates are sold at a price negotiated for each transaction, in which case the price is determined by such factors as the date of shipment and the mine from which it was obtained, in addition to the ore grade. Whatever the mechanism used to price ores and concentrates, a decision between comparable bids ultimately rests on nonprice factors such as the currency of payment, the reputation of the shipper or mine, and the likely impurities of the ore.

Some ore and concentrate markets operate relatively autonomously, but others are dominated by the markets of their respective metals. The beryllium, tungsten, and vanadium concentrate markets respond to their own supply and demand conditions, whereas the price structure of bismuth, copper, lead, tin, and zinc concentrates closely follows the markets of the refined products. Other metal ores have autonomous, but interrelated, concentrates and metal markets.

Government policy factors affecting metal ores pricing

Metal ore pricing structures can be influenced by a variety of government arrangements in addition to technical and market factors. Governments have various policies and programs that affect both the consumption and production of metal ores, including: (1) state ownership or control of mineral production, in which foreign exchange earnings and employment are often more important objectives than profit, and as a result, production and pricing patterns differ from those of more profit oriented operations; (2) development bank financing, though relatively small in comparison with private financing for mining projects, which acts as a catalyst for funding and may ultimately lower the overall costs of capital for mining projects; (3) the IMF compensatory financing facility, designed to assist countries with balance of payments problems arising from temporary shortfalls in exports, which may allow metal ore production to continue through severe economic downturns; (4) government sponsored economic stockpiles, such as in Japan, which facilitate the operation of long term supply arrangements by ensuring that delivery can be taken even when demand is low; (5) tariff structures with high rates for refined metal products which can affect the price of ores, as well as metals prices, as in the case of copper in Japan; (6) price review authorities which exist in some countries to guarantee that reasonable terms and prices are negotiated on exported materials; and (7) price control authorities which exist in some countries to keep domestic inflation in check. Many of these government programs can result in price disparities that can both favor and work to the disadvantage of domestic consumers. Though there are many mechanisms for government involvement in the metal ore markets, none of the major producers of metal ores with whom the U.S. competes significantly in finished products 1/ were found to have explicit policies geared towards lowering the price of ores consumed domestically relative to the price of exported ores (table 25).

1/ Australia, Brazil, Canada, Chile, West Germany, Jamaica, Mexico, Peru, the Republic of South Africa, Suriname, Turkey, Venezuela, Zaire, Zambia, and Zimbabwe.

Table 25.—Metal ores: Pricing practices of major metal ore producing nations

Country	Principal metal ores produced/refined materials exported	Structure of industry	Domestic pricing mechanisms	Export pricing mechanisms
Australia	Bauxite/Aluminum Manganese ore/Ferromanganese Iron ore/Steel Lead ore/Lead Zinc ore/Zinc	Primarily private ownership.	Market oriented.	Market oriented; government monitors export contracts to ensure that reasonable market prices are achieved.
Brazil	Bauxite/Aluminum Chromite/Ferrochromium Manganese ore/Ferromanganese Iron ore/Steel Zinc ore/Zinc	Primarily private ownership.	Government sets prices as an inflation control measure.	Tax structure contains incentives to export.
Canada	Copper ore/Copper Iron ore/Steel Lead ore/Lead Zinc ore/Zinc	Primarily private ownership.	Market oriented.	Market oriented.
Chile	Copper ore/Copper	Largely government owned.	Basically market oriented; price supports exist to help mines endure recession.	Market oriented.
Jamaica	Bauxite/Alumina	Bauxite: Majority government owned. Alumina: Primarily private ownership.	No commercial transactions. There are no sales of bauxite from one domestic company to another. Levy on bauxite production declines with percentage of bauxite processed in the country.	Market oriented. Levy indexed to price of aluminum ingot. Minimum export prices recommended by IBA are followed.
Mexico	Copper ore/Copper Manganese ore/Ferromanganese Iron ore/Steel Lead ore/Lead Zinc ore/Zinc	Mixed private and government owned.	Market oriented.	Market oriented.
Peru	Copper ore/Copper Lead ore/Lead Zinc ore/Zinc	Mixed private and government owned.	Market oriented.	Market oriented.
South Africa	Copper ore/Copper Chromite/Ferrochromium Manganese ore/Ferromanganesium Iron ore/Steel	Primarily private ownership.	Large stated owned consumer (ISCOR) influences prices through its ownership of iron ore mines and its dominance in other metal ore markets.	Market oriented; government can control prices to ensure reasonable market prices are achieved.

Table 25.—Metal ores: Pricing practices of major metal ore producing nations—Continued

Country	Principal metal ores produced/refined materials exported	Structure of industry	Domestic pricing mechanisms	Export pricing mechanisms
Suriname	Bauxite/Alumina	Primarily private ownership.	Market oriented; levy on bauxite production declines with percentage of bauxite processed in the country.	Market oriented; levy indexed to price of aluminum ingot.
Turkey	Chromite/Ferrochromium	Largely government owned.	Only domestic ferrochromium producer (the state owned Etibank) owns chromite mines. Private chromite producers export concentrates.	Market oriented.
Venezuela	Iron ore/Steel	Largely government owned.	Iron ore producer (Ferrominera) and primary consumer (SIDOR) are both state owned. Quantity and price terms are negotiated annually.	Market oriented.
West Germany	Zinc ore/Zinc	Primarily private ownership.	Market oriented.	Market oriented.
Zaire	Copper ore/Copper	Copper production is fully state owned.	Copper production is integrated from mine to refinery.	Market oriented.
Zambia	Copper ore/Copper	Government has majority interest in copper production.	Copper production is integrated from mine to refinery.	Exports of unrefined copper are negligible.
Zimbabwe	Chromite/Ferrochromium	Primarily private ownership.	Ferrochromium production is integrated from mine to refinery.	Exports of chromite are negligible.

Source: U.S. Bureau of Mines and Department of State telegrams from American Embassies in certain metal ore producing countries.

APPENDIX A

LETTER FROM REPRESENTATIVE GIBBONS

SAM M. GIBBONS, FLA., CHAIRMAN
SUBCOMMITTEE ON TRADE

DAN ROSTENKOWSKI, ILL.
JAMES R. JONES, OKLA.
ED JENKINS, GA.
THOMAS J. DOWNEY, N.Y.
DON J. PEASE, OHIO
KENT HANCE, TEX.
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MARTY RUSSO, ILL.

GUY VANDER JAGT, MICH.
BILL ARCHER, TEX.
BILL FRENZEL, MINN.
RICHARD T. SCHULZE, PA.
PHILIP M. CRANE, ILL.

EX OFFICIO
BARBER B. CONABLE, JR., N.Y.

COMMITTEE ON WAYS AND MEANS

U.S. HOUSE OF REPRESENTATIVES

WASHINGTON, D.C. 20515

SUBCOMMITTEE ON TRADE

DAN ROSTENKOWSKI, ILL., CHAIRMAN
COMMITTEE ON WAYS AND MEANS

JOHN J. SALMON, CHIEF COUNSEL
A. L. SINGLETON, MINORITY CHIEF OF STAFF

RUFUS YERXA, SUBCOMMITTEE STAFF DIRECTOR

November 20, 1984

The Honorable Paula Stern
Chairwoman
U.S. International Trade Commission
701 E Street, N.W.
Washington, D.C. 20436

Dear Madam Chairwoman:

The Subcommittee on Trade of the Committee on Ways and Means requests that the U.S. International Trade Commission conduct an investigation under section 332 of the Tariff Act of 1930 regarding the consequences of foreign governments' policies of pricing natural resource products, including metal ores and basic energy products such as petroleum, petroleum products (such as fuel oil) and natural gas, to domestic industrial users in the country concerned at prices substantially below the export selling price or other market value of the product. The investigation should focus on foreign government policies, implemented either through government ownership of resource production facilities or price controls, that manipulate production cost factors in industries whose production processes make heavy use of the preferentially priced resource products concerned, and the consequences as they relate to conditions of competition between such foreign industries and U.S. industries manufacturing merchandise of the same kind as that manufactured by those foreign industries.

In particular, we are interested in obtaining information with respect to the effects of the Mexican government's policy regarding the pricing of natural gas and petroleum products such as fuel oil on conditions of competition between Mexican and U.S. industries that are particularly heavy users of those products either as a raw material or as an energy source, including the ammonia, carbon black, cement, float glass, lime, and steel industries. National resources pricing policies of other governments, such as in the Middle East, and their effects on conditions of competition should also be examined.

Each of the following should be specifically addressed in the study:

The Honorable Paula Stern
November 20, 1984
Page Two

(1) A description of the foreign governments' pricing policies selected for examination. The description should include the manner in which and the entity or agency, if any, through which the government concerned implements the policy and whether or not the promotion of exports and the substitution of imports are among the stated or unstated objectives of the policy.

(2) An analysis of whether such pricing policies confer greater benefits on certain industries or groups of industries in the foreign countries concerned than on other industries or groups of industries in those countries, and if so, identification of the industries or groups of industries that disproportionately benefit.

(3) An estimate of the production cost savings realized by foreign producers in sample industries that are heavy users of the products concerned, by reason of the foreign government's concessionary domestic use pricing policy.

(4) An analysis of the competitive advantage, if any, with respect to United States producers of like merchandise, enjoyed by such foreign producers by virtue of the concessionar pricing policy.

(5) An analysis of the effect of such pricing policies on resource allocation within the foreign country concerned, including specifically whether the pricing policy provides an incentive for the allocation of resources to industries that are heavy users of the products concerned.

Please transmit your final report to the Subcommittee on Trade not later than six months after receipt of this request.

Sincerely,

Sam M. Gibbons
Chairman

SMG/MJWc

APPENDIX B

THE U.S. INTERNATIONAL TRADE COMMISSION NOTICE CONCERNING INVESTIGATION NO. 332-202

Commission thirty (30) days after the date of its service upon the parties, unless the Commission orders review of the initial determination. The initial determination in this matter was served upon the parties on December 20, 1984.

Copies of the initial determination, the consent order agreement, and all other nonconfidential documents filed in connection with this investigation are available for inspection during official business hours (8:45 a.m. to 5:15 p.m.) in the Office of the Secretary, U.S. International Trade Commission, 701 E Street NW., Washington, D.C. 20436, telephone 202-523-0161.

Written Comments: Interested parties may file written comments with the Commission concerning termination of the aforementioned respondent. The original and 14 copies of all such comments must be filed with the Secretary to the Commission, 701 E Street NW., Washington, D.C. 20436, no later than 10 days after publication of this notice in the Federal Register. Any person desiring to submit a document (or portion thereof) to the Commission in confidence must request confidential treatment. Such requests should be directed to the Secretary to the Commission and must include a full statement of the reasons why confidential treatment should be granted. The Commission will either accept the submission in confidence or return it.

FOR FURTHER INFORMATION CONTACT: Ruby J. Dionne, Office of the Secretary, U.S. International Trade Commission, telephone 202-523-0176.

By order of the Commission.

Issued: December 20, 1984.

Kenneth R. Mason,

Secretary.

[FR Doc. 84-33654 Filed 12-26-84; 8:45 am]

BILLING CODE 7020-02-M

[Investigation No. 337-TA-204]

Certain Pull-Type Golf Carts and Wheels Therefor; Commission Decision Not to Review Initial Determination Amending the Complaint and Notice of Investigation to Join a Party Respondent

AGENCY: International Trade Commission.

ACTION: Decision not to review an initial determination (ID) amending the complaint and notice of investigation to join a party respondent.

SUMMARY: The U.S. International Trade Commission hereby gives notice of its decision not to review an ID (Order No. 3) issued in this investigation by the administrative law judge (ALJ) on November 16, 1984. The ID granted complainants' motion to amend the complaint and notice of investigation to add Glotex International Co., Ltd., of Taipei, Taiwan, as a party respondent.

FOR FURTHER INFORMATION CONTACT: Carol McCue Verratti, Esq., Office of the General Counsel, U.S. International Trade Commission, 701 E Street, NW., Washington, D.C. 20436, telephone 202-523-0079.

SUPPLEMENTARY INFORMATION: The authority for the Commission's action in this matter is contained in 19 U.S.C. 1337 and in 19 CFR 210.53.

Copies of the ALJ's ID and all other nonconfidential documents filed in connection with this investigation are available for inspection during official business hours (8:45 a.m. to 5:15 p.m.) in the Office of the Secretary, U.S. International Trade Commission, 701 E Street, NW., Washington, D.C. 20436, telephone 202-523-0161.

By order of the Commission.

Issued: December 18, 1984.

Kenneth R. Mason,

Secretary.

[FR Doc. 84-33655 Filed 12-26-84; 8:45 am]

BILLING CODE 7020-02-M

[Investigation No. 337-TA-198]

Certain Portable Electronic Calculators; Commission Decision Not To Review an Initial Determination Amending Complaint and Notice of Investigation

AGENCY: International Trade Commission.

ACTION: Amendment of complaint and notice of investigation.

SUMMARY: The U.S. International Trade Commission has determined not to review an initial determination (ID) amending the complaint and notice of investigation in the above-captioned investigation. On October 15, 1984, complainant Texas Instruments Incorporated filed a motion (Motion No. 198-36) to amend the complaint and notice of investigation to allege infringement of claims 2, 7, 30, 37, 41, and 53 of U.S. Letters Patent 3,819,921. The motion was supplemented on November 9, 1984. The administrative law judge issued an ID granting the motion on November 16, 1984. No petitions for review of the ID were filed nor were any comments received from Government agencies.

FOR FURTHER INFORMATION CONTACT: Wayne Herrington, Esq., Office of the General Counsel, U.S. International Trade Commission, telephone 202-523-3395.

SUPPLEMENTARY INFORMATION: This action is taken under the authority of section 337 of the Tariff Act of 1930 (19 U.S.C. 1337) and Commission rule 210.22 (to be codified at 19 CFR 210.22).

Copies of the ID and all other nonconfidential documents filed in connection with this investigation are available for inspection during oficial business hours (8:45 a.m. to 5:15 p.m.) in the Office of the Secretary, U.S. International trade Commission, 701 E Street NW., Washington, D.C. 20436, telephone 202-523-0161.

By order of the Commission.

Issued: December 19, 1984.

Kenneth R. Mason,

Secretary.

[FR Doc. 84-33653 Filed 12-26-84; 8:45 am]

BILLING CODE 7020-02-M

[332-202]

Potential Effects of Foreign Governments' Policies on Pricing Natural Resources

AGENCY: International Trade Commission.

ACTION: Institution of an investigation under section 332(b) of the Tariff Act of 1930 (19 U.S.C. 1332(b)).

SUMMARY: Following receipt of a request from the Subcommittee on Trade of the House Committee on Ways and Means, the Commission has instituted on its own motion investigation No. 332-202 under section 332(b) of the Tariff Act of 1930 (19 U.S.C. 1332(b)), for the purpose of gathering and presenting information on the potential effects of foreign governments' polices of pricing natural resource products to domestic industrial users in the country concerned at prices substantially below the export selling price or other market value of the product.

EFFECTIVE DATE: December 14, 1984.

FOR FURTHER INFORMATION CONTACT: Mr. John J. Gersic, Chief, Energy and Chemicals Division, U.S. International Trade Commission, Washington, D.C. 20436 (telephone 202-523-0451). For information on legal aspects of the investigation contact Mr. William Gearhart of the Commission's Office of the General Counsel at 202-523-0487.

SUPPLEMENTARY INFORMATION: During the investigation the Commission has been specifically requested to:

(A) Describe certain foreign governments' pricing policies.

(B) Analyze the effects of such pricing policies on certain industries or groups of industries.

(C) Estimate the foreign production cost savings conferred by such pricing policies

(D) Analyze the competitive advantage of such production cost savings vis-a-vis United States producers.

(E) Analyze the effect of such foreign resource pricing policies on the resource allocation within the foreign country.

Natural resources to be included in the study are petroleum, natural gas, and metal ores.

Authority: This investigation is being instituted under authority of section 332(b) of the Tariff Act of 1930 (19 U.S.C. 1332(b)).

Written Submissions: In lieu of a public hearing, interested parties are invited to submit written statements concerning the investigation. Commercial or financial information which a submitter desires the Commission to treat as confidential must be submitted on separate sheets of paper, each clearly marked "Confidential Business Information" at the top. All submissions requesting confidential treatment must conform with the requirements of section 201.6 of the Commission's *Rules of Practice and Procedure* (19 CFR 201.6 as amended by 49 FR 32571 of August 15, 1984). All written submissions, except for confidential business information, will be made available for inspection by interested persons. To be assured of consideration by the Commission, written statement should be received by the Commission at the earliest practical date, but not later than February 19, 1985. All submissions should be addressed to the Secretary at the Commission's Office in Washington, DC.

By Order of the Commission

Kenneth R. Mason,

Secretary

Issued December 19, 1984.

[FR Doc. 84-33657 Filed 12-26-84; 8:45 am]

BILLING CODE 7020-02-M

[332-203]

Investigation and Hearing; Possible Effects of and Recommendations Concerning the Proposed Tariff Reclassification of Catalytic Naphtha and Other Motor Fuel Blending Stocks

AGENCY: International Trade Commission.

ACTION: Institution of an investigation under section 332(g) of the Tariff Act of 1930 (19 U.S.C. 1332(g)) and scheduling of a public hearing.

SUMMARY: At the request of the House Committee on Ways and Means and the Senate Committee on Finance, the Commission has instituted investigation No. 332-203 under 332(g) of the Tariff Act of 1930 (19 U.S.C. 1332(g)), for the purpose of gathering and presenting information on the tariff classification and treatment of those products potentially affected by a reclassification of catalytic naphtha and other motor fuel blending stocks. The Commission was also requested to hold a public hearing in connection with the investigation and to report to the Committees by April 15, 1985.

EFFECTIVE DATE: December 18, 1984.

FOR FURTHER INFORMATION CONTACT: Mr. Edmund Cappuccilli or Ms. Cynthia B. Foreso, Energy and Chemicals Division, U.S. International Trade Commission, Washington, DC 20436, telephone 202-523-0490/202-523-1230.

SUPPLEMENTARY INFORMATION: The Committees specifically requested that the Commission study address (1) the current tariff treatment of naphthas, motor fuel, and motor fuel blending stocks; (2) the desirability of modifying the current tariff classification treatment consistent with sound principles of product nomenclature; and (3) the effects that such changes would be likely to have on U.S. industries and competitive conditions between U.S. and foreign firms in the affected segments of the petrochemical and petroleum industries.

Public Hearing: A public hearing in connection with the investigation will be held in Washington, DC at 10:00 a.m. on March 7, 1985, at the U.S. International Trade Commission Building, 701 E Street, NW., Washington, DC 20436. All persons shall have the right to appear by counsel or in person, to present information, and to be heard. Requests to appear at the public hearing should be filed with the Secretary, United States International Trade Commission, 701 E Street, NW., Washington, DC 20436, not later than February 21, 1985.

Written Submission: In lieu of or in addition to appearance at the public hearing, interested persons are invited to submit written statements concerning the investigation. Commercial or financial information which a party desires the Commission to treat as confidential must be submitted on separate sheets of paper, each clearly marked "Confidential Business Information" at the top. All submissions requesting confidential treatment must conform with the requirements of section 201.6 of the Commission's *Rules of Practice and Procedure* (19 CFR 201.6 as amended in 49 F.R. 32571 of August 15, 1984.). All written submissions, except for confidential business information, will be made available for inspection by interested parties. To be ensured of consideration by the Commission, written statements should be received by the close of business on March 11, 1985. All submissions should be addressed to the Secretary at the Commission's office in Washington, DC.

By order of the Commission.

Issued by: December 21, 1984.

Kenneth R. Mason,

Secretary.

[FR Doc. 84-33648 Filed 12-26-84; 8:45 am]

BILLING CODE 7020-02-M

INTERSTATE COMMERCE COMMISSION

[Finance Docket No. 30575]

Rail Carriers; Willamette Valley Railroad Co. and Willamina & Grand Ronde Railroad Co.; Acquisition and Operation Exemption

AGENCY: Interstate Commerce Commission.

ACTION: Notice of exemption.

SUMMARY: The Interstate Commerce Commission exempts from the requirements of (a) 49 U.S.C. 10901 the acquisition and operation by Willamette Valley Railroad Company of a 1.8-mile line of railroad extending from milepost 0.0 at or near Independence, to milepost 1.8, in Polk County, OR, owned by the Valley & Siletz Railroad Company; (b) 49 U.S.C. 11301 the issuance by Willamette Valley Railroad Company of 500 shares of $40 par value common stock to Willamina & Grand Ronde Railroad Company and (c) 49 U.S.C. 11343 control of Willamette Valley Railroad Company by the Willamina & Grand Ronde Railroad Company, subject to standard employee protective conditions.

DATES: This exemption will be effective on December 27, 1984. Petitions to reopen must be filed by January 18, 198

ADDRESSES: Send pleadings referring to Finance Docket No. 30575 to:

(1) Office of the Secretary, Case Contro Branch, Interstate Commerce Commission, Washington, DC. 20423

(2) Petitioners' representative: Fritz R. Kahn, Suite 1000, 1660 L Street, NW., Washington, DC 20036

FOR FURTHER INFORMATION CONTACT: Louis E. Gitomer (202) 275-7245.

SUPPLEMENTARY INFORMATION: Additional information is contained in

APPENDIX C

CRUDE PETROLEUM AND PETROLEUM PRODUCTS WORLD MARKET AND U.S. INDUSTRY PROFILE

Crude Petroleum

World Market

Production and reserves

Crude petroleum is the natural resource base used to satisfy a large share of the energy and petrochemical feedstock needs in most of the world's nations. In 1983, crude petroleum was used to meet 40 percent of the world's energy needs and 42 percent of U.S. energy requirements. If natural gas is included with crude petroleum, a reasonable inclusion since a large portion of the natural gas produced is associated with crude petroleum production, the above figures became 59 and 67 respectively. Other energy sources, including coal, are not as universally used although individual nations or regions may be overly dependent on one of these other energy sources. For example, Canada, and in particular the Canadian aluminum industry, is highly dependent upon hydropower.

While reserves of crude petroleum are found in many nations, a large share of the world's crude petroleum production is consumed in other than the nations in which it is produced. Thus, there is a large volume of trade in crude petroleum. Imports into many developed nations, and exports from most producing nations, are large items in each of these types of nation's trade balances. For the United States, for example, in 1984, crude petroleum imports accounted for 33 percent of the total U.S. trade deficit.

Reserves. 1/--World estimated proved reserves of crude petroleum increased from 649 billion barrels as of January 1, 1981 to 699 billion barrels as of January 1, 1985 (table C-1). The OPEC member nations accounted for a total of 68 percent of the world's reserves, as of January 1, 1985; the

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1/ As previously mentioned, there are certain world areas that are known to be advantaged in terms of crude petroleum and natural gas availability. We must first define the term "availability" and explain how we will use the concept in relation to crude petroleum and natural gas. The first distinction to be made is between "reserves" and "resources." According to the U.S. Department of Energy, the "total resource" of crude petroleum and natural gas, that is, the amount that existed before any production, consists of the total volume formed and trapped in place within the Earth. A portion of this total resource is recoverable by current or foreseeable technology, for two principal reasons. First, much of this portion is dispersed at very low concentrations throughout the Earth's crust and cannot be extracted without mining the rock or applying some other approach that could consume more energy than it covered. Second, an additional portion of the total resource volume cannot be recovered because available production technology cannot extract all of the inplace crude petroleum and natural gas. This technical inability to recover 100 percent of the inplace hydrocarbons in a producible deposit may result from the economics involved, intractable physical forces, or a combination of both. The concept of "recoverable resources" normally excludes these unrecoverable fractions.

The "total recoverable resource" includes both discovered and undiscovered recoverable resources. "Discovered recoverable resources" consist of two major parts: cumulative production and reserves. "Cumulative production is the sum of the current year's production and the production that occurred in all prior years. "Reserves" are volumes estimated to exist in known deposits, and believed to be recoverable in the future through the application of present or anticipated technology. "Proved reserves," the major concern of this report, are those reserves of crude petroleum and natural gas that geological and engineering data demonstrate with reasonable certainty to be recoverable in the future under existing economic and operating conditions.

"Undiscovered recoverable resources" are those quantities of crude petroleum and natural gas which are as yet undiscovered but which are thought to exist in favorable geologic settings.

"Indicated additional reserves" . . . are those quantities of crude petroleum, in addition to proved reserves, which in the future may become technically and economically recoverable from known productive reservoirs through the application of currently available but uninstalled recovery technology. Indicated additional reserves are not included in proved reserves.

. . . the estimate of proved reserves for any given [petroleum] fuel is dynamic over time and is influenced directly by the amount, kind, and quality of data that becomes available concerning that field.

Table C-1.--Crude petroleum: Estimated proved reserves, by leading nations, 1/ as of January 1, 1981-85

(In millions of barrels)

Nation	Reserves as of January 1--				
	1981	1982	1983	1984	1985
Saudi Arabia 2/	165,000	164,600	162,400	166,000	169,000
Kuwait 2/	64,900	64,480	64,230	63,900	90,000
U.S.S.R	63,000	63,000	63,000	63,000	63,000
Mexico	44,000	56,990	48,300	48,000	48,600
Iran 2/	57,500	57,000	55,308	51,000	48,500
Iraq 2/	30,000	29,700	41,000	43,000	44,500
Abu Dhabi 2/	29,000	30,600	30,510	30,400	30,500
United States	26,400	29,785	29,785	27,300	27,300
Venezuela 2/	17,950	20,300	21,500	28,850	25,845
Libya 2/	23,300	22,600	21,500	21,270	21,100
China	20,500	19,895	19,485	19,100	19,100
Nigeria 2/	16,700	16,500	16,750	16,550	16,650
United Kingdom	14,800	14,800	13,900	13,150	13,590
Algeria 2/	8,200	8,080	9,440	9,220	9,000
Indonesia 2/	9,500	9,800	9,550	9,100	8,650
Norway	5,500	7,620	6,800	7,660	8,300
Canada	6,400	7,300	7,020	6,730	7,075
Divided (neutral) Zone 2/	6,060	6,500	5,840	5,695	5,420
Oman 2/	2,340	2,570	2,730	2,790	3,350
Qatar 2/	3,585	3,434	3,425	3,330	3,350
All others	34,190	35,155	37,717	37,258	35,687
Total	648,525	670,709	670,190	669,303	698,667

1/ These nations had the largest proved reserves of crude petroleum in the world as of Jan. 1, 1985.
2/ OPEC member

Source: "Worldwide Report," Oil & Gas Journal, annual issues.

U.S.S.R., 9 percent; Mexico, 7 percent; the United States, 4 percent; and Canada, 1 percent. Saudi Arabia by itself accounted for 24 percent of the total world's reserves and 36 percent of OPEC's total reserves as of January 1, 1985.

The largest increases in estimated proved reserves of crude petroleum during the period January 1, 1981, to January 1, 1985, were registered by Venezuela and Kuwait, both OPEC-member nations (table C-1). Venezuela's estimated proved reserves increased from 18 billion barrels as of January 1, 1981 to 26 billion barrels as of January 1, 1985, or by 43 percent. Estimated proved reserves in Kuwait increased by 38 percent, from 65 billion barrels as of January 1, 1981, to 90 billion barrels as of January 1, 1985.

Production.--World production of crude petroleum decreased from 60 million barrels per day in 1980 to 53.2 million barrels per day in 1982, primarily because of the worldwide economic recession and price-induced conservation by consuming nations (table C-2). World crude petroleum production increased to 54 million barrels per day in 1984 as improved economic conditions in many nations helped to increase demand (table C-2).

Output from the OPEC-member nations reached a new low of 17.4 million barrels per day in 1984, compared with 31.3 million barrels per day in the peak year of 1977. Increased prices, which increased conservation and energy source switching, coupled with increased output by non-OPEC producing nations such as Mexico and the United Kingdom, were factors behind OPEC's decreased production.

Table C-2.--Crude petroleum: World production by leading nations, 1/ 1980-84

(In thousands of barrels per day)

Nation	1980	1981	1982	1983	1984
U.S.S.R	12,050	12,080	12,252	12,388	12,230
United States	8,650	8,588	8,652	8,669	8,750
Saudi Arabia 2/	9,620	9,642	6,012	4,872	4,545
Mexico	1,960	2,390	2,748	2,702	2,743
United Kingdom	1,600	1,790	2,043	2,260	2,452
China	2,170	2,005	2,027	2,107	2,250
Iran 2/	1,280	1,375	1,814	2,606	2,166
Venezuela 2/	2,150	2,093	1,886	1,791	1,724
Canada	1,470	1,287	1,221	1,396	1,430
Nigeria 2/	2,100	1,369	1,286	1,232	1,414
Indonesia 2/	1,570	1,607	1,337	1,292	1,332
Iraq 2/	2,600	892	914	905	1,218
Libya 2/	1,780	1,063	1,175	1,020	1,090
Kuwait 2/	1,400	916	577	912	925
Egypt	585	578	667	690	790
Abu Dhabi 2/	1,380	1,145	848	757	750
Norway	530	508	466	600	688
Algeria 2/	1,000	750	766	687	608
Australia	380	382	368	405	481
Argentina	490	497	484	481	467
All others	4,909	4,929	5,663	5,487	6,037
Total	59,674	55,886	53,206	53,259	54,090

1/ These nations were the largest producers of crude petroleum in 1984.
2/ OPEC member

Source: "Worldwide Report," Oil & Gas Journal, annual issues.

Exports

The value of world exports of crude petroleum increased from $160 billion in 1979 to $211 billion in 1980 but decreased to $128 billion in 1982 as a result of decreased demand in consuming nations (table C-3). 1/ The OPEC nations continued to be the major suppliers of crude petroleum to the world market during the period. Saudi Arabia remained the world's largest single supplier of crude petroleum during 1979-82. Saudi Arabia's share of total world exports of crude petroleum increased from 38 percent in 1979 to 57 percent in 1982 (table C-3). The value of exports of crude petroleum from Indonesia, the second largest world exporter, increased during 1979-82 from $8 billion to $15 billion but decreased to $12.6 billion in 1983. Venezuela's crude petroleum exports increased from $8.4 billion in 1979 to $13.8 billion in 1981.

Table C-3.--Crude petroleum: World exports by selected nations, 1/ 1979-83

(In millions of U.S. dollars)

Nation	1979	1980	1981	1982	1983
Algeria 2/	8,475	12,871	3/	5,862	5,393
Brunei	1,799	2,794	2,260	2,136	3/
Canada	2,053	2,479	2,093	2,211	2,805
Ecuador	1,036	3/	3/	1,472	3/
Egypt	566	1,762	1,758	3/	3/
Gabon 2/	1,445	3/	3/	1,275	3/
Indonesia 2/	8,124	11,671	13,182	14,821	12,600
Kuwait 2/	13,645	14,120	10,431	3/	3/
Malaysia	1,927	3,083	2,997	3,294	3/
Norway	2,830	5,707	5,359	4,958	5,617
Oman 2/	2,159	3,603	4,419	4/	4/
Qatar 2/	3,311	3/	3/	3/	3/
Saudi Arabia 2/	59,572	103,148	113,703	73,386	3/
Singapore	16	8	13	70	97
Trinidad and Tobago	985	1,635	1,612	1,116	1,100
United Kingdom	5,779	9,815	14,307	14,917	15,299
United States	394	751	577	469	244
Venezuela 2/	8,359	12,239	13,795	3/	3/
Total 5/	160,159	211,204	203,590	127,586	43,771

1/ These nations were the largest exporters of crude petroleum in 1982 (1983 data for many nations were not available).
2/ OPEC member.
3/ Not available.
4/ Less than $1 million.
5/ Totals do not reflect world exports because data for many countries were not available.

Source: Official statistics of the United Nations.

1/ Data for 1983 are not available for all nations.

The largest increases in non-OPEC crude petroleum exports were made by the North Sea countries of Norway and the United Kingdom (table C-3). Norway's exports doubled during the period, increasing from $2.8 billion in 1979 to $5.6 billion in 1983. The value of the United Kingdom's exports of crude petroleum increased from $5.8 billion in 1979 to $15.3 billion in 1983, or by 165 percent.

Consumption

International consumption of crude petroleum is best discussed in terms of the production and consumption of petroleum products such as fuel oil and gasoline that are made by refining crude petroleum. Worldwide production and consumption of petroleum products is discussed in another section of this report.

The world level of crude petroleum prices now approaches the OPEC level. While there is an oversupply of crude petroleum on the world market, OPEC is still essentially the marginal producer, therefore, its price is generally the highest possible. This does not mean that all OPEC nations sell at the same price or that all other producers sell at the same price. The surplus situtation has, however, weakened cartel pricing, and the market place now exerts a greater influence over the world price. Currently, crude petroleum is moving in international markets at 25 to 60 cents per barrel below the Saudi Arabia benchmark price of $29 per barrel. Prices could decrease to as low as $25 per barrel by the end of 1985. 1/

Up until 1981, OPEC virtually monolithically set world crude petroleum prices. At that time, the two crude petroleum price shocks of 1973-74 and 1979-80 effectively brought additional players into the crude petroleum supply scenario, and at the same time worked to reduce demand. The resulting long supply situation led to an undermining of the effectiveness of the ability of OPEC to set world prices. The following tabulation gives average OPEC crude petroleum sales prices (in dollars per barrel): 2/

1/ "Outlook Fuzzy for World Oil Prices During 1985," Oil & Gas Journal, Dec. 31, 1984, pp. 41-42.
2/ Central Intelligence Agency, Economic and Energy Indicators, Mar. 1, 1985, p. 11.

Year	Average OPEC sales price
1973------------------	$3.39
1974------------------	11.29
1975------------------	11.02
1976------------------	11.77
1977------------------	12.88
1978------------------	12.93
1979------------------	18.67
1980------------------	30.87
1981------------------	34.50
1982------------------	33.63
1983------------------	29.31
1984------------------	28.70

U.S. Industry Profile

Structure

There are approximately 19,000 companies involved in the production of crude petroleum in the United States. Many of these companies are small companies that individually and collectively account for relatively small shares of total U.S. crude petroleum production. Industry sources indicate that about 60 percent of total production is accounted for by the 50 largest companies; the remaining 40 percent of production is spread among many thousands of companies.

The number of producing crude petroleum wells reached a record high of 597,000 in 1983; however, the average productivity declined to 14.5 barrels per day per well. The following tabulation shows the number of wells and average productivity: 1/

Year	Producing wells	Average productivity (barrels per day per well)
1979---------------	531,000	16.3
1980---------------	548,000	15.9
1981---------------	557,000	15.4
1982---------------	580,000	14.9
1983---------------	597,000	14.5

Many producers of crude petroleum in the United States are large, multinational companies (MNC's) that are involved both in foreign production and importing into the United States. Most of these MNC's are also involved in refining and the production of petrochemicals. In times of crude petroleum surplus such as existed in 1982, the large, integrated producers may enter the merchant market in order to sell their crude petroleum surplus. There are also a number of smaller firms that may or may not refine but that sell crude petroleum to other refiners.

1/ U.S. Department of Energy, Annual Energy Review 1983, April 1984, p. 81.

About 2 to 3 percent of all the crude petroleum sold in the United States by the major crude petroleum producers is on the basis of a buy-sell exchange. Crude petroleum is often exchanged either for crude petroleum or for refined products at a different location and/or at a different time.

Investment and labor

In 1982, domestic capital and exploration outlays reached a high of $83.4 billion for petroleum companies, or more than 37 percent above the nearly $60.7 billion in outlays in 1979. 1/ An industry source estimates that comparable expenditures for 1983 were nearly $79.2 billion. U.S. corporate spending for crude petroleum and natural gas exploration, exclusive of capital outlays, reportedly declined to $24 billion in 1983 from $31.7 billion in 1981, or by 25 percent. 2/

Total employment in Standard Industrial Classification (SIC) 1311 increased from 167,100 workers in 1979 to 226,500 workers in 1982. 3/ Average hourly earnings reached $12.73 in 1982 as compared with $8.69 according to the 1977 Census of Manufacturers. 4/

Financial

Industry sources attribute the general decline in industry spending to the decline in demand for crude petroleum, reflecting a decrease in demand for petroleum products such as gasoline because of higher product prices and conservation. This decline in demand for crude petroleum which has resulted in a financial weakening of many small crude petroleum companies, has led to a softening in crude petroleum prices. In addition to reducing capital and exploration budgets, many petroleum companies began implementing major cost-cutting programs, such as major staff reductions and the elimination of alternate energy programs.

The rate of return for all U.S. petroleum companies decreased from 18.2 percent in 1979 to 10.9 percent in 1983. This is a faster rate of decrease than experienced by the entire manufacturing sector, whose rate of return declined from 16.5 percent in 1979 to 10.5 percent in 1983. 5/

1/ Standard & Poor's, "Oil: Basic Analysis," Industry Survey, Nov. 4, 1982, sec. 2; and Standard and Poor's, "Oil: Current Analysis," Industry Survey, July 22, 1982.

2/ Ibid.

3/ U.S. Department of Commerce, Bureau of Industrial Economics, U.S. Industrial Outlook 1984, January 1984, p. 9-7.

4/ Ibid.

5/ Independent Petroleum Association of America, United States Petroleum Statistics, 1985, March 1985, table 15.

Government

The U.S. Government, pursuant to the Emergency Petroleum Allocation Act of 1973, as amended, had imposed price controls on domestically produced crude petroleum which continued until January 28, 1981. 1/ Controls became discretionary with the President on June 30, 1979, and statutory authority for controls was to expire on September 30, 1981. 2/ However, these price controls were removed effective January 28, 1981, by Executive Order 12287.

U.S. Government export and import controls are discussed later in this section. The U.S. Government purchases crude petroluem for the Strategic Petroleum Reserve (SPR); however, it does not have a national petroleum company and is not involved directly in any industry operations.

U.S. Market

Production

U.S. production of crude petroleum has remained relatively constant, increasing slightly from 3.1 billion barrels in 1980 and 1981 to 3.2 billion barrels in 1982, 1983, and 1984 (table C-4). During 1980-84, the unit value of a barrel of crude petroleum has fluctuated from a low of $21.59 per barrel in 1980 to a high of $31.77 per barrel in 1981. The price per barrel declined to $26.01 in 1984, reflecting general world oversupply and soft prices (table C-4).

The level of U.S. production of crude petroleum depends on changes in the inventory levels, the level of imports, and the demand for petroleum products. The market has recently been faced with a situation of oversupply and declining world prices for crude petroleum, thus the level of domestic production has remained stable. Some refiners have been depleting inventory in anticipation of even lower future crude petroleum prices.

1/ A two-tiered pricing system was applied to domestically produced crude petroleum from 1974 until Jan. 28, 1981, in response to rapid price increases in the world crude petroleum market. This was done to reduce the impact of increased petroleum prices on the U.S. economy. The Federal Energy Administration developed the two-tiered system. This system linked maximum allowable price to production at a particular field in order to encourage maximum production of existing reserves, exploration and development of new reserves, and continuation of stripper well leases production (wells producing less than 10 barrels per day). The phased Federal decontrol of the price of crude petroleum began in April 1979.

2/ "Phased Decontrol of Crude Oil Prices Examined," Oil & Gas Journal, Apr. 5, 1982, p. 185.

3/ U.S. International Trade Commission, Factors Affecting World Petroleum Prices to 1985, USITC Publication 832, September 1977.

Table C-4.--Crude petroleum: U.S. production, exports, imports, and apparent consumption, 1980-84

(Quantity in thousands of barrels; value in thousands of dollars; unit value in dollars per barrel)

Year	Production	Exports	Imports	Apparent consumption	Ratio (percent) of imports to apparent consumption
			Quantity		
1980	3,137,905	30,567	1,974,774	5,082,112	39
1981	3,128,780	16,447	1,750,964	4,863,297	36
1982	3,156,885	13,083	1,416,884	4,560,686	31
1983	3,171,120	6,781	1,283,218	4,447,557	29
1984	3,186,450	5,784	1,316,969	4,497,635	29
			Value		
1980	67,747,369	750,541	61,899,003	128,895,831	48
1981	99,401,340	576,795	61,457,915	160,282,460	38
1982	90,034,360	468,870	45,723,820	135,289,310	34
1983	83,051,633	224,089	36,491,953	119,319,497	31
1984	82,879,565	185,294	36,444,573	119,138,844	31
			Unit value		
1980	$21.59	$24.55	$31.34	-	-
1981	31.77	35.07	35.10	-	-
1982	28.52	35.84	32.27	-	-
1983	26.19	33.05	28.44	-	-
1984	26.01	32.04	27.67	-	-

Sources: Official statistics of the U.S. Department of Energy and the U.S. Department of Commerce.

The cost of producing a barrel of crude petroleum varies widely. It is higher for those wells that cost the most to drill. These wells usually include those in so-called hostile environments, such as the Artic and offshore; it is also higher for the slower producing well. Crude petroleum production rates can vary widely from well to well. For example the average crude petroleum produced per well per day in the United States in 1983 was 14.4 barrels. On the other hand, the average stripper well produced about 2.9 barrels per day. While this difference is significant, the production cost advantages some producing nations enjoy may become more obvious when it is noted that the average well in Saudi Arabia in 1983 produced 8,300 barrels per day. 1/ Average 1984 U.S. production costs per barrel are estimated to fall in the $10 to $15 range. 2/

1/ "Worldwide Report," Oil & Gas Journal, Dec. 26, 1983, p. 81.
2/ "Tax, Market Questions Cut 1985 U.S. Oil Industry Spending Plans," Oil & Gas Journal, Feb. 28, 1985, p. 46, and Independent Petroleum Refiners Association, United States Petroleum Statistics 1985, table 12.

Exports

U.S. exports of crude petroleum are prohibited except as approved by the Government. Canada has been the only market for U.S. exports of crude petroleum, and most of these exports are composed of sweet, light crude petroleum (table C-5). These exports are part of a commercial exchange agreement between U.S. and Canadian refiners, and approved by the Secretary of the Department of Energy.

The export of crude petroleum may also be restricted by the President under section 103 of the "Energy Policy and Conservation Act," Public Law 94-163, dated December 22, 1975. In matters of export control of crude petroleum, the President acts through the Secretary of Commerce, who imposes such restrictions as necessary to be consistent with the national interest and the purposes of this act. The Secretary enforces this provision of the act through the requirement of validated export licenses. The rules governing these exports are set forth in section 377.6, "Petroleum and Petroleum Products," U.S. Department of Commerce, Export Administration Regulations, December 7, 1981.

According to the U.S. Department of Commerce, exports of crude petroleum may also be controlled by three other acts: the "Export Administration Act of 1979," Public Law 96-72, dated September 29, 1979; the "Naval Petroleum Reserves Production Act of 1976," Public Law 94-258, dated April 5, 1976; and, the "Trans-Alaska Pipeline Authorization Act," Public Law 93-153, dated November 16, 1973.

Alaskan North Slope crude petroleum may now be exported to an adjacent foreign country, Canada, to be refined and consumed therein in exchange for the same quantity of crude petroleum being exported from that country to the United States, provided: 1/ (1) that the exchange will result in lower prices for consumers of petroleum products in the United States; (2) within 3 months of the exchange, the transaction results in lower acquisition costs to the refiner than the refiner would have to pay for domestically produced crude petroleum in the absence of such an exchange; and (3) at least 75 percent of such savings in cost must be reflected in wholesale and retail prices of products refined from such imported crude petroleum.

U.S. exports of crude petroleum decreased from 30.6 million barrels in 1980 to 5.8 million barrels in 1984 (table C-5). The value of these exports decreased from $750 million in 1980 to $185 million in 1984.

1/ U.S. Department of Commerce, Export Administration Regulations, Dec. 7, 1981, p. EAB218.

Table C-5.--Crude petroleum: U.S. exports of domestic merchandise, by principal markets, 1980-84

Market	1980	1981	1982	1983	1984
	Quantity (1,000 barrels)				
Canada	30,567	16,440	13,083	6,781	5,784
Trinid	0	0	0	0	1/
Jamaica	0	0	0	0	1/
Sudan	0	0	0	0	0
Venez	0	0	0	0	1/
Colomb	0	0	0	1/	0
Lw WW I	0	0	1/	0	0
Hg Kong	0	7	0	0	0
Total	30,567	16,447	13,083	6,781	5,784
	Value (1,000 dollars)				
Canada	750,541	576,623	468,867	224,086	185,286
Trinid	-	-	-	-	6
Jamaica	-	-	-	-	2
Sudan	-	-	-	-	1
Venez	-	-	-	-	1
Colomb	-	-	-	3	-
Lw WW I	-	-	3	-	-
Hg Kong	-	172	-	-	-
Total	750,541	576,795	468,870	224,089	185,294
	Unit value (per barrel)				
Canada	$24.55	$35.07	$35.84	$33.05	$32.03
Trinid	-	-	-	-	235.17
Jamaica	-	-	-	-	128.75
Sudan	-	-	-	-	-
Venez	-	-	-	-	31.84
Colomb	-	-	-	101.88	-
Lw WW I	-	-	34.08	-	-
Hg Kong	-	24.60	-	-	-
Average	24.55	35.07	35.84	33.05	32.04

1/ Less than 500.

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

Imports

The United States became a net importer of crude petroleum following World War II. As the volume of total U.S. imports of crude petroleum increased, the share of total imports accounted for by the OPEC nations also increased, thus spurring concern over U.S. dependence on foreign petroleum. Because of concern for national security, the United States has employed various methods to control imports of crude petroleum amd petroleum products and thus reduce dependence on foreign supplies.

During 1955-59, control programs were essentially voluntary with few mechanisms to police compliance; however, during 1959-73 imports of both crude petroleum and petroleum products were regulated by a mandatory program that was based on officially fixed quotas. The Mandatory Oil Import Proclamation (MOIP) was established by Presidential Proclamation No. 3279 on March 19, 1959, and provided quotas for virtually all U.S. imports of crude petroleum and petroleum products. The action was taken under the national security provisions of the Trade Agreements Extension Act of 1958. 1/ The program was originally designed to limit imports and thus insulate the price of U.S.-produced crude petroleum from the much lower world prices. 2/ It also established a fixed ceiling on imports so that domestic production was needed to supply domestic demand.

Although numerous modifications were made to the original restrictions of Proclamation No. 3279 between 1959 and 1977, one proclamation in particular issued during this period may have had an important bearing on the level of trade of crude petroleum and petroleum products during 1978-82. That was proclamation No. 4210, which was issued and became effective April 18, 1973. This proclamation suspended tariffs on imports of crude petroleum and petroleum products, provided for a gradual transition from the then existing quota method, and shifted to a system whereby fees for licenses covering such imports were charged and whereby it was possible to adjust such fees from time to time in order to discourage the importation of crude petroleum and petroleum products into the United States. These fees were to be raised when the quantity of imports increased to such a level as, for example, to threaten to impair the national security. These fees could also be reduced in times of shortages. The fee schedule provided for in this proclamation, with certain exceptions, permitted a maximum fee of 21 cents per barrel.

Because of the continued shortages in international petroleum and resultant escalating world prices, Proclamation No. 4655, issued April 1979, and effective April 7, 1979, suspended the import fees; however, licenses were still required.

U.S. imports of crude petroleum decreased from 2 billion barrels, valued at $62 billion in 1980 to 1.3 billion barrels, valued at $36 billion in 1984 (table C-6). During this period, Mexico replaced Saudi Arabia as the principal supplier of U.S. imports of crude petroleum.

1/ Authority for such action was later provided for under sec. 232 of the Trade Expansion Act of 1962.

2/ U.S. Tariff Commission, World Oil Developments and U.S. Oil Import Policies , October 1973, p. 42.

Table C-6.--Crude petroleum: U.S. imports for consumption, by principal sources, 1980-84

Source	1980	1981	1982	1983	1984
	Quantity (1,000 barrels)				
Mexico	194,172	177,510	264,988	285,436	252,454
U King	56,779	134,267	158,379	129,997	139,123
Canada	75,691	57,188	78,301	101,000	131,242
S Arab	452,952	433,593	207,363	116,215	127,292
Indnsia	120,916	124,751	87,722	121,250	117,137
Nigeria	311,660	238,459	197,357	119,378	79,708
Venez	70,985	70,254	58,784	64,352	90,389
Norway	61,629	48,384	43,332	27,765	40,521
Trinid	43,668	40,616	32,593	29,807	33,788
Ecuador	7,986	14,381	16,384	30,212	33,972
All other	578,336	411,562	271,680	257,804	271,343
Total	1,974,774	1,750,964	1,416,884	1,283,218	1,316,969
	Value (1,000 dollars)				
Mexico	5,923,589	5,892,686	7,563,362	7,520,719	6,700,258
U King	1,922,490	4,932,989	5,248,682	3,931,362	4,023,187
Canada	2,196,424	1,928,184	2,225,008	2,664,691	3,498,874
S Arab	12,230,681	14,008,695	6,974,455	3,416,521	3,480,343
Indnsia	3,698,760	4,394,859	3,093,181	3,723,188	3,431,164
Nigeria	10,625,818	9,061,264	6,958,292	3,627,228	2,352,218
Venez	1,694,865	1,997,979	1,412,707	1,433,332	2,185,189
Norway	2,075,342	1,782,786	1,467,693	830,401	1,186,945
Trinid	1,495,585	1,547,899	1,144,667	955,502	1,026,264
Ecuador	276,435	487,457	520,662	845,407	947,203
All other	19,759,015	15,423,116	9,115,111	7,543,602	7,612,928
Total	61,899,003	61,457,915	45,723,820	36,491,953	36,444,573
	Unit value (per barrel)				
Mexico	$30.51	$33.20	$28.54	$26.35	$26.54
U King	33.86	36.74	33.14	30.24	28.92
Canada	29.02	33.72	28.42	26.38	26.66
S Arab	27.00	32.31	33.63	29.40	27.34
Indnsia	30.59	35.23	35.26	30.71	29.29
Nigeria	34.09	38.00	35.26	30.38	29.51
Venez	23.88	28.44	24.03	22.27	24.18
Norway	33.67	36.85	33.87	29.91	29.29
Trinid	34.25	38.11	35.12	32.06	30.37
Ecuador	34.62	33.90	31.78	27.98	27.88
All other	34.17	37.47	33.55	29.26	28.06
Average	31.34	35.10	32.27	28.44	27.67

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

Consumption

U.S. apparent consumption of crude petroleum decreased from 5 billion barrels in 1980 to 4.5 billion barrels in 1984, primarily as the result of decreased domestic demand for refined petroleum products during 1980-84 (table C-4). Although the quantity declined, the value of apparent consumption of crude petroleum increased from $129 billion in 1980 to $160 billion in 1981, because of increasing prices. However, as prices began to fall in late 1982, the value of apparent consumption declined to $119 billion in 1984.

Imports accounted for a declining share of U.S. apparent consumption in 1980-84. Imports accounted for 39 percent of U.S. demand in 1980 but declined to 29 percent in 1983 and 1984 (table C-4).

Petroleum Products

World Market

Except for small quantities used directly as fuel, all of the world's crude petroleum produced is made into petroleum products by various processing techniques in refineries. These techniques essentially can be categorized into those that separate the crude petroleum into component parts, those that combine simpler molecules into more complex molecules, and those that break complex molecules into simple molecules.

Until the Arab crude petroleum embargo in 1973, world petroleum product demand was increasing faster than refining capacity. In the post-1973 crisis period both crude petroleum importing and exporting nations began increasing refining capacity. Nations did so to become less dependent upon petroleum product imports or to increase their control of the petroleum market. The Iranian crisis in 1979 again resulted in crude petroleum price increases which decreased demand further. Even with the closing of some refineries since 1979, the world remains in a situation of having excess refining capacity.

Refining capacity

World capacity to refine crude petroleum decreased from 81.3 million barrels per day as of January 1, 1981 to 75.2 million barrels per day as of January 1, 1984 (table C-7) because of the decreased demand for petroleum products,because of higher prices, conservation, and fuel switching. Worldwide refining capacity further declined from 75.2 million barrels per day as of January 1, 1984 to 74.9 million barrels per day as of January 1, 1985, or by 0.4 percent. The effects of lower demand, coupled with the closing and/or reshuffling of refining capacity, affected specific nations differently. For example, while Western Europe's capacity declined by about 3.6 percent from

Table C-7.--Petroleum products: Crude petroleum refining capacity, by leading nations 1/, 1981-85

(In thousands of barrels per day)

Nation	Capacity as of January 1--				
	1981	1982	1983	1984	1985
United States	18,400	18,700	16,859	15,930	15,400
U.S.S.R	11,400	11,600	11,750	12,000	12,200
Japan	5,454	5,601	5,731	5,020	4,813
Other Communist areas 2/	2,827	3,123	3,123	3,150	3,150
Italy	4,092	4,003	3,283	3,050	3,095
France	3,342	3,291	2,871	2,670	2,386
West Germany	3,021	2,937	2,471	2,386	2,170
China	1,810	1,810	2,000	2,050	2,150
United Kingdom	2,630	2,482	2,260	2,092	2,008
Canada	2,160	2,200	2,020	1,807	1,869
Netherlands	1,827	1,708	1,552	1,552	1,499
Spain	1,464	1,517	1,522	1,493	1,493
Brazil	1,402	1,407	1,219	1,301	1,305
Mexico	1,394	1,470	1,289	1,269	1,269
Venezuela 3/	1,349	1,323	1,284	1,224	1,224
Singapore	1,069	1,096	1,096	1,101	1,072
Saudi Arabia 3/	487	487	705	860	840
South Korea	607	755	755	776	776
Australia	743	742	716	722	697
Belgium	1,056	1,035	693	694	693
All others	14,807	14,151	11,007	14,060	14,797
Total	81,341	81,438	77,206	75,207	74,906

1/ These nations had the largest capacity to refine crude petroleum as of Jan. 1, 1985.
2/ Includes Albania, Bulgaria, Cuba, Czechoslovakia, East Germany, Hungary, Mongolia, North Korea, Poland, Romania, Vietnam, and Yugoslavia.
3/ OPEC member.

Source: "Worldwide Report," Oil & Gas Journal, annual issues.

1984 to 1985, with France and West Germany accounting for most of the capacity shutdowns, refining capacity in the Middle East increased by about 4 percent. 1/

Saudi Arabia's refining capacity increased by 72 percent from 487,000 barrels per as of January 1, 1981, to 840,000 barrels per day as of January 1, 1985. At least part of the refining capacity expansion in the Middle East is the result of the availability of low-cost crude petroleum and the efforts to increase foreign revenue. Also, during this period, U.S.

1/ "Worldwide Report," Oil & Gas Journal, Dec. 31, 1984, p. 76.

capacity to refine crude petroleum decreased from 18.4 million barrels per day to 15.4 million barrels per day (table C-7).

Substantial additional capacity expansion is underway in OPEC countries. The first of the new wave of refineries in Libya, Saudi Arabia, Algeria, Kuwait, and Indonesia are now complete. Some of the new capacity was planned to meet domestic needs, although most of the expansion in the Persian Gulf and North Africa was designed for export. 1/ The following tabulation shows OPEC's current and future refining capacity (in thousands of barrels per day): 2/

Source	1984 capacity	Capacity additions	1987 capacity
Iran	545	250	795
Iraq	170	240	410
Kuwait	550	80	630
Qatar	10	50	60
Saudi Arabia	840	1,125	1,965
UAE	130	45	175
Ecuador	85	-	85
Venezuela	1,224	-	1,224
Gabon	20	-	20
Libya	350	-	350
Algeria	435	-	435
Nigeria	260	150	410
Indonesia	460	400	860
Total OPEC	5,079	2,340	7,419

Production

World production of petroleum products decreased from 64 million barrels per day in 1979 to 58.1 million barrels per day in 1982 (table C-8). The United States remained the world's leading producer of these products during 1979-82; the second largest producing nation is the U.S.S.R. These major industrialized nations are also the primary consumers of refined products.

U.S. production of these products declined from 15 million barrels per day in 1979 to 13.4 million barrels per day in 1982 as the result of decreased domestic demand. Production of petroleum products in the U.S.S.R. increased from 9.3 million barrels per day in 1979 to 10.2 million barrels per day in 1982.

1/ OPEC Downstream Project, "The Changing Structure of World Refining Industry: Implications for U.S. Energy Security," Jan. 23, 1985, p. 38.
2/ Ibid.

Exports

The traditional nations exporting petroleum products have been the industrialized nations of the world with large refining capacities. World exports of petroleum products increased from $51 billion in 1979 to $68 billion in 1980 but decreased to $58.5 billion in 1982 and $51 billion in 1983

Table C-8.--Petroleum products: World production, by leading nation, 1/ 1979-82

(In thousands of barrels per day)

Nation	1979	1980	1981	1982
United States	15,236	14,622	14,009	13,391
U.S.S.R	9,326	9,825	9,981	10,219
Japan	4,535	4,428	4,262	3,566
West Germany	2,539	2,198	2,134	1,908
Italy	2,379	1,943	1,892	1,744
France	2,543	2,321	1,972	1,726
Canada	1,950	2,030	1,883	1,639
United Kingdom	1,999	1,764	1,618	1,532
China	1,882	1,879	1,515	1,419
Mexico	982	1,254	1,292	1,302
Brazil	1,000	1,136	1,086	1,068
Spain	948	982	949	905
Saudi Arabia 2/	835	902	852	888
Venezuela 2/	1,010	943	861	881
Singapore	723	717	778	836
Netherlands	1,250	1,082	900	828
India	556	504	611	669
Australia	602	613	589	614
Iran 2/	672	675	505	546
Argentina	495	518	526	514
All others	12,579	12,659	11,986	11,895
Total world	64,041	62,995	60,183	58,096

1/ These nations were the largest producers of crude petroleum in 1984.
2/ OPEC member

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

(table C-9). The decrease in world exports of petroleum products was the result of decreased world demand for the products.

Table C-9.--Petroleum products: World exports by selected nations, 1/ 1979-83

(In millions of U.S. dollars)

Nation	1979	1980	1981	1982	1983
Algeria 2/	541	1,442	3/	3,639	3,091
Belgium	3,359	4,970	4,556	4,071	3,999
Brazil	215	344	973	1,163	1,558
Canada	1,008	1,109	1,052	725	1,092
France	3,049	3,887	4,009	2,978	2,589
West Germany	2,035	2,863	2,817	2,719	2,382
Italy	4,618	4,203	4,547	4,859	3,717
Netherlands	7,942	10,440	9,970	10,040	9,846
Saudi Arabia 2/	2,169	2,714	2,519	2,194	3/
Singapore	3,358	4,809	5,621	5,571	5,921
Spain	345	734	978	1,375	1,659
Sweden	682	1,194	1,078	1,270	1,598
Trinidad/Tobago	1,377	2,132	1,742	1,565	858
United Kingdom	3,013	4,379	4,031	3,713	3,615
United States 4/	1,532	2,054	3,085	5,470	4,390
Total	50,926	67,997	60,380	58,474	51,064

1/ These nations were the largest exporters of petroleum products in 1982, (1983 data for many nations was not available).
2/ OPEC member.
3/ Not available.
4/ These data differ from data provided by the U.S. Department of Commerce because of the additions of asphalts, petroleum coke, and petroleum waxes.

Source: Official statistics of the United Nations.

Proposed increases in OPEC refinery capacity could result in exports reaching 3.5 million barrels per day in 1987. 1/ While part of these exports could move to areas requiring imports some could move to areas with adequate refining capacity, particularly if the need to export is combined with only limited growth in demand. The following tabulation shows projected petroleum product exports in 1987 from OPEC and the Persian Gulf nations (in thousands of barrels per day): 2/

1/ Ibid, p. 45.
2/ Ibid, p. 46.

Exporter	Refined product production	Domestic demand	Gross product exports
Bahrain	225	16	209
Kuwait 1/	640	95	545
Oman 1/	45	29	16
Qatar 1/	55	16	39
Saudi Arabia 1/	1,655	614	1,041
UAE 1/	160	125	35
Iran 1/	2/ 975	740	2/ 0-235
Iraq 1/	2/ 385	430	2/ 0
Algeria 1/	390	130	260
Ecuador 1/	75	127	-
Gabon 1/	15	44	-
Indonesia 1/	810	550	260
Libya 1/	315	146	170
Nigeria	350	221	129
Venezuela 1/	1,220	420	800
Total	7,315	3,703	3,504-3,739
OPEC total	7,045	3,660	3,279-3,514

1/ OPEC member.
2/ Uncertainty resulting from the Iran/Iraq war.

Consumption

The major world consumers of petroleum products were traditionally the industrialized nations of the United States, Western Europe, and Japan which together accounted for almost 50 percent of the world total in 1982. U.S. consumption of petroleum products declined from 18.9 million barrels per day in 1978 to 15.3 million barrels per day in 1982 (table C-10), primarily as the result of conservation efforts. The U.S.S.R. also traditionally accounted for a large share of the world demand for refined products. Petroleum product consumption in the U.S.S.R. increased from 8.5 million barrels per day in 1978 to 9.3 million barrels per day in 1982 (table C-10).

The major world consumers during the period also accounted for most of the world's capacity to refine crude petroleum. With the exception of Japan, most of the major consuming nations also produce crude petroleum.

Table C-10.--International consumption of petroleum products, by selected nations 1/, 1978-82

(In millions of barrels per day)

Nation	1978	1979	1980	1981	1982
United States	18.85	18.51	17.06	16.06	15.30
U.S.S.R	8.47	8.58	8.91	9.03	9.25
Japan	5.14	5.48	4.96	4.85	4.56
West Germany	3.05	3.07	2.71	2.45	2.33
France	2.17	2.39	2.26	2.02	1.94
Italy	2.18	2.00	1.88	1.91	1.78
China	1.81	1.85	1.83	1.68	1.66
Canada	1.74	1.86	1.95	1.84	1.62
United Kingdom	1.85	1.93	1.73	1.59	1.59
Mexico	.92	.90	1.22	1.27	1.36
Spain	.95	.98	.99	.94	1.01
Saudi Arabia 2/	3/	3/	3/	.49	.61
Other	19.78	17.56	17.53	16.58	16.73
Total world	62.84	65.11	63.03	60.71	59.74

1/ These nations (except Saudi Arabia) were the largest consumers of petroleum products in 1982.
2/ OPEC member.
3/ Not available.

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

U.S. Industry Profile

Structure

The United States relies on the major international petroleum companies and the private sector to supply its need for crude petroleum and petroleum products. According to the 1977 Census of Manufacturers, there were 349 U.S. refineries in operation in that year; however, as of January 1, 1983, the number of operating refineries had fallen to 225 with a total capacity to process 16.2 million barrels of crude petroleum per day. 1/ As of January 1, 1984, there were 220 operating refineries in the United States with a crude petroleum capacity of 15.9 million barrels per day 2/; however, as of January 1, 1985, the number of operating refineries declined to 191. 3/ The decrease in the number of operating refineries since 1977 is the result of a combination of factors including decreased domestic demand for petroleum products, market shifts, increased transportation costs, consolidation of refinery operations, and the decontrol of crude petroleum prices in 1981.

1/ "Annual Refining Report," Oil & Gas Journal, Mar. 21, 1983, p. 130.
2/ "Annual Refining Report," Oil & Gas Journal, Mar. 26, 1984, p. 112.
3/ "Annual Refining Report," Oil & Gas Journal, Mar. 18, 1985, p. 123.

The major States producing petroleum products are Texas, California, and Louisiana. As of January 1, 1985, these States together accounted for about 41 percent of the total number of U.S. refineries and 58 percent of the total refining capacity. 1/

The value of petroleum product shipments (in current dollars) decreased from $215 billion in 1981 and $198 billion in 1982 to $183 billion in 1984. 2/ During 1984, the four largest petroleum companies accounted for approximately 30 percent of the total value of industry shipments. 3/

Investment and labor

Capital expenditures for petroleum refining increased at a compared annual growth rate of almost 25 percent from 1977 to 1982 as they increased from $2.1 billion in 1977 to $6.4 billion in 1982.

Employment in the petroleum refining industry decreased from 108,300 workers in 1979 to 99,000 in 1984. 4/ The number of production workers declined from 72,800 in 1979 to 64,700 in 1983. 5/ Petroleum refining industry wage rates reached $15.31 per hour in 1984. 6/

Financial

Since 1965, the highest rate of return experienced by the petroleum industry, 18.2 percent, occurred in 1979. From that year the rate of return continually decreased, finally reaching 10.9 percent in 1983, the latest year for which data are available. Decreased demand and excess supply have combined to cause a decrease in refining return.

As a result, refining has not been a favorite recent investment sector of the U.S. petroleum industry. U.S. refining investment funds decreased almost 26 percent between 1983 and 1984 before the latest investment data indicated a projected growth of 3.5 percent between 1984 and 1985. 7/ A significant portion of the new refining investment will be in equipment to produce octane improving materials to replace lead as it is phased-out of gasoline.

Government

The U.S. Government is not now directly involved in the refining industry and there is no state petroleum company. It does purchase crude petroleum for the SPR, and in the past, controlled the prices of petroleum products and crude petroleum, as well as the imports and exports of petroleum products.

1/ "Annual Refining Report," Oil & Gas Journal, Mar. 18, 1985, p. 123.
2/ U.S. Department of Commerce, Bureau of Industrial Economics, U.S. Industrial Outlook, 1985, January 1985, p. 10-1.
3/ Ibid.
4/ Ibid.
5/ Ibid.
6/ Ibid.
7/ Independent Petroleum Association of America, United States Petroleum Statistics, 1985, March 1985, table 15.

U.S. Market

Production

Between 1977 and 1985, approximately 158 refineries shut down operations. The typical refinery that closed had a capacity of less than 50,000 barrels per day, and was relatively unsophisticated, that is with no cracking or other major upgrading facilities. Many of these refineries were built under the Government program of support for small refiners in the 1970's. 1/ During the period 1981-84, the refineries that remained open were the more sophisticated units; however, they operated at about 68 to 70 percent of capacity as compared with the more traditional 85 percent achieved in 1979. 2/

Another factor contributing to the decrease in U.S. production of refined products, the shutdown of refineries, and the subsequent decline in capacity utilization is an increase in offshore refinery operations. The market is in a scenario combining petroleum product oversupply as well as excess refinery capacity. Some of the foreign refiners' petroleum products enter the U.S. market, which is already faced with decreased demand for many of these refined products.

The following tabulation, derived from official statistics of the U.S. Department of Energy, shows U.S. production of selected petroleum products (in thousands of barrels per day): 3/

Year	Motor gasoline	Distillate fuel oil	Residual fuel oil	Liquefied petroleum gases 1/	Other 2/
1973	6,535	2,822	971	1,600	3,693
1977	7,033	3,273	1,754	1,566	3,912
1979	6,852	3,153	1,687	1,556	4,153
1980	6,506	2,662	1,580	1,535	3,956
1981	6,405	2,613	1,321	1,571	3,739
1982	6,338	2,606	1,070	1,528	3,453
1983	6,340	2,456	852	1,642	3,460
1984	6,468	2,688	891	1,702	3,656

1/ Includes ethane, propane, normal butane, and isobutane.
2/ Includes pentanes plus, other hydrocarbons and alcohol, unfinished oils, gasoline blending components and all finished petroleum products except finished motor gasoline, distillate fuel oil, residual fuel oil, and liquefied petroleum gases.

1/ Resource System Institute, OPEC Downstream Project, "The Changing Structure of World Refining Industry: Implications for U.S. Energy Security," presented to the U.S. Department of Energy, Jan. 23, 1985, p. 23.
2/ U.S. Department of Energy, Petroleum Supply Monthly, March 1982, p. 6 and January 1983, p. 6.
3/ Ibid., pp. 11, 13, 15, 17, and 18.

The production cost of petroleum products consists essentially of the cost of crude petroleum plus the cost of refining the crude petroleum. Many different petroleum products, such as motor gasoline, heating oil, and kerosene, are made in a typical refinery. The actual production costs assigned to each of the individual petroleum products is heavily weighted by the allocation of general refining costs. Usually a greater share of these refining costs is assigned to those petroleum products, such as motor gasoline, that sell at a higher price and are thus capable of assuming the burden. Refining costs associated with special processing designed to produce a specification product, such as low sulfur content home heating oil, usually are added directly to that product's production cost. U.S. refining costs are estimated to be in the $2 to $3 per barrel range. This cost added to the refiner's acquisition cost of a barrel of crude petroleum, gives an average cost per barrel of petroleum products.

Exports

The exportation of petroleum products was, until 1982, restricted and may at any time in the future be restricted by the President under section 103 of the "Energy Policy and Conservation Act," Public Law 94-163, December 22, 1975. The President acts through the Secretary of Commerce, who imposes such restrictions as necessary to be consistent with the Nation's interest and the purposes of this act. The Secretary enforces this provision of the act through the requirement of validated export licenses. 1/

Exports of petroleum products during 1980-84 are shown in table C-11. The value of U.S. exports increased by 451 percent during 1980-82. The reasons for this apparent dramatic increase include both an increase in the unit value of petroleum product exports of between 200 and 300 percent, and the 1982 relaxation of export restrictions which also allowed quantities to increase. However, U.S. exports in 1983 declined by 27 percent to a value of $3.8 billion because of the strong U.S. dollar, some continued weakness in foreign economies and the availability of petroleum products from many other suppliers.

The major markets for petroleum products are other developed nations without significant reserves of crude petroleum for use as a raw material base, especially Japan, Canada, the Netherlands, and Singapore. A notable exception to this rule has been Mexico, whose economy depends upon the revenues generated from the export of crude petroleum to such an extent that imports of petroleum products have often been necessary to satisfy the Mexican domestic demand. These four nations together account for nearly 50 percent of U.S. exports of petroleum products.

Imports

The United States is a net importer of petroleum products primarily from Venezuela and the Caribbean nations. As a result of increased prices, the

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1/ The rules governing these exports are set forth in section 377.6, "Petroleum and Petroleum Products," of the Export Administration Regulations of the U.S. Department of Commerce (15 C.F.R. sec. 377.6).

Table C11.--Petroleum products: U.S. exports of domestic merchandise, by principal markets, 1980-84

(In thousands of dollars)

Market	1980	1981	1982	1983	1984
Japan	75,770	151,692	483,606	489,930	539,412
Canada	107,431	215,384	317,299	428,585	512,421
Mexico	218,609	210,206	962,901	196,868	270,028
N Antil	4,940	16,876	75,657	147,947	258,656
U King	50,084	36,732	126,652	85,555	218,200
China t	39,194	85,244	44,676	113,314	157,229
Spain	-	-	-	-	148,312
Kor Rep	17,328	87,875	277,132	132,516	147,816
All other	799,477	1,426,571	2,503,971	2,173,975	1,325,122
Total	1,312,833	2,230,580	4,791,893	3,768,688	3,577,194

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

value of imports of petroleum products increased from $11.4 billion in 1980 to $18.6 billion in 1984 (table C-12). U.S. imports of petroleum products could increase further as additional refinery capacity comes onstream in the OPEC nations as well as in other conventional-energy-rich nations. These nations, with abundant supplies of crude petroleum, have a competitive advantage in the production of energy-intensive products, such as petroleum products and petrochemicals, because of relatively assured supplies of crude petroleum at below-world prices. At a time when exports of crude petroleum have peaked, these nations have developed or are developing downstream industries to diversify their exports, further their economic development, and gain additional foreign exchange credits.

Consumption

U.S. consumption of petroleum products varied since 1971 as a result of crude petroleum and petroleum products price changes, product availability, fuel switching, and conservation. In 1979, U.S. consumption of petroleum products was 18.5 million barrels per day and declined to 15.2 million barrels per day in 1983; consumption in 1984 increased to 15.8 million barrels per day as the economy picked up and demand for most petroleum products increased, as shown in the following tabulation (in thousands of barrels per day): 1/

Year	Consumption
1979	18,513
1980	17,056
1981	16,058
1982	15,296
1983	15,231
1984	15,769

During 1978-82, the refiner acquisition cost for domestic and imported crude petroleum rose sharply before declining slightly in 1984 as shown in the following tabulation (in dollars per barrel): 2/

1/ U.S. Department of Energy, Petroleum Supply Monthly, June 1984, p. 4.
2/ U.S. Department of Energy, Monthly Energy Review, August 1984, p. 89.

Table C-12.--Petroleum products: U.S. imports for consumption, by principal sources, 1980-84

(In thousands of dollars)

Source	1980	1981	1982	1983	1984
Venez--------	3,202,196	3,078,736	2,995,228	2,890,272	3,482,349
Algeria------	633,030	1,059,741	1,351,209	1,655,822	2,535,309
N Antil------	2,428,061	2,503,093	2,051,526	2,180,452	1,960,574
Canada-------	588,264	966,541	799,031	1,187,966	1,339,722
Nethlds------	71,519	507,191	544,600	774,398	1,068,668
Bahamas------	1,262,283	1,146,145	941,492	1,547,388	1,007,010
Mexico-------	85,705	292,863	235,754	475,919	791,227
Brazil-------	29,036	123,771	377,158	531,820	716,035
All other----	3,055,417	3,512,049	3,767,409	3,739,945	5,734,477
Total----	11,355,510	13,190,129	13,063,408	14,983,983	18,635,372

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

Year	Refiner acquisition cost of crude petroleum	
	Domestic	Imported
1978	$10.61	$14.57
1979	14.27	21.67
1980	24.23	33.89
1981	34.33	37.05
1982	31.22	33.55
1983	28.87	29.30
1984	28.66	29.02

Partially as a result of these price increases, prices for petroleum products increased in 1980, which led consumers to switch to alternative sources of energy and reduce consumption through conservation efforts as shown in the following tabulation of wholesale prices (in dollars per barrel): 1/

Year	Motor gasoline	Kerosene	Distillate fuel oil	Residual fuel oil	Average of fuel products
1978	16.47	15.64	14.98	9.66	14.16
1979	23.87	23.77	22.88	14.12	20.79
1980	36.71	33.71	32.85	18.66	30.56
1981	42.68	42.43	40.82	25.69	37.28
1982	39.02	40.82	38.62	24.27	34.62
1983	35.18	35.75	33.62	24.07	31.64
1984	32.71	35.60	33.44	24.84	30.60

The prices of petroleum products mirrored changes in crude petroleum prices and were also influenced by the abundant availability of petroleum products from excess refining capacity around the world. In the future, petroleum product prices could decrease further because of the world's excess refining capacity even if the world price for crude petroleum remains relatively stable. It has been stated that OPEC (or other crude-petroleum-rich nations) could operate so as to sell the maximum quantity of crude petroleum possible at the world price and then refine additional crude petroleum into petroleum products that would be sold at whatever price was necessary to clear the market. 2/

U.S. imports accounted for 6 percent of U.S. apparent consumption of petroleum products during 1980-82. The share of apparent consumption

1/ Independent Petroleum Association of America, United States Petroleum Statistics 1985, March 1985.

2/ National Petroleum Refiners Association, Washington Bulletin, Mar. 8, 1985, p. 2.

satisfied by imports increased to 8 percent in 1983 and 9 percent in 1984 (table C-13).

Table C-13.--Petroleum products: Value of U.S. producers' shipments, exports, imports, and apparent consumption, 1980-84

Year	Producers' shipments	Exports	Imports	Apparent consumption	Ratio (percent) of imports to ap parent consumptic
			1,000 dollars		
1980	190,103,000	1,312,833	11,355,510	200,145,677	
1981	215,056,000	2,230,580	13,190,129	226,015,549	
1982	198,017,000	4,791,893	13,063,408	206,288,515	
1983	171,839,000	3,768,688	14,983,983	183,054,295	
1984	181,999,000	3,577,194	18,635,372	197,057,178	

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

APPENDIX D

NATURAL GAS WORLD MARKET AND U.S. INDUSTRY PROFILE

Natural Gas

World Market

Natural gas usage in other nations is not as widespread as in the United States. Many industrialized nations lack significant natural gas resources, the developed domestic market, and the pipeline infrastructure necessary for the transport and use of imported natural gas. On the other hand, certain conventional-energy-rich nations (CERN's) with significant natural gas reserves 1/ are endeavoring to, or are actually in the process of, developing industrial ventures, particularly in the petrochemicals area, based on these reserves. However, many of these nations, which have flared and continue to flare the natural gas associated with the production of crude petroleum, still remain without local natural gas markets, the sophisticated infrastructure (pipelines, liquefaction equipment, or port facilities) to support a large-scale international liquefied natural gas (LNG) export trade, or other commercial ventures that use significant quantities of natural gas. As recently as 1982, only 51 percent of Middle East natural gas production was utilized; however, in 1972 the percent utilization was but 30 percent. 2/ It is this underutilized associated natural gas production that is now being studied, developed, or used to support petrochemical facilities in such nations as Saudi Arabia.

Reserves and production

Reserves.--Proved reserves of natural gas, throughout the world, have been increasing steadily during the past 5 years (table D-1). The average reserve additions during 1982-85 have been approximately 107 percent of production. The current supply-deliverability surplus is expected to last through 1987, when supply and demand may come into balance. 3/

The greatest increase in an individual nation's proved reserves have been in the Soviet Union, which as of Jan. 1, 1985, had nearly 43 percent of the world's proved reserves of natural gas. Between 1981 and 1985, the Soviet Union's reserves increased by 58 percent, from 920 trillion cubic feet to 1,450 trillion cubic feet. Qatar and Malaysia also showed significant increases in proved reserves during this period; proved reserves of natural gas in Qatar increased by 42 percent between 1984 and 1985, as significant new fields were discovered. Malaysian reserves increased steadily from 15 trillion cubic feet in 1981 to 48 trillion cubic feet in 1984, an average annual rate of 50 percent, but increased only slightly to 50 trillion cubic feet in 1985. 4/

1/ For example, Mexico and member nations of OPEC.
2/ Exxon Corporation, Middle East Oil and Gas, December 1984, p. 19.
3/ According to American Gas Association (AGA) President George H. Lawrence, "Gas-Processing Volumes Fight Back from Vestiges of Worldwide Recession Slump," Oil & Gas Journal, July 16, 1984, p. 60.
4/ Ibid.

Table D-1.--Natural gas: Estimated proved reserves, by leading nations, 1/ as of Jan. 1, 1981 to Jan. 1, 1985

(In trillions of cubic feet)

Nation	Reserves as of January 1--				
	1981	1982	1983	1984	1985
Soviet Union	920.0	1,160.0	1,240.0	1,400.0	1,450.0
Iran 2/	485.0	484.0	482.6	480.0	478.6
United States	191.0	198.0	204.0	198.0	198.0
Qatar 2/	60.0	60.0	62.0	62.0	150.0
Saudi Arabia 2/	110.0	114.0	117.0	121.0	123.3
Algeria 2/	131.5	130.9	111.3	110.2	109.1
Canada	87.3	89.9	97.0	90.5	92.3
Mexico	64.5	75.4	75.9	75.4	77.0
Norway	42.7	49.4	58.0	58.8	89.0
Netherlands	62.0	55.7	52.0	50.1	68.5
Venezuela 2/	42.0	47.0	54.1	54.6	55.4
Malaysia	15.0	19.0	34.0	48.0	50.0
Indonesia 2/	23.5	27.4	29.6	30.2	40.0
Nigeria 2/	41.0	40.5	32.4	34.8	35.6
Kuwait 2/	30.8	30.5	29.9	31.0	32.5
China	24.5	24.4	29.8	30.3	30.9
Iraq 2/	27.5	27.3	28.8	29.0	28.8
United Kingdom	24.8	26.0	25.4	25.1	27.8
Argentina	22.0	23.4	25.2	24.4	24.6
Libya 2/	23.8	23.2	21.5	21.4	21.2
Abu Dhabi 2/	20.0	19.5	19.3	20.5	20.8
Australia	30.0	18.7	17.8	17.7	17.9
All others	159.6	167.1	176.2	187.1	180.7
Total	2,638.5	2,911.3	3,023.6	3,200.0	3,402.0

1/ Nations having the largest proved reserves of natural gas in the world, as of Jan. 1, 1985.
2/ OPEC member.

Source: "Worldwide Report," Oil & Gas Journal, annual issues.

Production.--The volume of natural gas produced worldwide has fallen steadily during 1979-83, from 58,757 trillion cubic feet to 55,066 trillion cubic feet, or by 6.3 percent, partially as a result of the decrease in crude petroleum production and the resultant decrease in the production of associated natural gas (table D-2). In 1983, the United States, which has historically been the largest producer of natural gas in the world, relinquished that position to the Soviet Union, which produced 18,903 trillion cubic feet of natural gas. U.S. production amounted to 16,581 trillion cubic feet in 1983, 11 percent less than the 18,731 trillion cubic feet of natural gas produced in 1982. In 1983, U.S. and Soviet production accounted for 64 percent of world natural gas production. Other major producing nations include the Netherlands, Canada, Mexico, the United Kingdom, and Romania; these nations together accounted for 17 percent of world production.

Exports

Natural gas is a commodity not easily transported, other than by pipeline. In 1983, 12.5 percent of the natural gas produced worldwide entered the international market. However, nearly 88 percent of the exported natural gas

Table D-2.--Natural gas: Production, by major producing nations, 1979-83

(In millions of cubic feet)

Nation	1979	1980	1981	1982	1983
Soviet Union	14,366	15,356	16,390	17,685	18,903
United States	19,999	20,268	19,596	18,731	16,581
Netherlands	3,490	2,800	3,054	2,522	2,679
Canada	3,646	2,668	2,623	2,546	2,414
Mexico	920	1,191	1,486	1,550	1,479
United Kingdom	1,365	1,500	1,427	1,276	1,395
Romania	1,134	1,176	1,440	1,150	1,200
Norway	905	705	932	862	861
Algeria	550	517	1,149	829	707
West Germany	630	739	636	585	605
Venezuela	465	518	602	527	559
Argentina	295	335	345	386	550
Iran	630	250	210	382	500
Indonesia	555	1,028	1,075	569	482
Italy	275	525	500	504	451
Australia	285	340	400	416	423
Saudi Arabia	325	405	435	592	381
China	350	469	459	364	371
Pakistan	235	600	600	315	341
Brunei	315	345	320	342	316
All other	8,022	6,901	4,137	3,761	3,868
Total world production	58,757	58,636	57,816	55,894	55,066

Source: "Worldwide Report," Oil & Gas Journal, annual issues, and "World Natural Gas Survey," Petroleum Economist, various issues.

was transported by pipeline, presumably to either neighboring nations or nations located fairly close to the producing sites of the natural gas. 1/ The natural gas exported across greater distances, and in particular across oceans, often can not be transported by pipeline. In these cases. the gas needs to be converted to LNG, by greatly increasing the pressure and lowering the temperature of the gas. In addition, special ships must be used to carry the LNG, and regasification facilities are required in the nation(s) receiving the shipments. These are extremely expensive processes and steps, which

1/ "World Survey: LNG Market," Petroleum Economist, December 1984, pp. 439-441.

significantly increase the cost of the delivered natural gas. The higher price of the LNG has tended to retard market development although its price has been close to the equivalent price of crude petroleum. 1/ One of the principal reasons is that the infrastructure, that is, pipelines and delivery systems, are usually not in place as in the case of petroleum.

Reportedly, LNG projects are planned by Malaysia and Australia. Other possible future LNG sources include North Africa, Bangladesh, Canada, Chile, Iran, New Zealand, North Sea, Pakistan, Qatar, Thailand, Trinidad, and the Soviet Union. These projects' chances would increase significantly if the possible future LNG markets develop in Korea, the U.S. West Coast, Taiwan, and Scandinavia. 2/

Table 16 shows the value of exports of natural gas from major producing nations, both by pipeline and by tanker (LNG), in terms of U.S. dollars. Unlike most commodities, the major producers of natural gas are not necessarily the largest exporters. Those nations that are large exporters of natural gas are typically nations with significant natural gas reserves, a small domestic market, and a large natural gas-consuming neighboring nation. Nations fitting this description are Canada, with exports valued at $4.1 billion, principally to the United States, the Netherlands with exports valued at $5.2 billion, and Norway with exports valued at $3.2 billion principally to other European nations. These three nations were the largest natural gas-exporting nations in 1983 (table D-3).

Exports of natural gas as LNG in 1983 were primarily from Algeria (16.5 billion cubic meters), Indonesia (13.0 billion cubic meters), and Brunei (7.2 billion cubic meters). These nations accounted for nearly 80 percent of the

1/ Society of Petroleum Engineers, World Liquefied Natural Gas (LNG) Trade, December 1983.
2/ Ibid.

Table D-3.--Natural gas: Exports of major exporting and producing nations, 1979-83

(In millions of U.S. dollars)

Source	1979	1980	1981	1982	1983
Major exporters:					
Netherlands	3,886.3	5,489.4	6,071.9	5,468.6	5,186.1
Canada	2,915.3	4,004.3	4,435.3	4,740.0	4,063.9
Norway	1,452.2	2,626.8	2,835.8	3,382.8	3,152.2
Indonesia	1,292.9	2,881.2	3,366.3	2,905.8	2,582.8
Algeria	623.4	1,068.7	1/	1,737.5	2,486.3
West Germany	650.8	1,495.2	1,720.4	1,743.3	1,448.6
Other major producers:					
Brunei	676.6	1,396.9	1,607.3	1,529.6	1/
Saudi Arabia	1,106.0	2,362.7	2,816.5	2,584.4	1/
United States	206.2	377.1	577.3	709.6	827.1
United Kingdom	138.9	269.6	275.5	386.3	547.9
Mexico 2/	31.8	621.5	688.6	641.1	518.4
France	154.4	257.1	272.2	255.5	333.7
Australia	9.8	18.6	28.4	19.1	84.4
Libya	285.9	1/	1/	1/	1/
Kuwait	529.9	674.8	448.8	1/	1/
Venezuela	209.1	191.1	1/	1/	1/

1/ Not available.
2/ Data reflect world imports from Mexico.

Source: Compiled from official statistics of the U.N. Trade Data System.

total world exports of LNG. 1/ The major importing nations in 1983 were Japan, France, and Spain.

Consumption

Estimated apparent consumption of natural gas for the major consuming and producing nations is shown in table D-4. The United States has traditionally been the largest consumer of natural gas. Two main uses for this natural gas have been heating and the generation of electricity, although most sectors of the economy use some natural gas. Although U.S. consumption of natural gas decreased from 20.2 trillion cubic feet in 1979 to 18.5 trillion cubic feet in 1982, the United States still remains the world's largest natural gas-consuming nation, accounting for 35 percent of worldwide consumption.

The Soviet Union is the second largest consumer of gas, burning 15.5 trillion cubic feet in 1982, which accounted for 29 percent of worldwide consumption.

1/ Ibid.

Table D-4.--Natural Gas: Estimated apparent consumption of major producing and consuming nations, 1979-82

(In billions of cubic feet)

Source	1979	1980	1981	1982
United States	20,241	19,877	19,930	18,477
Soviet Union	13,064	13,328	14,440	15,522
West Germany	1,964	2,102	2,133	1,795
Canada	757	1,850	1,708	1,664
United Kingdom	1,656	1,900	1,671	1,571
Netherlands	1,702	1,035	1,421	1,511
Romania	1,259	1,251	1,267	1,411
Mexico	757	908	930	1,016
Venezuela	540	517	572	585
Algeria	127	460	346	553
Australia	296	338	379	383
China	512	504	450	381
Indonesia	814	195	232	218
Saudi Arabia	390	517	560	201
Iran	358	232	155	200
Bahrain	105	97	124	131
Kuwait	213	244	100	100
Trinidad and Tobago	158	185	85	92
Libya	60	55	110	88
Brunei	37	6	62	70
World total	51,740	53,730	54,213	53,563

Since the United States is the world's single largest natural gas consumer, its domestic natural gas price is a highly significant factor affecting world prices, even though individual nations often have different domestic prices for natural gas. The price of natural gas imported as LNG is usually much higher in the consuming nation than the price of the natural gas from the domestic resources of that consuming country, owing primarily to the handling and transportation costs. Even with the weakening of OPEC, there still remains a much more recognizable world crude petroleum price than a world natural gas price. The effect major consuming countries, such as the United States, have on natural gas price is by way of imports; if the potential import is too high-priced, the import will not occur.

U.S. Industry Profile

Structure

The natural gas industry in the United States is located primarily in Texas and Louisiana. This one area, along the Gulf of Mexico, accounted for more than 65 percent of U.S. natural gas production in 1982. 1/ Areas in

1/ U.S. Department of Energy, Natural Gas Annual, 1982, October 1983.

North Dakota, the Rocky Mountains, and offshore Louisiana are expected to provide new natural gas finds during the mid to late 1980's; Alaskan discoveries are also expected to significantly increase U.S. natural gas reserves during the late 1980's and in the 1990's.

The major U.S. producers of natural gas are usually the major petroleum companies. Natural gas may be produced simultaneously with crude petroleum (known as associated natural gas) or by itself (nonassociated natural gas). Data concerning U.S. producers of natural gas are integrated with the data on U.S. producers of crude petroleum; therefore, separate data regarding employment and investment are not available.

Natural gas as it comes from the well contains many components and is commonly referred to as "wet" natural gas. Most of these components, such as propane, butane, ethane, and other liquid products, 1/ are removed at natural gas processing plants or at field strippers before the natural gas stream is used. These components can be sold separately both as energy sources and as petrochemical feedstocks.

As of 1984, there were approximately 880 natural-gas-processing plants in the United States, up from about 760 in 1979. 2/ The ownership of the "wet" natural gas streams into the plants, and the "dry" natural gas streams and the NGL's from these plants is often difficult to determine.

Approximately 5 percent of total U.S. natural gas production is used as raw materials for petrochemical feedstocks. The remaining 95 percent is used by the residential, commercial, and industrial sectors as fuel.

Financial investment and labor

As mentioned previously, there are no separate statistics available concerning financial, investment, and employment in the natural gas industry. Employment for the crude petroleum and natural gas industry increased from 134,100 in 1977 to 226,500 in 1982, a compound annual growth rate of approximately 11.1 percent. 3/

Despite the increase in natural gas consumption in 1984, domestic natural gas well completion and domestic natural gas footage drilled decreased for the second straight year. The relative disinterest in natural gas investment largely reflects the industy's belief that a surplus natural gas situation will remain for at least 2 more years and possibly through 1990, particularly if imports from Canada increase. 4/

Investment in new natural gas-processing facilities has declined every year during 1980-84, as shown in the following tabulation of the number of natural gas-processing projects underway during the period 1980-84 5/:

1/ These materials together are called natural gas liquids (NGL's).

2/ "Gas-processing Volumes Fight Back from Vestiges of Worldwide Recession Slump," Oil & Gas Journal, July 16, 1984.

3/ U.S. Department of Commerce, 1985 U.S. Industrial Outlook, January 1985, pp. 9-1, 9-7.

4/ "Gas Price Decontrol Is a Nonevent," Chemical Week, Jan. 23, 1985, p. 44.

5/ "Annual Gas Processing Report," Oil & Gas Journal, July 13, 1981; July 19,1982; July 18, 1983; and July 16, 1984.

Year	Gas-processing plant construction 1/
1980-------------------	41
1981-------------------	33
1982-------------------	28
1983-------------------	21
1984-------------------	20

1/ Includes those planned, under construction, and expansions.

Although there have been some technological advances and innovations in the processes used to extract natural gas, as well as to construct new plants for the processing of natural gas, the natural gas industry does not rely on highly skilled labor. The industry is, however, capital intensive.

Government

The U.S. Government is not directly involved in the natural gas industry, although it does review possibilities for the import of LNG, and also reviews LNG prices. The intent has been to balance the users' desire for low prices with the desire of the producers to realize an adequate profit. Low prices have tended to discourage the pace of natural gas supply development. 1/

Under the Natural Gas Policy Act (NGPA) of 1978, the price of natural gas was set to be gradually decontrolled by 1985. Although repeated legislative attempts were made by the U.S. industry to accelerate and alter this program, only certain categories of gas accounting for about 30 percent of the gas flowing to interstate pipelines were decontrolled on January 1, 1985. 2/

Price controls from the early 1960's through 1978 were the primary reason for decreasing production levels. As a result of a 1954 Supreme Court decision, 3/ the price of gas produced and sold within a State was unregulated; however, if gas was produced in one State and sold in another the Federal Power Commission 4/ was empowered to regulate prices at the wellhead. The cost of natural gas was determined at the wellhead based on service, expenditure, and inventory costs. Prices were regulated on the basis of the maximum local price established under the NGPA. Different prices were set for more recent gas discoveries. In order to charge the higher maximum local price, contractual authorization was established between producers and pipeline companies, and presented to the State jurisdictional agency. Certain criteria, established by the NGPA, needed to be met before the State could authorize the use of the higher maximum local price. The Federal Energy

1/ "Drastic Changes Mark the Path to U.S. Natural Gas Decontrol," Oil & Gas Journal, Aug. 20, 1984, p. 74.

2/ "Gas Deregulation: Here's What to Expect," World Oil, January 1985, pp. 125-128.

3/ Phillips Petroleum Co. v. Wisconsin, 347 U.S. 672.

4/ The Federal Energy Regulatory Commission, within the U.S. Department of Energy, has retained the functions of the former Federal Power Commission.

Regulatory Commission (FERC) was then informed of the price increase by the State.

U.S. Market

Natural gas and its components are used as fuel by the industrial, commercial, and residential sectors of the economy. In the industrial sector, the items covered by this section are used as both fuel and petrochemical feedstocks.

Natural gas and its components are used as petrochemical feedstocks for the production of primary petrochemicals, which, in turn, are used to produce petrochemical products, such as synthetic fibers, rubber, and plastics. These petrochemical products are then used to produce consumer items, such as clothing, footwear, medical goods, and packaging materials.

Production

Table D-5 shows a summary of the natural gas production in the United States during 1973-84. Marketed production of natural gas declined throughout this period, from 22.6 trillion cubic feet in 1973 to a low of 16.8 trillion cubic feet in 1983. Marketed production in 1984 is estimated to have increased to 18.1 trillion cubic feet.

Table D-5.--Natural gas: U.S. production, 1973-84

(In billions of cubic feet)

Year	Gross wet gas withdrawals	Marketed (wet) production 1/	NGL's 2/	Total dry gas production
1973	24,067	22,648	917	21,731
1974	22,850	21,601	887	20,236
1975	21,104	20,109	872	19,713
1976	20,944	19,952	854	19,098
1977	21,097	20,025	863	19,163
1978	21,309	19,974	852	19,122
1979	21,883	20,471	808	19,663
1980	21,870	20,180	777	19,403
1981	21,587	19,956	775	19,181
1982	20,210	18,520	762	17,758
1983	18,597	16,822	790	16,033
1984 3/	19,880	18,076	850	17,226

1/ Gross production minus vented and flared natural gas, and reinjected natural gas.
2/ Natural gas liquids removed at natural gas processing plants.
3/ Estimated.

Source: Energy Information Administration, Natural Gas Monthly, December 1984, February 1985, p. 7.

As the volume of "old gas" that is still under price controls dwindles, the decreased regulation will allow greater reliance on market forces to determine price. 1/ The future price of natural gas will also determine to a significant extent the future exploration and production levels of natural gas.

The majority of the natural gas discoveries between 1945 and 1981, which experts believe combined account for slightly more than 50 percent of total domestic U.S. natural gas resources, were in large fields and in locations that enabled the natural gas to be commercially recovered at relatively low costs. The remaining domestic resources yet to be discovered are likely to be in smaller fields, which will necessitate a greater number of wells to recover an equivalent volume of gas, and are also likely to be located in hostile environments, such as offshore, Alaska, or the Arctic, which make drilling for natural gas even more costly. Therefore, the incremental price of newly discovered gas will be continually increasing, and the exploration for new gas reserves will need to be predicated on more expensive natural gas prices to both the industrial and residential consumer. 2/

Natural gas is produced both from crude petroleum wells (associated natural gas) and from natural gas wells (nonassociated natural gas). The cost of producing each may be quite different, particularly if the associated natural gas is considered a byproduct and the crude petroleum is assigned the major share of the production costs. In the case of the natural gas well, all the production costs are assigned to the only product produced, which is the natural gas.

As a general rule of thumb, the natural gas production costs account for about two thirds of the average retail price of natural gas. The balance of the price is made up of the utility's operating and maintenance costs. 3/

Exports

U.S. exports of natural gas, methane, and LNG remained low compared with domestic production, particularly because of the high cost of transportation. Exports in 1984 of 55.8 billion cubic feet valued at $263 million represented less than 1 percent of domestic production (table D-6). Exports of other products or separated components of natural gas, such as propane and butane, which are more easily transported, increased the total value of exports by approximately 52 percent, to a total of $401 million in 1984. Although the value of exports of natural gas and its products increased steadily during 1980-83 from $266 million to $555 million, and declined to $401 million in 1984 (table D-7); most of the fluctuation in the value of exports may be accounted for by changes in the price of the natural gas and its products on the world market.

1/ Energy Information Administration, Annual Energy Outlook, 1984, January 1985, pp. 141-146.

2/ Joseph P. Riva, Jr. and John J. Schanz, Jr., "Conventional Natural Gas Production in the Lower 48 States to the End of the Century (Resource Capability and Cost Implications)," Congressional Research Service Review, July/August 1984, pp. 11-4, 34.

3/ "Drastic Changes Mark the Path to U.S. Natural Gas Decontrol," Oil & Gas Journal, Aug. 20, 1984, p. 74.

The major market for U.S. exports of natural gas, methane, and LNG was Japan, which accounted for 99.7 percent of U.S. exports. When the other products of natural gas are considered in addition, Japan accounted for 65.7 percent of U.S. exports, and Mexico accounted for 13.3 percent, via pipeline.

Imports

The United States imports natural gas from Canada and Mexico via pipeline and as LNG from Algeria. 1/ Imports of all natural gas in 1984 declined to 838 billion cubic feet, the smallest amount of any year during 1980-84 (table D-8). Canada accounted for 88 percent of these imports in 1984, Mexico accounted for 7 percent, and Algeria accounted for 5 percent of these imports in 1984. The value of U.S. imports of natural gas and natural gas products was $4.9 billion in 1984 (table D-9). The major sources of imports of the individual components of natural gas was Canada.

Consumption

Apparent U.S. consumption of natural gas decreased during 1980-83 from 21.1 trillion cubic feet to 17.7 trillion cubic feet, and increased to 18.9 trillion cubic feet in 1984 (table D-10). The import-to-consumption ratio fluctuated during 1980-84, from a low of 4.1 percent in 1981, to a high of 5.2 percent in 1983. Domestic production accounted for the overwhelming majority of U.S. consumption throughout this period, generally accounting for about 95 percent of U.S. consumption.

The decline in consumption during 1980-84 may be attributed to conservation efforts along with rising energy prices, particularly during 1980-83 when natural gas prices to U.S. industrial consumers increased by 68 percent and to other U.S. consumers by 100 percent, as shown in the following tabulation (in dollars per thousand cubic feet): 2/

Year	To industrial consumers	To all other consumers	Average wellhead
1980----------	2.53	2.58	1.59
1981----------	3.11	3.15	1.98
1982----------	3.73	3.74	2.46
1983----------	4.27	5.18	2.59
1984----------	4.06	5.29	2.59

1/ Energy Information Administration, Natural Gas Monthly, December 1984, February 1985, p. 8.
2/ Ibid, pp. 23, 29.

[illegible]
domestic merchandise, by principal markets, 1980-84

Market	1980	1981	1982	1983	1984
	Quantity (million cubic feet)				
Japan	45,832	56,888	52,534	54,124	55,618
Canada	1	2	10	0	100
S Arab	2	6	7	11	14
Israel	10	4	1/	2	8
Austral	15	21	15	16	14
Jamaica	0	6	3	5	13
Kor Rep	0	2	15	1	1
Brazil	10	0	1	0	6
All other	3,160	2,565	424	612	60
Total	49,031	59,494	53,010	54,773	55,834
	Value (1,000 dollars)				
Japan	218,061	328,490	291,920	266,835	262,334
Canada	14	23	27	-	437
S Arab	4	10	14	43	34
Israel	19	7	1	4	27
Austral	28	39	27	30	24
Jamaica	-	11	5	8	24
Kor Rep	-	4	27	3	17
Brazil	12	-	1	-	11
All other	7,215	6,438	726	1,194	90
Total	225,353	335,021	292,748	268,118	262,998
	Unit value (per 1,000 cubic feet)				
Japan	$4.76	$5.77	$5.56	$4.93	$4.72
Canada	18.35	13.32	2.59	-	4.35
S Arab	1.80	1.80	1.99	3.77	2.53
Israel	1.80	1.80	1.80	1.80	3.49
Austral	1.80	1.80	1.80	1.84	1.80
Jamaica	-	1.80	1.80	1.80	1.80
Kor Rep	-	1.80	1.80	1.80	16.29
Brazil	1.15	-	1.80	-	1.80
All other	2.28	2.51	1.71	1.95	1.50
Average	4.60	5.63	5.52	4.90	4.71

1/ Less than 500.

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

Table D-7.--Natural gas, total: U.S. exports of domestic merchandise, by principal markets, 1980-84

(In thousands of dollars)

Market	1980	1981	1982	1983	1984
Japan	218,912	329,063	293,465	352,284	263,121
Mexico	30,052	35,219	27,207	26,235	53,462
Guatmal	24	36	3,115	11,567	13,100
Venez	319	2,389	1,174	2,829	12,169
Ecuador	34	95	4,105	23,090	9,155
Dom Rep	138	84	2,573	12,390	7,481
Italy	68	152	18,506	26,182	6,523
Jamaica	48	29	850	4,919	6,423
Nethlds	598	7,187	35,474	24,910	3,680
Panama	18	39	1,856	4,601	3,677
All other	15,373	11,387	67,764	66,205	21,875
Total	265,584	385,680	456,087	555,212	400,665

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

Table D-8.--Natural gas, methane, and mixtures (including lng): U.S. imports for consumption, by principal sources, 1980-84

Source	1980	1981	1982	1983	1984
	Quantity (million cubic feet)				
Canada	778,509	716,277	748,219	691,036	747,480
Mexico	100,558	104,751	93,427	75,624	52,691
Algeria	86,566	37,507	48,381	146,411	36,497
U King	0	0	1/	0	981
S Arab	0	0	0	0	353
Japan	0	0	0	1/	5
Singapr	0	1/	0	0	0
Kor Rep	0	0	0	0	1/
All other	2,994	397	0	705	0
Total	968,627	858,931	890,028	913,777	838,008
	Value (1,000 dollars)				
Canada	3,235,063	3,401,002	3,665,902	3,153,267	3,095,840
Mexico	440,977	511,332	474,324	379,268	238,822
Algeria	235,652	201,934	250,854	641,301	177,916
U King	-	-	1/	-	3,251
S Arab	-	-	-	-	1,590
Japan	-	-	-	3	16
Singapr	-	1/	-	-	8
Kor Rep	-	-	-	-	1/
All other	25,037	3,657	-	3,956	-
Total	3,936,729	4,117,925	4,391,080	4,177,795	3,517,443
	Unit value (per 1,000 cubic feet)				
Canada	$4.16	$4.75	$4.90	$4.56	$4.14
Mexico	4.39	4.88	5.08	5.02	4.53
Algeria	2.72	5.38	5.18	4.38	4.87
U King	-	-	3.14	-	3.31
S Arab	-	-	-	-	4.50
Japan	-	-	-	11.36	2.97
Singapr	-	420.00	-	-	-
Kor Rep	-	-	-	-	360.00
All other	8.36	9.20	-	5.61	-
Average	4.06	4.79	4.93	4.57	4.20

1/ Less than 500.

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

Table D-9.--Natural gas, total: U.S. imports for consumtion, by principal sources, 1980-84

(In thousands of dollars)

Source	1980	1981	1982	1983	1984
Canada------	4,130,745	4,514,669	4,830,883	4,263,742	4,192,140
Mexico------	551,555	652,448	610,721	507,025	279,334
Algeria-----	235,652	225,700	263,737	646,536	204,848
S Arab------	29,120	167,143	79,932	44,197	97,042
Angola------	-	-	-	-	31,975
U King------	17,556	6,095	25,905	6,519	29,913
Indnsia-----	40,551	28,584	38,285	-	29,220
Venez-------	89,387	59,498	52,103	19,644	24,971
Austral-----	5,587	14,050	13,178	16,236	20,022
Belgium-----	-	-	-	23	10,305
All other---	22,169	20,879	19,443	25,861	9,861
Total---	5,122,323	5,689,065	5,934,187	5,529,783	4,929,632

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

Table D-10.--Natural gas: U.S. production, exports of domestic merchandise, imports for consumption, and apparent consumption, 1980-84

(Quantity in millions of cubic feet; value in thousands of dollars; unit value per thousand cubic feet)

Year	Production 1/	Exports	Imports	Apparent consumption	Ratio (percent) of imports to consumption
	Quantity				
1980-----	20,180,000	59,494	968,627	21,099,596	4.6
1981-----	19,956,000	49,031	858,008	20,755,437	4.1
1982-----	18,520,000	53,010	890,028	19,357,018	4.6
1983-----	16,822,000	55,834	913,777	17,681,004	5.2
1984-----	18,076,000	54,773	838,008	18,858,174	4.4
	Value				
1980-----	32,086,200	225,353	3,936,729	35,797,576	11.0
1981-----	39,512,880	335,021	4,117,925	43,295,784	8.1
1982-----	45,559,200	292,748	4,391,080	49,657,532	9.3
1983-----	43,568,980	268,118	4,177,795	47,478,657	8.8
1984-----	46,455,320	262,998	3,517,443	49,709,765	7.1
	Unit value				
1980-----	$1.59	$4.60	$4.01	$1.70	-
1981-----	1.98	5.63	4.79	2.09	-
1982-----	2.46	5.52	4.93	2.57	-
1983-----	2.59	4.90	4.57	2.69	-
1984-----	2/ 2.57	4.71	4.20	2.64	-

1/ Marketed production of natural gas (production representing gross withdrawals, less gas used for repressuring and quantities vented and flared) was compiled from official statistics of the U.S. Department of Energy.
2/ Estimated.

Source: Compiled from official statistics of the U.S. Department of Commerce, except as noted.

APPENDIX E

METAL ORES WORLD MARKET AND U.S. INDUSTRY PROFILE

Metal Ores

World Market

Production and reserves

Production.--The annual value of world mineral production has averaged about $550 billion in constant 1978 dollars, during 1978-82. 1/ Metal ores mining is estimated to account for about 8 percent of the total, and nonmetallic and fuel minerals production account for 14 and 77 percent, respectively. 2/

Production patterns change over time as new deposits are discovered, relative wage rates change, high grade deposits are depleted, and technologies are developed that make lower grade ores more economical to mine. Mineral production continues to be a very important segment of the economies of many nations, especially certain developing countries whose economies are relatively undiversified.

Table E-1 shows production of metal ores during 1980-84. Of the major metals, only gold, silver, copper, and zinc showed overall increases from 1980 to 1984, and only gold and silver showed increases in each year of the period. The general downward production trend of most other metal ores reflects the effects of the global recession on demand, and in some instances, what is believed to be the effects of structural reductions in metals consumption in certain countries. The world's major mineral suppliers are the United States, the Soviet Union, Australia, South Africa, and Canada.

The international mining industry is centralized among a relatively small number of large firms, most of which are large multinational corporations. These firms are involved in virtually all of the major mining projects of international significance in the free world. In many cases, the development of large-scale foreign mining operations involves consortium-type arrangements that can involve governments as well as private industry.

Many U.S. mining firms have interests in foreign mining, milling, and processing operations through subsidiaries, mutual shareholdings, interlocking directorships, and other minority or majority interest arrangements. In the 1960's, however, the worldwide ownership pattern of U.S. companies began to change as foreign governments nationalized or expropriated properties in favor of increased participation by the host governments.

Much of the industry in the developed countries is vertically integrated--from ore to metal. In the developing countries, the extent of vertical integration is not as great, but the process of upgrading their ores to more advanced forms has begun. Although much of the foreign mining industry is privately owned, there is a substantial and increasing share of government-owned operations.

1/ According to the U.S. Bureau of Mines the value of world crude mineral production (in constant 1978 dollars) was to be $539.7 billion in 1978, $567.0 billion in 1979, $551.7 billion in 1980, $543.6 billion in 1981, and $540.0 billion in 1982.

2/ Based on 1978 data from Annales des Mines, November-December 1980 as reported in the Minerals Yearbook v. III, U.S. Bureau of Mines, 1980, and assuming that Bureau of Mines adjustment of this data involved primarily the addition of nonmetallic minerals.

Table E-1.—Certain metal ores and concentrates: World mine production and principal producing countries, 1980-84

Metal ores	Unit of quantity	1980	1981	1982	1983	1984 1/	Principal producers in 1983 and their respective shares of world production
Antimony 2/	Short tons	70,020	63,124	59,277	53,301	3/ 53,500	Bolivia (22%); China (21%); USSR (19%); South Africa (13%)
Arsenic trioxide 3/ 4/	Metric tons	28,619	27,872	26,264	25,276	26,000	USSR (32%); France (20%); Mexico (19%); Sweden (16%)
Bauxite	1,000 metric tons	89,215	85,523	77,793	76,016	78,800	Australia (32%); Guinea (15%); Jamaica (10%); Brazil (9%)
Beryl 3/ 4/	Short tons	2,823	3,198	3,414	3,189	3,200	USSR (66%); Brazil (28%); Rwanda (2%); Zimbabwe (2%)
Bismuth 2/ 3/	1,000 pounds	7,954	8,130	8,799	8,935	8,100	Australia (37%); Peru (15%); Mexico (15%); Japan (14%)
Chromite 4/	1,000 short tons	10,438	9,660	8,770	8,921	9,210	USSR (30%); South Africa (28%); Albania (11%); Zimbabwe (1%)
Cobalt 2/	Short tons	34,178	33,090	26,846	26,596	29,100	Zaire (47%); Zambia (13%); USSR (10%); Australia (8%)
Columbium 2/ 4/ 5/	1,000 pounds	33,359	32,664	23,388	18,680	23,000	Brazil (82%); Canada (15%); Thailand (1%); Nigeria (1%)
Copper 2/	1,000 metric tons	7,739	8,191	8,072	8,027	8,120	Chile (15%); United States (13%); USSR (12%); Canada (8%)
Gold 2/	1,000 troy ounces	39,205	41,249	43,057	44,533	45,000	South Africa (49%); USSR (19%); Canada (5%); United States (4%)
Iron ore 6/	1,000 long tons	876,894	841,579	769,149	729,642	785,000	USSR (33%); Brazil (12%); Australia (10%); China (10%)
Lead 2/	1,000 metric tons	3,448	3,349	3,408	3,324	3,250	United States (14%); USSR (13%); Peru (6%); Mexico (5%)
Manganese ore 6/ 7/	1,000 short tons	29,089	25,894	26,607	24,739	24,900	USSR (46%); South Africa (13%); Bolivia (9%); Gabon (8%)
Mercury	1,000 76-lb. flasks	197	211	198	188	187	Turkey (34%); Spain (26%); United States (13%); China (11%)
Molybdenum 2/	1,000 pounds	241,734	241,125	207,344	137,861	204,000	United States (25%); Chile (24%); USSR (18%); Canada (17%)
Nickel 2/	1,000 short tons	859	803	705	759	768	USSR (25%); Canada (18%); Australia (13%); New Caledonia (9%)
Platinum group metals 4/	1,000 troy ounces	6,848	6,931	6,431	6,482	6,700	USSR (56%); South Africa (40%); Canada (3%); Japan (1%)
Rare earth ores 3/ 8/	Metric tons	35,498	9/	9/	36,000	37,000	United States (47%); Australia (22%); PR China (17%); India (6%)
Silver 2/	1,000 troy ounces	344,026	361,781	383,766	390,618	400,000	Mexico (16%); Peru (14%); USSR (12%); United States (11%)
Tantalum 2/ 4/ 5/	1,000 pounds	1,168	822	690	678	740	Thailand (41%); Australia (22%); Brazil (13%); Zaire (7%)
Tin 2/ 3/	Metric tons	247,300	253,113	237,176	211,620	209,000	Malaysia (20%); USSR (17%); Indonesia (13%); Bolivia (12%)
Titanium concentrates 3/ 6/ 10/	1,000 short tons	5,931	5,661	4,878	4,330	4,667	Australia (27%); Canada (16%); Norway (14%); USSR (11%)
Tungsten 2/	Metric tons	51,897	49,011	45,305	38,882	43,200	China (32%); USSR (23%); Bolivia (6%); South Korea (6%)
Vanadium 2/	Short tons	38,281	38,778	35,898	30,087	32,000	USSR (35%); South Africa (30%); China (17%); Finland (12%)
Zinc 2/	1,000 metric tons	5,962	5,848	6,238	6,246	6,350	Canada (17%); USSR (13%); Australia (11%); Peru (9%)
Zirconium concentrates 3/	1,000 short tons	749	700	782	784	974	Australia (65%); South Africa (18%); USSR (11%); China (2%)

1/ Estimated.
2/ Content of ore and concentrate.
3/ Underestimated, because some or all U.S. output is excluded to avoid disclosing company proprietary information.
4/ Underestimated, because output of China is excluded.
5/ Underestimated, because output of the U.S.S.R. is excluded.
6/ Gross weight.
7/ Ores with 35 percent or more contained manganese.
8/ Bastinite and monazite, rare earth oxide content.
9/ Not available.
10/ Ilmenite, leucoxene, rutile, and titaniferous slag.

Source: U.S. Bureau of Mines, Minerals Yearbook V.I 1983 and Mineral Commodity Summaries, 1985.

The major barriers to international market entry are access to commercial deposits, economies of scale, high capital costs, and proprietary technology. Transportation costs, which tend to be substantial, are a significant barrier to domestic and international trade. Except in the case of copper, and possibly lead and zinc, the basic international movement of metal ores and concentrates is not significantly affected by foreign tariffs or other trade controls.

As an outgrowth of the international market structure and trading patterns in metal ores and concentrates, various multinational producing and consuming groups have been formed in an effort to control certain competitive variables. The International Bauxite Association (IBA) was formed in 1974 by 10 bauxite-producing countries. It now has 11 members and holds meetings regularly to discuss bauxite mining, equity sharing, and control of production facilities. The Intergovernmental Council of Copper Exporting Countries (CIPEC) was created in 1967 by four major copper-exporting countries. It now has nine members and conducts marketing studies, disseminates reports on world copper developments, and, in its most important role, acts as a consultative body for policy coordination. The Association of Iron Ore Exporting Countries (APEF) came into being in 1976. It currently has nine members and is mainly concerned with the exchange of information and increased marketing cooperation. The International Tin Agreement was formed in 1956 and has 24 country members. It was set up to administer the international tin agreements, whose main purpose has been the stabilization of tin metal prices in international markets. It intervenes in the market through buffer stock purchases and sales and export quotas. 1/

Reserves.--Metallic minerals exist in small quantities in many countries throughout the entire world, but deposits large and rich enough to be economically exploited are much less extensive. Table E-2 shows the size and location of the reserves of metallic ores. The reserve base for most of the metal ores seems adequate to cover current production levels for many years.

Exports

Australia, Brazil, Canada, and the United States were the world's principal metal ore exporters in 1979-83 (table E-3). Exports appear to have reached a period high in 1980 and have declined steadily since then. Of the major exporters, only Australia and Brazil seem to sustain or exceed their 1980 exports in 1982-83.

Iron ore accounts for the largest volume of metal ores trade, accounting for 40 to 50 percent of documented exports (table E-4). Copper and precious metal ores exports are also large, accounting for an additional 20 to 30 percent. Ores are shipped in a wide range of tonnages, ranging from the bulk boatload for iron, manganese, and bauxite to drums for cesium and tantalum. Some relatively rare ores, such as cesium and tantalum, may be shipped by air if market conditions are pressing. 2/

1/ U.S. International Trade Commission, Summary of Trade and Tariff Information, Ores and Concentrates and Other Metalbearing Materials, Control No. 6-1-15, February 1982.

2/ Trading in Metals, ed. Trevor Tarring and Peter Robbins, Metal Bulletin Books Limited, 1983.

Table E-2.--Certain metal ores: World mine production and reserves and principal countries with reserves, 1984

Metal ores	Unit of quantity	Mine production 1984 1/	Reserve base 2/	Principal countries with reserves and their respective shares of world reserves
Antimony	Short tons	53,500	5,175,000	Centrally planned economies (57%); Bolivia (7%); South Africa (5%); Mexico (5%)
Arsenic trioxide	Metric tons	26,000	1,850,000	Peru (95%); United States (5%)
Bauxite	1,000 metric tons	78,800	22,300,000	Guinea (26%); Australia (21%); Brazil (10%); Jamaica (9%)
Beryl	Short tons	3,200	3/	3/
Bismuth	1,000 pounds	8,100	4/ 408,000	Japan (31%); Australia (14%); Centrally planned econ. (12%); Bolivia (9%)
Chromite	1,000 short tons	9,210	5/ 7,540,000	South Africa (84%); Zimbabwe (11%); USSR (2%); India (1%)
Cobalt	Short tons	29,100	9,200,000	Zaire (25%); Cuba (22%); U.S. (10%); New Caledonia (10%)
Columbium	1,000 pounds	23,000	9,100,000	Brazil (88%); Canada (8%); Nigeria (2%); Zaire (2%)
Copper	1,000 metric tons	8,120	510,000	Chile (19%); United States (18%); USSR (7%); Zambia (7%)
Gold	1,000 troy ounces	45,000	1,450,000	South Africa (55%); Centrally planned econ. (18%); Canada (3%); U.S. (7%)
Iron ore	1,000 long tons	785,000	206,300,000	USSR (29%); Australia (16%); Canada (12%); United States (12%)
Lead	1,000 metric tons	3,250	135,000	Australia (21%); Centrally planned econ. (21%); U.S. (20%); Canada (13%)
Manganese ore	1,000 short tons	24,900	12,000,000	South Africa (68%); USSR (20%); United States (4%); Gabon (4%)
Mercury	1,000 76-pound flasks	187	7,200	Spain (38%); Italy (28%); USSR (7%); Mexico (3%)
Molybdenum	1,000 pounds	204,000	25,950,000	United States (45%); Chile (21%); Centrally planned econ. (20%); Canada (1%)
Nickel	1,000 short tons	768	111,000	Cuba (23%); New Caledonia (15%); Canada (13%); USSR (7%)
Platinum group metals	1,000 troy ounces	6,700	1,200,000	South Africa (81%); USSR (17%); United States (1%); Canada (1%)
Rare earth ores	Metric tons	37,000	48,000,000	China (80%); United States (11%); India (5%)
Silver	1,000 troy ounces	400,000	6/ 10,800,000	United States (17%); USSR (15%); Canada (13%); Mexico (13%)
Tantalum	1,000 pounds	740	76,000	United States (26%); Thailand (26%); Nigeria (13%); Zaire (13%)
Tin	Metric tons	209,000	3,000,000	Malaysia (36%); Indonesia (22%); Thailand (9%); Australia (6%)
Titanium concentrates	1,000 short tons	4,667	1,039,600	Norway (18%); Canada (16%); South Africa (13%); Brazil (13%)
Tungsten	Metric tons	43,200	3,460,000	China (36%); Canada (19%); USSR (14%); United States (8%)
Vanadium	Short tons	32,000	18,250,000	South Africa (47%); USSR (25%); United States (13%); China (10%)
Zinc	1,000 metric tons	6,350	290,000	Centrally planned econ. (11%); Canada (19%); United States (18%); Australia (13%)
Zirconium concentrate	1,000 short tons	974	48,000	Australia (29%); South Africa (25%); United States (16%); USSR (10%)

1/ Estimated.

2/ The reserve base is that part of an identified resource that meets specified minimum physical and chemical criteria related to current mining and production practices, including those for grade, quality, thickness, and depth. It may encompass those parts of the resources that have a reasonable potential for becoming economically available within planning horizons beyond those that assume proven technology and current economics. The reserve base includes those resources that are currently economic (reserves), marginally economic (marginal reserves), and some of those that are currently subeconomic (subeconomic resources).

3/ The world reserve base is not adequately delineated.

4/ Most of the reserve base is bismuth recoverable from lead ores.

5/ Shipping grade.

6/ Includes silver recoverable from base metal ores.

Source: U.S. Bureau of Mines, Mineral Commodity Summaries, 1985.

Table E-3.--Metal ores: World exports by country, 1979-83 1/

(In millions of dollars)

Country	1979	1980	1981	1982	1983
Australia	1,458	1,951	2,023	2,015	2/
Bolivia	323	2/	2/	2/	2/
Brazil	1,379	1,722	1,968	1,932	1,906
Canada	1,728	1,864	1,891	1,310	1,346
Chile 3/	606	787	673	646	602
China 3/	99	136	161	73	57
Cuba	213	257	2/	2/	2/
Guinea 3/	206	265	340	325	326
India	366	2/	2/	2/	2/
Indonesia	125	246	189	163	145
Jamaica	213	198	760	130	2/
Liberia	290	310	325	2/	2/
Netherlands	312	395	234	167	120
Papua New Guinea 3/	418	515	452	349	399
Peru	444	563	2/	380	2/
Philippines	725	1,031	753	528	2/
South Africa	2/	2/	372	287	2/
Sweden	541	565	515	405	399
United Kingdom	147	228	112	82	85
U.S.S.R. 3/	91	353	305	380	529
United States	1,076	1,627	873	693	693
Venezuela	243	279	335	2/	2/
West Germany	195	267	171	117	107
Zaire 3/	72	100	77	67	72
Other reporting countries 4/	1,943	1,845	1,793	1,201	1,014

1/ Excludes gold. Caution should be used in interpreting year to year trends because of the large differences in the number of countries providing data for each commodity in each year. For the same reason, totals are not presented.

2/ Data not available.

3/ World imports from this country are used as a proxy for its exports.

4/ Includes data from 57 countries in 1979, 51 in 1980, 44 in 1981, 39 in 1982, and 29 in 1983.

Source: United Nations Trade Data System.

Table E-4.--Metal ores: World exports by commodity, 1979-83 1/

(In millions of dollars)

Commodity	1979	1980	1981	1982	1983
Bauxite	791	780	1,411	697	592
Chromium ores	134	130	181	129	56
Copper ores	1,466	1,982	1,583	1,362	776
Iron ores	5,455	5,865	5,958	5,240	3,627
Lead ores	684	811	415	384	106
Manganese ores	290	134	442	330	80
Nickel ores	307	474	136	77	40
Silver and platinum ores	946	2,092	1,138	865	1,134
Tin ores	401	294	316	291	261
Tungsten ores	282	260	256	143	60
V, Mo, Ta, Ti, Zr, Nb ores	1,297	1,521	1,102	755	502
Zinc ores	750	725	651	787	567
Other metal ores, except gold	405	486	731	189	19

1/ Caution should be used in interpreting year to year trends because of the large differences in the number of countries providing data for each commodity in each year. For the same reason, totals are not presented.

Source: United Nations Trade Data System.

Consumption

The pattern of metal ore consumption for 1979-83 is shown in table E-5. Most of the figures in this table represent the production of refined metal and as such are general indicators of metal consumption. In general, the consumption levels decreased during 1980-82. Some ores continued the decline into 1983; others showed increases in this year. Individual consumption patterns notwithstanding, overall consumption of most ores decreased from 1979 to 1983.

U.S. Industry Profile

Structure

Metal ores and concentrates minerals are produced at nearly 1,100 establishments, nearly 300 of which employ 20 or more people. 1/ These establishments are owned by a few large firms, many of which are multinational in character and are both vertically and horizontally integrated, with

1/ U.S. Bureau of the Census, Census of Mineral Industries, 1982. Includes uranium and radium.

Table E-5.—Certain metal ores and concentrates 1/: World consumption and principal consuming countries, 1979-83

Metal ores	Units of quantity	1979	1980	1981	1982	1983	Principal consumers in 1983 and their respective shares of world consumption
Antimony 2/	Metric tons	18,900	16,000	15,000	3/	3/	China (37%); USSR (16%); Yugoslavia (13%); United States (13%)
Bauxite 4/	1,000 metric tons	31,429	33,489	32,184	28,195	29,530	Australia (24%); United States (14%); USSR (11%); Jamaica (6%)
Chromite 5/	1,000 short tons	3,458	3,507	3,315	3,030	2,860	USSR (24%); South Africa (23%); Japan (12%); Sweden (8%)
Cobalt 6/	Short tons	31,426	33,312	28,417	21,649	20,316	Zaire (30%); USSR (25%); Zambia (13%); Finland (8%)
Copper 7/	1,000 metric tons	7,543	7,485	7,870	7,771	7,758	USSR (14%); Chile (13%); Japan (12%); United States (12%)
Iron ore 8/	1,000 short tons	585,254	559,855	551,501	501,672	485,175	USSR (24%); Japan (17%); United States (10%); China (8%)
Lead 9/	1,000 short tons	3,275	3,171	3,107	3,162	3,209	United States (16%); USSR (15%); Australia (11%); Japan (8%)
Manganese ore 10/	1,000 short tons	6,912	6,666	6,469	6,180	5,915	USSR (33%); Japan (11%); China (9%); Norway (8%)
Nickel 11/	Short tons	704,641	805,401	768,494	660,053	685,080	USSR (30%); Canada (14%); Japan (11%); Australia (7%)
Silver 12/	1,000 troy ounces	462,000	368,200	345,800	361,500	366,600	3/
Tin 13/	Metric tons	249,337	249,236	247,832	239,213	222,035	Malaysia (29%); USSR (17%); Indonesia (13%); Thailand (8%)
Tungsten	Metric tons 14/	48,487	47,625	47,854	41,084	38,925	USSR (41%); U.S. (13%); China (12%); South Korea (4%)
Zinc 15/	1,000 metric tons	5,952	5,756	5,755	5,506	5,810	USSR (14%); Canada (11%); Japan (10%); West Germany (6%)

1/ Date unavailable for consumption of arsenic trioxide, beryl, bismuth, columbium, gold, mercury, molybdenum, platinum group ores, rare earth ores, tantalum, titanium concentrates, vanadium, and zirconium concentrate.
2/ Production of antimony metal, country shares based on 1979 data (the last year that estimates for China and the U.S.S.R. were available; Source: Metal Bulletin Handbook.
3/ Not available.
4/ Production of alumina.
5/ Production of chromium ferroalloys.
6/ Production of cobalt metal.
7/ Smelter production of primary copper.
8/ Production of pig iron; Source: American Iron and Steel Institute.
9/ Smelter production of primary lead.
10/ Production of manganese ferroalloys.
11/ Smelter production of nickel.
12/ Consumption in market economies of silver for coinage, industry, and the arts.
13/ Smelter production of tin.
14/ Contained tungsten.
15/ Smelter production of primary zinc.

Source: Compiled from official statistics of the U.S. Department of the Interior, Bureau of Mines, unless otherwise noted.

interests in the production of a variety of other products, such as chemicals and petroleum, in addition to metal-bearing materials. 1/ In addition, some foreign firms have interests in segments of the U.S. industry, an investment trend which started after World War II. The minerals that are found together in certain ores, e.g., lead, zinc, silver, copper, and gold and other mining and processing similarities have facilitated horizontal integration of many firms in the industry.

In addition, a majority of companies in the industry are vertically integrated, having mining, smelting, refining, and fabricating facilities, as well as their own marketing organizations. Since metal ores and concentrates move basically from the producing areas to the smelters, most producers are also the principal consumers of their metal-bearing ores and concentrates. As a result, relatively small quantities of metal-bearing materials enter the open market. Those companies which produce their own raw materials make intracompany transfers from the mining division of the company to the smelting division. Those companies that do not have a captive raw materials source, or those that must supplement this source, purchase metal-bearing materials directly from other domestic or foreign producers, from trading firms, or on the spot market.

Metal ores and concentrates have no intrinsic value; their only use is the manufacture of various metal or chemical products. Consequently, the market for these metal-bearing materials is totally dependent upon the demand for the primary, refined metals, or chemicals.The needs of customers relative to recoverable metal content and physical properties can dictate demand for one metal-bearing material over others.

Investment, labor, and financial situation

The production of metal ores and concentrates is capital intensive and, in some cases, such as certain iron ore operations, encourages firms to enter into joint ventures in order to meet initial capital requirements. Changes in mining and concentrating methods are generally incremental and occur slowly. Radical changes have not been forthcoming. In 1982, the metal mining industry's capital expenditures for development and exploration of mineral properties, for construction, and for machinery amounted to $1,150 million, and the value added in mineral production and the development of mineral properties came to $3,130 million. 2/

Employment in the metal mining industry generally declined during 1980-84. The number of production workers decreased from 73,900 in 1980 to

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1/ Acquisition of mining interests by oil companies, which had been popular in recent years, seems to have halted. The waning popularity of such acquistions stems from the poor profitability of mining, the reduced availability of cash within oil companies (due to the current oil glut), and an increased awareness of differences between the oil and mining businesses on the part of oil executives.

2/ U.S. Bureau of the Census, Census of Mineral Industries, 1982. Includes uranium and radium.

41,300 in 1984, and the total number of employees decreased from 98,200 to 56,900 in this period, as shown in the following tabulation: 1/

	Total employment	Production workers	Average hourly earnings of production workers
1980	98,200	73,900	$10.26
1981	103,700	78,000	11.55
1982	73,800	53,600	12.33
1983	56,900	41,300	12.57
1984	56,900	41,300	13.01

The profitability of the metal-ores mining industry is not available since these materials are generally processed at or near the mine, entering the market in the form of metal or other processed articles.

Government

The U.S. Government influences mineral production in the United States in a variety of ways, including--

- control over access for exploration and mining on many Federal lands
- technical support from the U.S. Geological Survey and the U.S. Bureau of Mines
- National Defense Stockpile purchases and releases
- Defense Production Act authority for Federal subsidies, purchase arrangements, and loan guarantees to assure supplies of essential defense materials

U.S. Market

Production

In the United States, the value of metal ores mining declined from $8.9 billion in 1980 to $5.5 billion in 1982 because of the decreased consumption and depressed prices associated with the recession. The market has since improved and production has risen to an estimated $6.0 billion in 1984, although about 30 percent below the 1980 level, as shown in the following tabulation (in millions of dollars): 2/

1/ U.S. Department of Labor, Earnings and Employment.
2/ U.S. Bureau of Mines, 1984 data estimated.

	Value of total U.S. metal ore production
1980	8,921
1981	8,842
1982	5,517
1983	5,866
1984	1/ 6,000

The largest components of the U.S. metal mining industry are the iron and copper mining sectors, with each accounting for about one-third of the value of U.S. production. Gold, silver, zinc, lead, and molybdenum largely account for most of the balance of U.S. metal ore production as shown in the following tabulation (in millions of dollars):

	Value of U.S. metal ore production, 1983
Bauxite	11
Copper	1,751
Gold	830
Iron	1,941
Lead	215
Molybdenum	167
Silver	497
Tungsten	11
Vanadium	31
Zinc	251
Other ores 1/	161
Total, metal ores	5,866

1/ Includes ores of antimony, beryllium, magnesium, manganese, mercury, platinum group metals, rare earth metals, titanium, and zirconium.

Exports

Metal ores exports from the United States declined 62 percent, from $1.3 billion in 1980 to $0.5 billion in 1983, before rising to $0.6 billion in 1984 (table E-6). While the world economic recession and the strength of the dollar probably both contributed to the general decline of these shipments during 1980-83, the export increases in 1984 (when the dollar was particularly strong) suggest that the rebound in global industrial activity had a stronger influence on exports.

The demand for U.S. metal ores exports is dependent on the size of foreign countries' consuming markets relative to their mineral reserves and production capacity. Transportation costs are significant in relation to the value of the metal-bearing materials. 1/ The bulk of U.S. metal ore shipments are to developed areas such as Canada, Japan, and Western Europe. Shipments of molybdenum, iron, and copper ores, the principal metal ores exported by the United States, fluctuated during 1980-84 (table E-7). Exports of molybdenum

Table E-6.--Metal ores: U.S. exports of domestic merchandise, by markets, 1980-84

(F.a.s. value, in millions of dollars)

Market	1980	1981	1982	1983	1984
Canada	266	281	180	216	264
Netherlands	257	190	116	96	151
Japan	292	242	201	58	102
Belgium and Luxembourg	140	30	19	21	26
West Germany	125	43	50	36	25
United Kingdom	35	22	18	18	24
Mexico	15	18	8	5	9
France	11	5	1	1	8
Republic of Korea	15	1/	3	1/	4
Austria	21	23	9	9	3
All other	99	102	72	29	19
Total	1,276	957	678	490	636

1/ Less than $0.5 million.

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

1/ U.S. International Trade Commission, Summary of Trade and Tariff Information, Ores and Concentrates and other Metal-bearing Materials, Control No. 6-1-15, February 1982.

Table E-7.--Metal ores: U.S. exports of domestic merchandise, by commodity, 1980-84

(F.a.s. value, in millions of dollars)

Commodity	1980	1981	1982	1983	1984
Molybdenum	715	407	232	185	243
Iron ore	231	245	151	183	239
Copper	203	207	211	48	69
Rare earth ores	16	19	11	10	17
Manganese ore	6	7	3	2	16
Zinc	25	23	33	23	13
Platinum group ores	1/	1	1	9	7
Silver	6	2	1/	1	5
Bauxite	5	3	3	3	5
Lead	11	19	10	8	5
Chromite	1	6	2	2	3
Zirconium concentrates	3	4	3	3	3
Titanium concentrates	3	2	1	1	2
Tungsten	15	1	3	1/	1
Gold	11	2	1	5	1
Vanadium	1	1	1	1/	1/
Tantalum	13	1/	1	0	0
Other metal ores	10	10	12	8	8
Total	1,276	957	678	490	636

1/ Less than $0.5 million.

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

and copper ores showed an overall decline, with shipments of both about 66 percent lower in 1984 than in 1980, while exports of iron in 1984 were roughly the same as those in 1980 and 1981.

Imports

U.S. imports of metal ores are generally about twice as large as U.S. exports. During 1980-84, imports fluctuated but showed an overall decline from $1.9 billion in 1980 to $1.2 billion in 1984 (table E-8). Canada is the primary foreign source of metal ores. With the exception of Australia, the remaining major suppliers are developing countries. About 60 percent of each year's imports are iron and bauxite (table E-9).

Table E-8.--Metal ores: U.S. imports for consumption, by principal sources, 1980-84

(Customs value, in millions of dollars)

Source	1980	1981	1982	1983	1984
Canada	736	843	444	413	447
Jamaica	196	173	177	97	150
Guinea	73	94	115	95	107
Peru	178	76	90	115	101
Brazil	109	113	50	55	88
Australia	120	114	57	37	66
Venezuela	81	141	61	50	38
Chile	32	40	47	53	37
Liberia	28	36	43	31	26
Mexico	19	46	74	41	24
All other	369	431	255	125	160
Total	1,940	2,106	1,415	1,113	1,243

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

Table E-9.--Metal ores: U.S. imports for consumption, by commodity, 1980-84

(Customs value, in millions of dollars)

Commodity	1980	1981	1982	1983	1984
Iron ore	773	948	497	452	534
Bauxite	381	393	360	227	311
Silver	158	79	71	115	74
Titanium concentrates	70	68	49	33	56
Gold	33	36	64	80	52
Tungsten	87	91	47	26	52
Zinc	74	110	27	17	29
Tin	11	3	22	10	21
Columbium	28	86	27	18	20
Tantalum	73	54	16	4	19
Manganese ores	46	43	19	20	19
Chromite	56	50	30	10	15
Lead	24	20	9	6	12
Copper	73	57	141	82	10
Zirconium concentrates	11	8	6	4	8
Antimony	12	9	4	2	7
Rare earth ore	2	3	3	2	2
Beryl	1	2	3	3	1
Molybdenum	10	10	13	3	1/
Mercury	0	0	1/	1/	1/
Cobalt	1/	1/	1/	1/	1/
Nickel	16	34	7	0	1/
Platium group ores	1/	1/	1/	1/	0
Vanadium	0	1/	1/	0	0
Total	1,940	2,106	1,415	1,113	1,243

1/ Less than $0.5 million.

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

Consumption

Consumption of metal ores fluctuated during 1980-84, but showed an overall decline from $9.6 billion in 1980 to $6.6 billion in 1984 (table E-10). This reflects the decline in demand for primary metals during the recession. Imports' share of metal ores consumption rose from 20.2 percent in 1980 to 22.6 percent in 1982, but fell to 18.8 percent in 1984.

Table E-10.--Metals ores: U.S. producers shipments, exports of domestic merchandise, imports for consumption, and apparent consumption, 1980-84

Year	Producers' shipments	Exports	Imports	Apparent consumption	Ratio of imports to consumption
	Millions of dollars				Percent
1980	8,921	1,276	1,940	9,585	20.2
1981	8,842	957	2,106	9,991	21.1
1982	5,517	678	1,415	6,254	22.6
1983	5,866	490	1,113	6,489	17.2
1984	1/ 6,000	636	1,243	6,607	18.8

1/ Estimated.

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

APPENDIX F

MAJOR CONSUMING INDUSTRIES

MAJOR CONSUMING INDUSTRIES

Ammonia

Industry Profile

The U.S. nitrogenous fertilizer industry, as of 1982, was composed of approximately 109 companies producing both ammonia and ammonia products including such products as, ammonium nitrate, and ammonium phosphates. 1/ There were approximately 45 domestic producers actively manufacturing anhydrous ammonia in the United States in 1984. 2/ These manufacturers were operating only 70 plants in 1984, as 33 were shut down during 1979-84. 3/ Since 1981, 11 U.S. plants stopped production. 4/

Estimated 1984 ammonia production capacity in the United States was approximately 18 million tons, down from 21 million tons in 1980. 5/ The majority of U.S. ammonia production capacity is located in States with large supplies of natural gas available for use as a feedstock and as a fuel, particularly Louisiana, Oklahoma, Texas, and Alaska, which together account for more than 60 percent of U.S. production.

The five largest ammonia producers accounted for approximately 40 percent of available production capacity 6/ throughout the period 1980-84. Employment in the ammonia industry has declined from approximately 9,000 workers in 1980 to approximately 8,000 workers in 1984. 7/

U.S. ammonia capacity has been declining since 1978; there has been no new ammonia plant construction in the United States since 1981, and no new U.S. plants are planned for the immediate future.

U.S. Market

U.S. consumption of anhydrous ammonia is directly related to demand for nitrogenous fertilizers, which account for 80 percent of ammonia's end-use markets. 8/ Industrial consumers of ammonia for the manufacture of urea, ammonium nitrate, ammonium sulfate, ammonia phosphates, and other fertilizers purchase large quantities of ammonia on a continuous long-term basis. The fertilizer market is seasonal in nature, as fertilizer is applied to crops at only certain times during the crop year.

1/ U.S. Department of Commerce, Bureau of the Census, 1982 Census of Manufactures. Data shown is for producers of nitrogenous fertilizers.

2/ U.S. Department of the Interior, "Nitrogen (Ammonia)," Mineral Facts and Problems, 1985.

3/ Brief submitted by Charls E. Walker and Associates on behalf of the Ad Hoc Committee of Domestic Nitrogen Producers on Feb. 9, 1985.

4/ Ibid.

5/ The Fertilizer Institute, Fertilizer Facts and Figures, September 1984, p. 1.

6/ Not including plants which have temporarily shutdown capacity.

7/ Compiled from official statistics of the U.S. Department of Commerce.

8/ "Key Chemicals: Ammonia," Chemical & Engineering News, Feb. 4, 1985, p. 11.

Apparent consumption of ammonia fluctuated during 1980-84 (table F-1), reaching its highest level of 21 million short tons in 1981 before declining for two consecutive years to 16 million short tons in 1983. Apparent consumption of ammonia rebounded to 18.8 million short tons in 1984. The 2.8 million short tons increase in 1984 required the use of all of the available domestic capacity, and also stimulated a record level of imports. As a result, the ratio of imports to consumption increased to 17.9 percent in 1984 from 16.4 percent in 1983 and a low of 9.9 percent in 1981.

Domestic production, following the same trend as consumption, increased between 1980 and 1981, declined during 1981-83, and increased again during 1983-84. However, while demand in 1984 slightly surpassed 1980 levels, the permanent shutting down of certain capacity during 1981-83 prevented the domestic producers from reaching previously attainable levels of production. During the entire period, production declined from 18.9 million short tons in 1980 to approximately 16 million short tons in 1984.

Table F-1.--Anhydrous ammonia: U.S. production, exports of domestic merchandise, imports for consumption, and apparent consumption, 1980-84

(Quantity in thousands of short tons, value in thousands of dollars, unit value per short ton)

Year	Production 1/	Exports	Imports	Apparent consumption	Ratio (percent) of imports to consumption
	Quantity				
1980	18,902	828	2,337	18,311	12.8
1981	19,542	616	2,091	21,017	9.9
1982	17,685	742	2,113	19,056	11.1
1983	13,811	363	2,639	16,087	16.4
1984	2/ 16,000	533	3,283	18,750	17.9
	Value				
1980	2,570,672	107,122	234,420	2,697,970	8.7
1981	3,165,804	90,740	244,866	3,319,930	7.4
1982	2,281,365	100,525	293,042	2,473,887	11.8
1983	1,878,296	48,336	344,320	2,174,280	15.8
1984	2,640,000	85,812	473,842	3,028,030	16.0
	Unit value				
1980	$136.00	$129.36	$100.29	-	-
1981	162.00	147.22	117.08	-	-
1982	129.00	135.56	138.66	-	-
1983	136.00	133.29	130.47	-	-
1984	165.00	161.02	144.32	-	-

1/ Quantity from Fertilizer Facts and Figures, September 1984, p. 2; unit value compiled from McGraw Hill, Green Markets Published Fertilizer International Markets Weekly, prices-FOB Gulf Coast.
2/ Estimated.

Source: Compiled from official statistics of the U.S. Department of Commerce, except as noted.

U.S. imports of ammonia declined from 2.3 million short tons in 1980 to 2.1 million short tons in 1981, and rose thereafter to 3.3 million short tons in 1984 (table F-2). The major source of these imports was the Soviet Union, Canada, Trinidad, and Mexico. These four nations accounted for 94 percent of the volume of 1984 U.S. ammonia imports, as well as 94 percent of the value.

U.S. firms with production facilities in Canada and Trindad accounted for much of the ammonia produced in these nations. These imports are reported to

Table F-2.--Anhydrous ammonia: U.S. imports for consumption, by principal sources, 1980-84

Source	1980	1981	1982	1983	1984
	Quantity (short tons)				
USSR	1,102,520	796,351	604,554	642,494	974,065
Canada	503,919	487,701	579,478	779,146	980,816
Trinid	332,815	340,330	291,039	535,223	814,289
Mexico	377,347	433,935	584,165	575,032	329,672
Brazil	0	0	0	0	65,108
Venez	650	0	20,874	28,384	50,818
F W Ind	0	9,403	9,474	69,675	41,235
Nethlds	11,254	0	0	0	12,202
Fr Germ	0	0	0	0	6,614
Dom Rep	0	0	0	0	5,240
All other	8,853	23,746	23,836	9,107	3,197
Total	2,337,358	2,091,466	2,113,420	2,639,061	3,283,256
	Value (1,000 dollars)				
USSR	94,796	78,414	88,765	85,722	139,604
Canada	56,573	60,534	83,314	111,051	131,446
Trinid	38,650	44,535	39,370	66,050	125,883
Mexico	42,290	56,972	73,702	69,491	48,453
Brazil	-	-	-	-	10,958
Venez	94	-	2,315	3,164	7,939
F W Ind	-	752	1,520	7,797	5,712
Nethlds	1,351	-	-	-	1,919
Fr Germ	-	-	-	-	1,068
Dom Rep	-	-	-	-	515
All other	667	3,659	4,057	1,044	344
Total	234,420	244,866	293,042	344,320	473,842
	Unit value (per short ton)				
USSR	$85.98	$98.47	$146.83	$133.42	$143.32
Canada	112.27	124.12	143.77	142.53	134.02
Trinid	116.13	130.86	135.27	123.41	154.59
Mexico	112.07	131.29	126.17	120.85	146.97
Brazil	-	-	-	-	168.31
Venez	145.08	-	110.89	111.48	156.23
F W Ind	-	80.00	160.47	111.91	138.52
Nethlds	120.05	-	-	-	157.24
Fr Germ	-	-	-	-	161.48
Dom Rep	-	-	-	-	98.26
All other	75.30	154.07	170.20	114.67	107.61
Average	100.29	117.08	138.66	130.47	144.32

1/ Less than 500.

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

be "captive" in nature, and are meant for use by the respective U.S. firms in their own domestic U.S. operations. 1/

U.S. ammonia exports fluctuated during 1980-84, as significant production capacity came onstream in certain energy-rich nations. This ammonia was used to both supply both these nations own domestic demands as well as demand in other neighboring nations. In many cases, these nations replaced U.S.-produced ammonia with their own domestic product both in their home and in the export markets. As a result, U.S. exports of ammonia declined from a high of 828,000 short tons in 1980 to a low of 363,000 short tons in 1983 (table F-3). The volume of U.S. ammonia exports increased in 1984 to 533 million short tons, as U.S. producers responded to demand by newly developing markets in Taiwan, Jordan, South Africa, and India. The largest market for U.S. ammonia exports in 1984 was the Republic of Korea, which accounted for 58 percent of all U.S. ammonia exports.

Production Costs and Prices

Natural gas costs for a producer of ammonia vary according to the size of the plant and the actual chemical process used to manufacture the ammonia. For example, older ammonia capacity in the United States built in the early to mid-1970's was based on a technology known as the "reciprocating" process. This process requires a larger volume of energy than does the technology used in the newer plants and those plants which were updated and began coming back onstream around 1979-80. The average production costs of U.S. ammonia producers attributable to the use of natural gas as a source of energy and as feedstocks rose during 1970-82 before leveling off in 1983. The following tabulation shows the cost of natural gas to produce one short ton of ammonia: 2/

Year	Natural gas cost
1970	$10.98
1973	13.89
1975	22.63
1977	42.06
1978	50.17
1979	59.12
1980	70.95
1981	85.01
1982	86.52
1983	82.95

1/ Submission by Charls E. Walker Associates, Inc., on behalf of the Ad Hoc Committee of Domestic Nitrogen Producers on Feb. 19, 1985, "Ammonia Fact Sheet," p. 7.

2/ The Fertilizer Institute, Fertilizer Facts and Figures, September 1984, p. 42.

Table F-3.--Anhydrous ammonia: U.S. exports of domestic merchandise, by principal markets, 1980-84

Market	1980	1981	1982	1983	1984
	Quantity (short tons)				
Kor Rep	0	21,945	124,373	254,060	301,554
Phil R	19,915	21,383	20,745	0	51,305
China t	0	0	64	77	32,494
Turkey	245,459	167,974	287,601	11,201	29,107
Canada	35,962	62,592	34,333	58,239	27,158
Jordan	0	0	0	5	23,136
Rep Saf	0	4	0	12	17,359
India	0	0	0	0	14,976
Spain	8,331	0	18,684	5,511	12,114
Belgium	78,288	79,161	62,839	12,359	9,925
All other	440,131	263,288	192,916	21,167	13,811
Total	828,086	616,347	741,555	362,631	532,939
	Value (1,000 dollars)				
Kor Rep	-	2,917	17,555	31,465	49,688
Phil R	2,649	3,190	2,759	-	7,790
China t	-	-	5	4	5,242
Turkey	32,938	24,066	37,521	1,809	4,806
Canada	6,440	10,127	6,499	9,110	3,536
Jordan	-	-	-	1	3,505
Rep Saf	-	1	-	1	2,812
India	-	-	-	-	2,295
Spain	964	-	2,590	650	1,910
Belgium	10,208	13,548	7,983	1,911	1,499
All other	53,923	36,892	25,613	3,386	2,727
Total	107,122	90,740	100,525	48,336	85,812
	Unit value (per short ton)				
Kor Rep	-	$132.90	$141.15	$123.85	$164.77
Phil R	133.00	149.18	133.00	-	151.84
China t	-	-	73.52	50.79	161.33
Turkey	134.19	143.27	130.46	161.50	165.11
Canada	179.07	161.79	189.28	156.42	130.20
Jordan	-	-	-	120.00	151.50
Rep Saf	-	127.00	-	54.08	162.00
India	-	-	-	-	153.26
Spain	115.67	-	138.63	117.95	157.70
Belgium	130.40	171.14	127.04	154.59	151.05
All other	122.52	140.12	132.77	159.97	197.47
Average	129.36	147.22	135.56	133.29	161.02

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

The following tabulation shows actual ranges of natural gas costs as well as other costs of production for the U.S. ammonia industry as it operated for the year ending December 31, 1983: 1/

Production cost category	Cost of ammonia produced (per short ton)
Natural gas	$71.00 - $114.00
Electricity	1.90 - 15.00
Other utilities	1.00 - 3.50
Operating labor	2.00 - 5.00
Plant overhead	3.30 - 7.00
Maintenance (labor, overhead, material)	4.00 - 9.50
Depreciation	6.40 - 9.00
Catalysts	.80 - 1.15
Other	3.00 - 4.50
Total production costs	92.00 - 170.00

Within the framework of the data in the previous tabulation, the share of the production costs attributable to natural gas ranges from 67 to 78 percent. Other energy-related costs accounted for between 3 and 11 percent of the total production costs shown, so that total energy and feedstock cost made up about 80 percent of total production cost.

The following tabulation shows the range of U.S. industry's total production costs and natural gas cost to produce one short ton of ammonia for some selected years during 1970-83: 2/

Year	Natural gas cost	Total production costs	Ratio of natural gas costs to total production costs
			Percent
1970	$8.30 - $13.60	$19.00 - $34.50	39 - 44
1973	11.20 - 17.60	23.00 - 41.50	42 - 49
1975	17.90 - 30.00	35.00 - 69.00	43 - 51
1978	42.00 - 60.50	65.50 - 102.00	59 - 65
1981	79.00 - 105.50	104.50 - 157.00	67 - 76
1983	71.00 - 114.00	92.00 - 170.00	67 - 78

1/ Date derived from The Fertilizer Institute, Ammonia Production Cost Survey, Ernst & Whitney, Dec. 31, 1983; the firms reporting to this survey represent approximately 90 percent of the domestic ammonia industry.
2/ Ibid.

The share of production costs attributable to natural gas appears to have stabilized somewhat during 1981-83 after the significant increase during 1975-81. This increase was probably a result of the leveling in the price of all energy sources because of the crude petroleum surplus and resultant decrease in official OPEC prices. Prices paid by farmers have not followed a similar trend, as indicated by the ammonia price (per ton of ammonia) paid by farmers as of March of a given year, except as noted: 1/

1975 1/	$265
1978	177
1980	229
1981	243
1982	255
1983	237
1984	275

1/ April. Ammonia, needed as fertilizer early in the season, commands the highest price as the demand peaks at that time of the year. The high price in 1984 probably reflects the relatively tight supply-demand situation previously discussed.

The following tabulation shows the increased share of the price paid for ammonia that is attributable to production costs in general, and natural gas-related production costs in particular (in percent):

Year	Ratio of natural gas costs to price	Ratio of total production cost to price
1975	6.7 - 11.4	13.2 - 26.1
1978	23.7 - 34.2	37.0 - 57.7
1981	32.5 - 43.4	43.0 - 64.7
1983	29.9 - 48.1	40.5 - 69.2

The data indicate that, in general, total production costs as a percent of price have increased during the period. Under this scenario, profits were probably squeezed. However, the data also appear to show that this squeeze was due more to increases in other production costs than to increases in natural gas costs. This is consistent with the previous observation that natural gas costs to the domestic ammonia producer appear to have stabilized since 1981.

Carbon Black

Carbon black is elemental carbon, with some surface oxidation, that is produced by the partial combustion or thermal degradation of hydrocarbons in

1/ The Fertilizer Institute, Fertilizer Facts and Figures, September 1984, p. 38.

the vapor phase. 1/ Carbon black is used primarily as a reinforcing agent in rubber which accounts for about 90 percent of its domestic demand; a large share of the reinforced rubber is used in tire manufacture. 2/

Industry Profile

There are currently seven domestic companies producing carbon black. Nameplate capacities for these firms totaled about 3.24 billion pounds per year in 1983, compared with 3.37 billion pounds per year in 1981, and 4.2 billion pounds per year in 1979. Capacity in 1984 was estimated to be even smaller at about 3.15 billion pounds. 3/ This decreasing capacity trend is mainly attributed to lower product prices, overcapacity in the industry, and the recent slump in the automotive industry. 4/ In addition, several older plants were phased out in 1981, mainly due to their extensive use of natural gas which at the time was in a period of steadily increasing prices. In 1982, the industry was operating at about 77 percent of nameplate capacity, compared with 84 percent in mid-1983. Plants are located close to the carbon black market, primarily the Southeast and Southwest, to minimize cost of transportation. 5/ The carbon black itself is light and fluffy and expensive to tranport in comparison to the feedstocks.

U.S. Market

Production of carbon black during 1980-82 decreased by 16 percent, from 2.73 billion pounds to 2.30 billion pounds (table F-4). Reasons for the decline include the economic slowdown experienced during this period, the changeover from bias-ply tires to the longer wearing radials, and the decline in automobile production. In 1983 and 1984, production increased to 2.50 billion pounds and about 2.85 billion pounds, respectively, as the economy strengthened. 6/

Exports of carbon black from the United States amounted to 163 million pounds in 1980 and then declined by 22 percent to 127 million pounds in 1981; they continued to decrease by 41 percent in 1982 to 75 million pounds (table F-5). In 1983 and 1984, exports declined to 68 million pounds, but then recovered to 74 million pounds, respectively. The decline primarily reflected the increasing number of carbon black facilities that came onstream in overseas countries supplying markets that had previously been serviced by the United States.

Carbon black imports increased by 39 percent in 1981 and then decreased by 9 percent in 1982, to 38 million pounds and 35 million pounds, respectively (table F-6). Imports increased by 69 percent in 1983, to 59 million pounds and countinued increasing in 1984, by 161 percent, to 159 million pounds. The

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1/ Brief filed by Cabot Corp., Feb. 19, 1985; Kirk-Othmer, Encyclopedia of Chemical Technology, 1978, vol. 4, p. 631.

2/ "Higher Costs in Store for Pigmented Plastics," Chemical & Engineering News, August 27, 1984, p. 10.

3/ Ibid.

4/ Predicasts, PROMPT, March 1983, p. 146.

5/ Brief filed by Cabot Corp., Feb. 19, 1985.

6/ 1984 production estimated by staff analyst.

ratio of imports to consumption increased from about 1 percent in 1980 to almost 5.5 percent in 1984. Imports increased in general from the exporting countries, with the largest percentage changes occurring from Italy and Belgium (table F-6).

Table F-4.--Carbon black: 1/ U.S. production, exports of domestic merchandise, imports for consumption, and apparent consumption, 1979-83

Year	Production	Imports	Exports	Apparent consumption	Ratio (percent) of imports to consumption
	Million pounds				Percent
1980	2,731	77	163	2,595	1.04
1981	2,700	38	127	2,611	1.46
1982	2,297	35	75	2,257	1.55
1983	2,491	59	68	2,482	2.38
1984	2/ 2,850	159	74	2/ 2,935	2/ 5.42

1/ Including thermal black.
2/ Estimated by the staff of the U.S. International Trade Commission.

Source: Production, trade source; imports and exports, compiled from official statistics of the U.S. Department of Commerce.

Apparent consumption has increased steadily between 1980-84, aside from a decrease of 14 percent in 1982. The continued increase was mainly the result of an increase in shipments of replacement tires. The replacement tires market is about three times larger than the original equipment market, which represents about 20 percent of the overall market. 1/

1/ "Carbon Black Demand Off in 1985, Reflecting Drop in Tire Output," Chemical Marketing Reporter, Mar. 18, 1985, p. 25.

Table F-5.--Carbon black: U.S. exports of domestic merchandise, by principal markets, 1980-84

Market	1980	1981	1982	1983	1984
	Quantity (pounds)				
Japan	11,096,878	16,166,815	11,869,247	10,882,286	12,259,155
Canada	12,698,369	11,722,217	15,082,233	17,320,837	20,554,137
U King	5,753,950	3,543,579	3,523,781	3,296,461	3,374,212
Rep Saf	937,249	1,503,042	1,139,454	6,926,778	7,404,022
Mexico	9,465,025	13,372,908	6,730,378	2,333,141	4,093,462
Fr Germ	11,062,618	6,943,443	3,417,474	4,032,714	3,353,453
Nethlds	2,043,364	1,615,107	1,625,451	2,053,763	2,077,971
France	11,687,163	4,930,206	4,236,727	3,098,782	2,624,237
All other	98,393,048	67,607,587	27,557,306	18,007,431	18,649,379
Total	163,137,664	127,404,904	75,182,051	67,952,193	74,390,028
	Value (1,000 dollars)				
Japan	4,767	8,817	8,103	7,974	10,588
Canada	4,240	4,558	5,449	7,554	8,091
U King	2,887	2,476	2,421	2,545	2,629
Rep Saf	449	675	478	2,264	2,553
Mexico	2,169	3,954	2,525	1,648	2,512
Fr Germ	4,046	3,649	1,964	2,586	2,429
Nethlds	1,553	1,165	1,405	1,894	2,035
France	4,300	2,571	2,511	2,231	1,882
All other	29,623	25,470	14,542	10,979	12,416
Total	54,035	53,336	39,397	39,675	45,134
	Unit value (per pound)				
Japan	$0.43	$0.55	$0.68	$0.73	$0.86
Canada	0.33	0.39	0.36	0.44	0.39
U King	0.50	0.70	0.69	0.77	0.78
Rep Saf	0.48	0.45	0.42	0.33	0.34
Mexico	0.23	0.30	0.38	0.71	0.61
Fr Germ	0.37	0.53	0.57	0.64	0.72
Nethlds	0.76	0.72	0.86	0.92	0.98
France	0.37	0.52	0.59	0.72	0.72
All other	0.30	0.38	0.53	0.61	0.67
Average	0.33	0.42	0.52	0.58	0.61

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

Source	1980	1981	1982	1983	1984
	Quantity (pounds)				
Canada	22,422,749	30,234,617	27,205,323	38,970,273	94,335,171
Mexico	2,465,905	5,251,763	6,726,676	18,812,245	49,745,809
Fr Germ	1,688,920	1,590,327	1,094,612	1,159,044	2,822,135
Nethlds	73,977	152,702	114,993	128,855	3,713,453
Japan	252,871	250,399	111,093	176,071	530,049
Italy	0	6,614	11,023	0	2,640,694
Belgium	0	0	37,585	9,313	482,763
Sweden	0	1,711	1,522	9,206	21,137
All other	262,954	208,291	51,693	149,883	582,420
Total	27,167,376	37,696,424	35,354,520	59,414,890	154,873,631
	Value (1,000 dollars)				
Canada	4,957	6,791	6,728	11,304	27,174
Mexico	186	937	1,384	3,155	7,762
Fr Germ	1,501	1,620	1,297	1,543	3,096
Nethlds	671	449	219	473	1,560
Japan	486	1,302	264	266	938
Italy	-	3	5	-	730
Belgium	-	-	30	17	344
Sweden	-	24	21	113	228
All other	833	187	99	200	545
Total	8,633	11,313	10,046	17,070	42,377
	Unit value (per pound)				
Canada	$0.22	$0.22	$0.25	$0.29	$0.29
Mexico	0.08	0.18	0.21	0.17	0.16
Fr Germ	0.89	1.02	1.18	1.33	1.10
Nethlds	9.07	2.94	1.90	3.67	0.42
Japan	1.92	5.20	2.37	1.51	1.77
Italy	-	0.49	0.48	-	0.28
Belgium	-	-	0.80	1.78	0.71
Sweden	-	14.13	13.80	12.23	10.77
All other	3.17	0.90	1.91	1.34	0.94
Average	0.32	0.30	0.28	0.29	0.27

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

Production Costs and Prices

As in many processes, the efficiency of conversion and the yield of desired product is different for different feedstocks. In the case of carbon black, the preferred carbon black feedstock (CBFS) is one containing a high proportion of polyaromatics. These compounds have a low hydrogen-to-carbon ratio which is important since carbon black is all carbon and the feedstock with the the most carbon will give the best yield.

The CBFS usually consumed in the United States is usually the residue from the catalytic cracking of gas oil to gasoline. This residue, commonly called "cat cracker bottoms," is also processed to remove the catalyst fines remaining behind in the bottoms after the processing of the gas oil. The actual CBFS sold to carbon black producers is often a mixture of these residues or catcracker bottoms. Since gasoline is the primary desired product derived from catalytic cracking, the bottoms differ from one another depending upon the severity of the catalytic cracking and composition of the gas oil, By blending various bottoms, CBFS can be made that meets carbon black producer specifications.

The pricing of the CBFS reflects the demand by the carbon black industry for the feedstock. If the bottoms were not processed to produce CBFS, they would more than likely be burned directly for fuel or used as a feedstock to produce some heavy industrial fuel oils. 1/ The price for CBFS in the United States in 1984 that ranged between $26.50 and $29.00 per barrel, thus reflects demand for CBFS versus the value of bottoms for other uses. The lower the demand for CBFS, the closer its price approaches that of its alternate use. 2/

Approximately 70 to 80 percent of the production cost of carbon black is accounted for by the energy and feedstock costs. Of these costs, about 86 percent is accounted for by the CBFS cost and 14 percent by natural gas cost. 3/ An estimate of the costs associated with producing 1 pound of rubber grade carbon black at a "typical U.S. Gulf Coast plant" is shown in the following tabulation (in cents per pound of carbon black): 4/

CBFS and natural gas fuel-----	$0.16-0.18
Catalysts and chemicals-------	.01
Electricity-------------------	.01
Operating labor---------------	.01
Maintenance-------------------	0.01- .02
Plant overhead----------------	0.01- .02
Insurance and taxes-----------	.01
Depreciation------------------	.01
Total cost per pound-----	$ .21- .23

Prices of carbon black prior to 1980 were approximately 20 cents per pound and subject to annual price discounts of about 15 to 20 percent. This

1/ Brief filed by O'Connor S. Hannan on behalf of the Mexican Carbon Black Industry, Feb. 19, 1985.

2/ Ibid.

3/ Brief filed by Cabot, Feb. 19, 1985, p.2.

4/ Ibid., p. 6.

changed in 1980, as list prices increased to about 30 cents per pound and discounts increased, and remained this way until 1982, when substantial discounting took effect. Thus, in 1983, list prices were not reflecting actual market conditions and the companies were fighting to maintain market share. 1/ Companies began to institute a "temporary voluntary allowance" (TVA) of about 20 percent on invoices in October 1983. This TVA stayed in effect until 1984, when the companies discontinued it to effect a price increase. Subsequently, carbon black list prices rose approximately 30 percent. 2/ As of January 1985, the price range of carbon black was 29.25 cents per pound for rubber grade (bulk), up to 34 cents per pound (bulk) for a bagged higher quality grade. 3/

Cement

Industry Profile

In 1984, cement clinker 4/ and cement (portland hydraulic cement) was produced by 47 companies and 1 State agency operating 143 plants in 40 States compared with 54 companies and 1 State agency, operating 161 plants in 39 States in 1980. The principal producing States in 1984 were Texas, California, Pennsylvania, Missouri, Michigan, and Florida, in declining order. These States accounted for about 50 percent of the U.S. cement production both in 1984 and 1980. The cement industry has continued its trend toward increased concentration. The five largest cement companies comprised about 37 percent of the cement clinker production capacity (33 percent in 1980), and the 10 largest accounted for 55 percent (51 percent in 1980). At the end of 1984 approximately 35 percent of U.S. cement capacity was foreign owned.

The production of cement in the United States is highly automated and a handful of workers can operate a centrally controlled, automated plant. During 1980-84, average employment of production workers in the cement industry had decreased 17 percent, from an average of 24,700 workers in 1980 to about 20,500 workers in 1984. Also, average total employment in the cement industry declined 15 percent, from 30,900 workers in 1980 to 26,200 workers in 1984. Hourly average earnings in the industry have increased from $10.55 in 1980 to $13.47 in 1984.

The U.S. cement industry is a capital intensive industry which operates with a high fixed overhead. Capital expenditures increased from $410.2 million in 1980 to $437.9 million in 1982, although declining to an estimated

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1/ Brief filed by O'Connor S. Hannan on behalf of the Mexican Carbon Black Industry, op. cit..

2/ Ibid., "Higher Costs in Store for Pigmented Plastics," Chemical & Engineering News, p. 10.

3/ Industry sources.

4/ Cement clinker is a finished product that may be stockpiled before it is ground into finished cement.

$345 million in 1984. 1/ Most of the new investment has been in the installation of coal burning and dry process systems with preheaters and precalciners to promote efficiency in fuel consumption. Capital expenditures during 1980-84 increased cement capacity slightly from 107 million tons in 1980 to about 108 million tons in 1984, as new cement capacity coming onstream generally has been offset by the closing of older facilities. The return on investment in the cement industry during the period averaged less than 3 percent. 2/ This was partially due to high fuel costs, and high interest costs incurred in the building of new cement plants and the modernization of old facilities. Much of the U.S. cement industry is based on older technology when compared with the cement industries of Japan and Western Europe, and few major modernization programs are being proposed in the next few years.

U.S. Market

Because of the fungible character and the low value-to-weight ratio of cement, transportation costs are an important limiting factor in determining markets; transportation costs are about $0.10 per ton per mile. More than 95 percent of the portland hydraulic cement produced in the United States is shipped to customers located within 300 miles of the production site and it is estimated that about 50 percent of cement shipments do not travel more than 100 miles, thus creating regional markets.

The demand for cement is influenced by construction activity. Most cement is consumed in residential construction (42 percent in 1983), private industrial and commercial buildings (23 percent in 1983), public building (7 percent in 1983) and other public construction (28 percent in 1983). Shipments of cement declined from 76.2 million short tons ($3.9 billion) in 1980 to 64.0 million short tons ($3.3 billion) in 1982 and then rebounded sharply, increasing 31 percent to an estimated 84.0 million short tons ($4.6 billion) in 1984 (see table F-7). This upturn reflected improved industrial, commercial, and residential construction activity, and continued strong growth in the market is anticipated by industry sources in 1985.

1/ 1982 Census of Manufactures and estimated by the staff of the U.S. International Trade Commission.
2/ Ibid.

Table F-7.--Hydraulic cement and cement clinker: U.S. shipments, exports of domestic merchandise, imports for consumption, and apparent consumption, 1980-84

(Quantity in thousands of short tons; value in thousands of dollars)

Year	Shipments 1/	Exports	Imports	Apparent consumption	Ratio (percent) of imports to consumption
	Quantity				
1980----------	76,241	186	5,263	81,318	6.5
1981----------	71,748	303	3,997	75,442	5.3
1982----------	64,006	203	2,929	66,732	4.4
1983----------	70,420	118	4,736	75,038	6.3
1984----------	2/ 84,000	80	8,876	92,796	9.6
	Value				
1980----------	3,884,769	16,997	195,573	4,063,345	4.8
1981----------	3,723,095	31,564	151,240	3,842,771	3.9
1982----------	3,263,585	27,456	110,886	3,347,015	3.3
1983----------	3,543,324	17,360	161,706	3,687,670	4.4
1984----------	2/ 4,600,000	13,496	294,207	4,880,711	6.0

1/ Portland and masonry cement only.
2/ Estimated by the staff of the U.S. International Trade Commission.

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

U.S. exports of cement are negligible and principally consist of border trade of specialty-type cements. Exports in 1980 increased from 186,000 short tons ($17.0 million) to 303,000 short tons ($31.6 million) in 1981 (table F-8), largely to meet increased Canadian demand due to temporary plant closures caused by strikes. Reflecting renewed production in Canada, U.S. exports have declined since 1981 by 74 percent to 80,000 short tons ($13.5 million) in 1984. Canada is the main market for cement exports.

U.S. imports of cement and clinker paralleled the trend in domestic production during 1980-84. Imports decreased from 5.3 million short tons ($195.6 million) in 1980 to 2.9 million short tons ($110.9 million) in 1982, and then responding to stronger construction more than tripled to 8.9 million short tons ($294.2 million) in 1984 (table F-9). Foreign competition in the U.S. cement market is directed toward those geographic markets most favorable in terms of access to port facilities, warehousing facilities, distance from U.S. plants, the size of the market, and the U.S. selling price. U.S. producers have traditionally imported both finished cement and clinker to help meet their customers' need in times of shortage. However, investment by U.S. and foreign companies in building or acquiring bulk cement import terminals, most recently in Texas, California, and Florida, has encouraged greater use of imported material. Countries that have low-cost fuels, the capability to

Table F-8.--Hydraulic cement and cement clinker: U.S. exports of domestic merchandise, by principal markets, 1980-84

Market	1980	1981	1982	1983	1984
	Quantity (1,000 short tons)				
Canada	123	208	134	106	72
Mexico	55	70	55	6	3
Trinid	1	1	1/	1	2
Venez	1/	3	4	1	1/
Japan	1/	1/	1/	1/	1/
Norway	1/	1/	1/	1/	1/
Hg Kong	1/	1/	1/	1/	1/
Dom Rep	1/	1/	1/	1/	1/
Peru	1/	2	1/	1/	1/
Ecuador	1/	1	1	1/	1/
All other	6	19	8	3	1
Total	186	303	203	118	80
	Value (1,000 dollars)				
Canada	9,571	18,251	17,748	12,183	10,704
Mexico	4,927	7,374	5,145	2,921	1,525
Trinid	165	131	159	230	247
Venez	74	699	1,143	167	93
Japan	43	72	94	57	78
Norway	34	55	22	55	77
Hg Kong	106	94	77	70	71
Dom Rep	149	122	139	126	63
Peru	9	347	79	34	56
Ecuador	107	210	177	56	46
All other	1,814	4,209	2,671	1,461	537
Total	16,997	31,564	27,456	17,360	13,496
	Unit value (per 1,000 short tons)				
Canada	$77.63	$87.63	$132.11	$114.92	$147.83
Mexico	90.13	105.39	93.76	477.22	440.24
Trinid	117.59	200.26	516.40	154.26	123.18
Venez	224.45	276.68	283.71	182.73	2,821.52
Japan	852.08	726.97	1,150.93	662.05	834.26
Norway	840.90	723.68	578.95	578.95	583.33
Hg Kong	641.66	659.25	858.63	553.02	758.48
Dom Rep	565.99	316.32	560.22	645.14	259.66
Peru	411.36	220.17	185.04	1,401.38	536.93
Ecuador	382.20	406.91	235.92	399.92	601.34
All other	306.83	226.82	326.69	457.78	395.11
Average	91.18	104.25	135.01	146.63	168.68

1/ Less than 500.

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

produce clinker, and proximity to deep water ports and the U.S. market are in a favorable position to export to the United States. Slower economic growth in many industrialized and less developed cement producing countries has led to worldwide overcapacity and depressed cement prices. These developments, coupled with the strong dollar and foreign investment in the U.S. industry, have spurred foreign companies to seek U.S. markets.

The bulk of U.S. cement imports have been principally border trade from Canada, with growing amounts of cement and clinker imports from Mexico and Spain. Most imports from Canada and Mexico are shipped overland, but imports from other countries come in by ocean vessel. Canadian imports decreased from 2.6 million short tons ($90.6 million) in 1980 to 2.1 million short tons ($76.5 million) in 1982, before increasing to 2.9 million short tons ($118.4 million) in 1984. A large portion of cement clinker imports from Canada are processed at Canadian-owned grinding plants in the United States.

Mexican imports decreased from 329,000 short tons ($13.8 million) in 1980 to 83,000 short tons ($4.6 million) in 1981, then rose significantly to 2.0 million short tons ($64.9 million) by 1984. The Mexican cement industry's recent focus on the U.S. market is partly attributed to the availability and surplus of new cement capacity that came on-stream from 1980 to 1983, and a lagging demand in their home market.

U.S. apparent consumption of portland hydraulic cement and cement clinker decreased from 81.3 million short tons ($4.1 billion) in 1980 to 66.7 million short tons ($3.3 billion) in 1982. Following the upturn in construction activity in the U.S. economy, cement consumption increased 39 percent to 92.8 million short tons ($4.9 billion) by 1984 (see table F-7). In 1984, consumption increased in all regions of the country, with the Pacific and South Atlantic regions experiencing the largest growth increases over that of 1983. During 1980-84 the ratio of imports to apparent U.S. consumption ranged from a low of 4.4 percent in 1982 to a high of 9.6 percent in 1984.

Production costs and prices

Direct production costs of U.S. cement operations vary from plant to plant, depending on factors such as location for energy sourcing, efficiency of the production facility, and fuel, power, and raw material input costs. The following tabulation contains data on the various factors of production and the percent of total production costs accounted for by each: 1/

1/ Estimated from information received from the U.S. cement industry and the U.S. Bureau of Mines.

Table F-9.-- Hydraulic cement and cement clinker: U.S. imports for consumption, by principal sources, 1980-84

Source	1980	1981	1982	1983	1984
	Quantity (1,000 short tons)				
Canada	2,635	2,338	2,074	2,651	2,936
Mexico	329	83	133	898	2,003
Spain	479	322	245	712	1,763
Venez	0	0	0	60	1,022
Kor Rep	0	0	19	43	332
France	251	239	130	153	225
Japan	619	569	87	1/	184
Colomb	91	48	1	74	227
Denmark	24	53	52	42	32
Belgium	13	8	10	11	13
All other	822	338	179	93	140
Total	5,263	3,997	2,929	4,736	8,876
	Value (1,000 dollars)				
Canada	90,597	83,660	76,526	86,222	118,382
Mexico	13,841	4,623	6,173	30,844	64,855
Spain	22,458	12,357	8,875	23,833	48,866
Venez	-	-	-	1,705	25,281
Kor Rep	-	-	748	3,458	10,046
France	13,699	12,614	6,057	6,435	7,491
Japan	20,822	20,944	3,158	99	5,591
Colomb	2,942	1,327	65	2,153	5,133
Denmark	944	2,031	1,627	2,748	3,664
Belgium	1,041	825	851	900	1,120
All other	29,231	12,860	6,807	3,309	3,777
Total	195,573	151,240	110,886	161,706	294,207
	Unit value (per 1,000 short tons)				
Canada	$34.38	$35.79	$36.91	$32.53	$40.32
Mexico	42.10	55.57	46.44	34.36	32.37
Spain	46.87	38.43	36.25	33.50	27.72
Venez	-	-	-	28.42	24.73
Kor Rep	-	-	39.92	79.87	30.30
France	54.56	52.67	46.49	42.19	33.27
Japan	33.66	36.80	36.18	273.91	30.47
Colomb	32.23	27.76	99.24	28.94	22.64
Denmark	38.84	38.67	31.17	64.93	115.49
Belgium	82.31	101.71	86.23	83.03	88.45
All other	35.55	38.09	38.07	35.59	27.01
Average	37.16	37.84	37.86	34.14	33.15

1/ Less than 500.

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

	Production cost (dollars per short ton)	Percent of total production cost
Raw material------------	$3.00- 4.00	8-8
Fuel--------------------	6.50-11.00	16-22
Power-------------------	6.50- 7.00	16-14
Direct labor------------	5.00- 7.50	13-15
Maintenance-------------	7.00- 7.50	18-15
Depreciation------------	4.50- 5.00	11-10
Other costs (including overhead)-------------	7.50- 8.00	19-16
Total production costs-------------	$40.00-50.00	100-100

Note.--Because of rounding, figures may not add to the totals shown.

Cement is a highly energy-intensive commodity and has one of the highest rates of energy costs to total material costs of any manufactured product. About 1.8 tons of raw material is needed to manufacture 1 ton of finished cement and approximately 90 percent of the energy used is fuel consumed in kiln firing to produce clinker. According to industry sources, over 50 percent of the total direct cost per ton (excluding depreciation and other costs) in producing cement is related to energy. Kiln efficiency, raw material quality, and type of production process affect fuel consumption. Average U.S. production costs range from $40.00 to $50.00 per ton of cement with an estimated 16 to 22 percent cost for fuel. Industry conversion to coal burning and dry process systems in an effort to conserve fuel consumption has changed the fuel input mix. Coal accounted for 92 percent of kiln fuel consumption in 1983 (76 percent in 1980), whereas natural gas accounted for 5 percent in 1983 (16 percent in 1980), and oil accounted for 3 percent in 1983 (8 percent in 1980). Cement manufacturers now burn an estimated 15 percent of total U.S. coal consumption. The cost of coal depends on the location of the consuming cement plant, since transportation costs for coal is a significant part of the price. Coal costs in 1984 were estimated to be about $45 to $60 a ton 1/, including freight.

In addition to fuel, cement manufacturing consumes significant amounts of electric power. The average amount of electrical energy consumed was about 142.1 kilowatt-hours per ton or 112 million Btu's per pound in 1983. Assuming a 40-percent energy efficiency in conversion of fuel to electrical energy, this represents a fuel equivalent of 1.2 million Btu per ton. The average fuel consumption for kiln firing plus electrical energy, primarily for finish grinding, was approximately 6.1 million Btu per ton. The average energy consumption per ton of clinker in 1983 was 4.9 million Btu, down from 5.5 million Btu in 1980. 2/

Cement is shipped by truck, railway, barge, and ship. Truck shipments accounted for more than 94 percent of total shipments in 1984 (91 percent in

1/ Southern California coal costs can go as high as $65 a ton.
2/ U.S. Bureau of Mines.

1980), rail accounted for 5 percent (8 percent in 1980), and barge and ships accounted for about 1 percent during 1980 and 1984. 1/ The deregulation of the trucking industry has encouraged cement companies to contract for shipment with independent truckers; it is estimated that these costs are about $0.10 per ton per mile.

Cement is manufactured to rigid industry specifications with little product variation and is considered a fungible commodity, thus, price is a very important factor. Cement prices have traditionally been determined through a "base-point" pricing system. Under this system, the cement mill closest to a particular customer is considered that customer's base-point, and that mill's price effectively sets the price against which other producers must compete. A delivered price has two components: (1) the f.o.b. mill price and (2) the freight costs. A supplier must grant a larger discount to customers located further away--and relatively closer to a competing supplier--hence, profit margins to those suppliers are smaller and affect a suppliers' willingness and ability to sell to a particular customer. Cement prices are sometimes published by manufacturers but usually the day-to-day market supply and demand establishes the prices. Prices of bulk portland cement for 20 U.S. cities averaged about $62.93 per ton in 1984, up slightly from $62.10 per ton in 1981. 2/

1/ U.S. Bureau of Mines.

2/ Information received from staff of Engineering News Record.

Float Glass

Industry Profile

The glass and glass products industry (which includes flat glass, glass containers, and household glassware) is a major consumer of natural gas, used principally to fuel furnaces where raw materials are melted and refined. Each sector of the glass and glass products industry is dependent on natural gas as its main energy source. For example, natural gas supplied more than 85 percent of the U.S. float glass producers' energy needs in 1982. 1/ The U.S. float glass industry is currently comprised of six large multiproduct firms that produce a wide range of flat glass products (float, rolled, tempered, and laminated) and other products. One of these firms started production in August 1982. The majority of the producing establishments are located in the Eastern and Midwestern states.

Employment in the industry fluctuated during 1980-84, from a peak of nearly 17,000 workers in 1981 to a low of approximately 15,000 in 1982. Employment is believed to have risen to an estimated 15,800 workers in 1984 with the upswing in the automobile and construction industries.

Investment in the facilities used to manufacture unprocessed float glass by four float glass producers rose from $931 million in 1980 to $1.1 billion in 1981, and it is believed that investment in these facilities increased during 1982-84.

The most recent innovation introduced to the float glass industry is the downsized "mini-float" glass plant. This plant operates efficiently at 120 tons or less per day, compared with the average float glass plant level of 500 to 650 tons per day. This plant could replace existing sheet glass plants around the world, enabling countries with small flat glass consumption rates that currently manufacture sheet glass to convert to the more efficient and cost-effective float glass process. 2/

In addition, industry executives and trade sources anticipate increased use of electricity in the manufacturing process to improve efficiency. Electric melters could become more common if the prices of natural gas and other natural resources continue to rise. 3/

U.S. Market

The float glass industry is cyclical, strongly affected by economic conditions in the primary construction and automobile industries, the two largest consumers of float glass. Secondary construction, which includes building repairs and remodeling, is the third major consumer of float glass. The relatively steady demand of the secondary construction industry partially offsets the fluctuations in float glass demand of the two primary users.

1/ Brief submitted by Stewart and Stewart on behalf of PPG Industries, Inc., Feb. 19, 1985.

2/ "A Mini-Float Plant Made Efficient," American Glass Review, June 1984, pp. 7-8.

3/ Ibid.

During 1980-84, U.S. producers' shipments of float glass rose from $625.9 million in 1980 to $720.4 million in 1981, before declining to an estimated $675.0 million in 1982 due to decreased demand by the construction and automobile industries during the economic slowdown (table F-10). During 1983 and 1984, float glass shipments are believed to have increased to $775.0 million as a result of the economic rebound in these consuming industries.

Apparent U.S. consumption exhibited the same trend during 1980-84, rising irregularly from $491.3 million in 1980 to an estimated $697.0 million in 1984. U.S. imports accounted for 2 to 3 percent of apparent consumption during this period.

U.S. exports of float glass declined 35 percent during 1980-84, from $145.7 million in 1980 to $95.0 million in 1984, principally due to the delayed economic recovery abroad and the strong dollar in foreign markets (table F-11). Canada was the principal U.S. export market during the period, accounting for an average of 41 percent of U.S. float glass exports. Mexico and Venezuela were secondary markets during 1980-84.

U.S. imports of float glass fluctuated during 1980-84, falling from $11.0 million in 1980 to $9.6 million in 1981, before rising to $17.6 million in 1983 (table F-12). U.S. imports declined slightly in 1984 to $17.0 million. Mexico emerged as the principal source of float glass imports in 1983 and 1984, displacing Canada and supplying 28 percent of 1984 imports. Canada, West Germany, and Japan were secondary suppliers during the period.

Table F-10.--Float glass: U.S. producers' shipments, exports of domestic merchandise, imports for consumption, and apparent consumption, 1980-84

Year	Shipments	Exports 1/	Imports 1/	Apparent consumption	Ratio of imports to consumption
	1,000 dollars				Percent
1980	625,916	145,659	10,995	491,252	2.2
1981	720,371	141,401	9,555	588,525	1.6
1982	2/ 675,000	111,532	11,278	2/ 574,746	2/ 2.0
1983	2/ 723,000	109,223	17,641	2/ 631,418	2/ 2.8
1984	2/ 775,000	94,975	16,988	2/ 697,013	2/ 2.4

1/ Of the products covered by the subject Schedule B and TSUS numbers, plate and sheet glass account for an insignificant share, if any, of exports and imports; the vast majority are exports and imports of float glass.
2/ Estimated by the staff of the U.S. International Trade Commission.

Source: Compiled from official statistics of the U.S. Department of Commerce, except as noted.

Production Costs and Prices

U.S. producers generally quote prices for unprocessed float glass on a delivered basis in terms of dollars and cents per square foot. These prices

Table F-11.--Float glass: U.S. exports of domestic merchandise, by principal markets, 1980-84

(F.a.s. value, in thousands of dollars)

Schedule B/Country	1980 1/	1981 1/	1982 1/	1983 1/	1984 1/
Total, selected commodities:					
Canada	55,897	55,478	41,559	50,404	43,896
Mexico	7,131	11,538	11,143	8,131	7,309
Venezuela	9,161	15,322	12,203	6,845	7,133
Australia	9,756	10,760	8,265	5,405	5,886
Saudi Arabia	2,465	4,020	3,929	4,648	4,502
United Kingdom	1,124	2,162	8,272	6,780	2,696
New Zealand	1,880	2,891	1,290	1,519	2,124
Hong Kong	2,587	2,977	3,558	2,573	1,832
Germany, West	2,050	2,177	1,261	2,174	1,673
Colombia	2,574	1,499	2,055	886	1,438
All other	51,034	32,578	17,996	19,858	16,487
All countries	145,659	141,401	111,532	109,223	94,975

1/ Of the products covered by the subject Schedule B numbers, plate and sheet glass account for an insignificant share, if any, of exports; the vast majority are exports of float glass.

Source: Compiled from official statistics of the U.S. Department of Commerce, except as noted.

Table F-12.--Float glass: U.S. imports for consumption, by principal sources, 1980-84

(Customs value, in thousands of dollars)

TSUSA/Country	1980 1/	1981 1/	1982 1/	1983 1/	1984 1/
Total, selected commodities:					
Mexico	279	233	718	3,338	4,799
Canada	7,410	2,981	3,742	3,204	3,644
Germany, West	182	456	1,341	3,014	2,563
Japan	2,178	3,220	2,482	3,078	2,145
Korea, South	0	18	671	1,793	1,158
United Kingdom	278	821	362	603	836
Italy	24	356	311	617	632
Spain	121	1,101	1,106	1,044	537
Belgium and Luxembourg	308	117	375	581	279
Brazil	0	0	0	0	119
All other	216	251	170	369	274
All countries	10,995	9,555	11,278	17,641	16,988

1/ Of the products covered by the subject TSUS numbers, plate and sheet glass account for an insignificant share, if any, of imports; the vast majority are imports of float glass.

Source: Compiled from official statistics of the U.S. Department of Commerce, except as noted.

vary according to the size, quality, and thickness of the glass and the type of packing. 1/ The cost of transportation represents approximately 10 percent of the delivered price of the glass. Estimated prices for unprocessed float glass, excluding transportation costs, range from 0.20 cents per square foot to 0.636 cents per square foot. 2/ These prices can fluctuate since float glass is usually sold on a negotiated price basis that can vary significantly depending on the quantity sold and market conditions.

The following tabulation contains data on the various factors of production and the percent of total production cost accounted for by each (in percent):

Energy and feedstock	50
Labor	25
Overhead	10
Maintenance	5
Depreciation	5
Insurance and taxes	5
Total production cost	100

Although progress has been made in energy conservation and efficiency, the float glass industry is still highly energy intensive. Energy, primarily natural gas, accounts for roughly 35 percent of total production costs. Raw materials (silica sand, limestone, soda ash, dolomite, and small amounts of other materials, which are relatively abundant in the United States) account for approximately 15 percent of production costs.

Lime

Industry profile

The lime industry consists of merchant producers who sell in the open market, captive producers who consume all of their production internally, and intermediate producers who manufacture for their own needs and sell the excess on the open market. In 1984, lime was produced by about 74 firms in 137 plants in 38 States and Puerto Rico, compared with about 96 firms in more than 151 plants in 40 States and Puerto Rico in 1980. The lime industry has continued to increase its concentration. The ten largest firms, operating 31 plants, accounted for about 51 percent of total industry output in 1984 compared with 39 percent in 1980. In 1984 the leading producing States were Ohio, Missouri, Pennsylvania, Alabama, and Michigan. These States each produced over 1 million tons annually and together accounted for over 47 percent of the total domestic output, down from 54 percent in 1980.

Employment in the lime industry has decreased more than 23 percent, from an estimated 6,500 employees in 1980 to about 5,000 employees in 1984. Hourly average earnings in the industry increased 25 percent to $9.02 in 1984 from $7.20 in 1980.

1/ Unprocessed Float Glass from Belgium and Italy, Investigation Nos. 104-TAA-11 and 104-TAA-12, USITC Publication 1344, February 1982, p. A-36.
2/ Phone conversation with industry official.

The U.S. lime industry is a capital-intensive industry that operates with a high fixed overhead. New capital expenditures for the lime industry decreased by 48 percent, from $69.7 million in 1980 to $36.1 million in 1982. 1/ This reduced investment trend has continued and capital expenditures in 1984 were estimated to be $34 million, 2/ reflecting relatively depressed steel, chemical, and metal-smelting markets since 1980. The average age of lime plants in the United States is over 15 years.

U.S. market

Lime is a high bulk, comparatively low-cost commodity that is usually not shipped long distances; most lime plants are located within 300 miles of its major consumers--the iron and steel, chemical and mining industries. U.S. shipments of lime decreased from 19.0 million short tons ($842.9 million) in 1980 to 14.1 million short tons ($696.2 million) in 1982, then increased 13 percent to 15.9 million short tons ($844.0 million) in 1984 (see table F-13).

U.S. exports of lime are negligible compared with domestic production, and principally consist of border trade. Exports of lime decreased 40 percent from 42,000 short tons ($4.0 million) in 1980 to 25,000 short tons ($6.8 million) in 1984 (table F-14), largely reflecting reduced demand in the Canadian market. Over 80 percent of total lime exports in 1984 were shipped to Canada; 5 percent to Mexico; 4 percent to Guyana, and the remaining exports to other countries.

Imports of lime into the United States decreased 48 percent, from 480,415 short tons ($19.2 million) in 1980 to 247,485 tons ($13.3 million) in 1984 (table F-15), as diminished demand enabled the U.S. industry to meet domestic needs. U.S. lime imports have been border shipments from Canada (70 percent) and Mexico (29 percent). U.S. imports of lime from Canada declined 62 percent, from 460,867 short tons ($18.2 million) in 1980 to 175,765 short tons ($10.7 million) in 1984. Imports of lime from Mexico increased 279 percent, from 18,897 short tons ($852,000) in 1980 to 71,602 short tons ($2.7 million) in 1984. In 1984 about 85 percent of all lime imports from Mexico entered through the custom district of Nogales, Arizona. Other lime imports from Mexico entered the custom districts of El Paso, Texas, San Diego, California, Miami, Florida, and Mobile, Alabama.

U.S. apparent consumption of lime decreased from 19.4 million short tons in 1980 to 14.4 million short tons in 1982, and then increased 12 percent to 16.1 million short tons in 1984. The increase in apparent consumption largely reflects a market upturn in economic activity in the steel and mining industries and growing demand for lime to control industrial air pollution. In 1984, lime consumption in the iron and steel industry was 38 percent of total consumption, for environmental uses 27 percent, other chemical and industry uses 21 percent, construction 10 percent, and refractories and agriculture 4 percent. During 1980-84 the ratio of imports to apparent U.S. consumption remained stable at about 2 percent annually.

1/ 1982 Census of Manufactures.
2/ Estimated by the staff of the U.S. International Trade Commission.

Table F-13.--Lime: U.S. shipments, exports of domestic merchandise, imports for consumption, and apparent consumption, 1980-84

(Quantity in thousands of short tons; value in thousands of dollars)

Year	Sold or used by producers 1/	Exports	Imports	Apparent consumption	Ratio (percent) of imports to consumption
	Quantity				
1980	19,010	42	480	19,448	2
1981	18,856	28	504	19,332	3
1982	14,075	23	348	14,400	2
1983	14,867	28	283	15,122	2
1984	15,905	25	247	16,127	2
	Value				
1980	842,922	3,990	19,177	858,109	2
1981	884,197	3,996	21,563	901,764	2
1982	696,207	3,199	16,808	709,816	2
1983	757,611	4,814	14,775	767,572	2
1984	844,000	6,805	13,379	850,574	2

1/ Includes dead burned dolomite.

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

Table F-14.--Lime: U.S. exports of domestic merchandise, by principal markets, 1980-84

Market	1980	1981	1982	1983	1984
	Quantity (short tons)				
Canada	23,784	15,995	10,691	17,686	20,310
Mexico	11,897	4,933	4,554	709	1,300
Guyana	1,925	1,800	1,583	2,655	1,107
Bahamas	830	738	829	888	604
Panama	30	518	1,985	1,051	509
Phil R	410	202	397	333	265
Brazil	78	115	79	98	71
Bermuda	399	535	572	330	154
Kor Rep	1	0	21	249	31
Rep Saf	24	4	80	45	50
All other	2,465	3,592	1,750	4,112	315
Total	41,843	28,432	22,541	28,156	24,716
	Value (1,000 dollars)				
Canada	2,062	1,707	1,256	3,253	5,908
Mexico	1,136	409	331	96	194
Guyana	146	136	124	317	176
Bahamas	90	91	120	134	99
Panama	3	68	221	118	86
Phil R	65	30	67	57	56
Brazil	31	52	54	52	55
Bermuda	42	73	66	64	52
Kor Rep	2	-	3	70	38
Rep Saf	5	3	19	10	16
All other	407	1,426	936	642	125
Total	3,990	3,996	3,199	4,814	6,805
	Unit value (per short ton)				
Canada	$86.71	$106.71	$117.52	$183.95	$290.89
Mexico	95.45	82.93	72.70	135.49	149.33
Guyana	76.00	75.67	78.33	119.23	158.99
Bahamas	108.66	123.97	144.95	151.03	163.73
Panama	100.23	130.99	111.18	112.39	168.69
Phil R	159.62	148.18	169.60	172.32	212.11
Brazil	397.13	453.17	689.54	535.32	779.69
Bermuda	105.44	136.60	114.56	195.29	339.27
Kor Rep	1,960.00	-	161.48	281.57	1,232.71
Rep Saf	220.96	741.50	238.71	214.76	315.82
All other	165.10	397.07	535.10	156.20	395.27
Average	95.36	140.54	141.90	170.99	275.34

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

Table F-15.--Lime: U.S. imports for consumption, by principal sources, 1980-84

Source	1980	1981	1982	1983	1984
	Quantity (short tons)				
Canada------	460,867	494,624	317,505	226,829	175,765
Mexico------	18,897	9,521	30,759	55,682	71,602
Spain-------	0	0	0	0	2
Venez-------	0	0	0	0	44
Thailnd-----	0	2	1	1	1
U King------	0	4	0	0	27
USSR--------	0	0	0	0	0
Rep Saf-----	20	118	0	0	24
Fr Germ-----	51	0	32	3	6
Switzld-----	0	0	0	0	11
All other---	580	71	77	47	3
Total---	480,415	504,340	348,374	282,562	247,485
	Value (1,000 dollars)				
Canada------	18,214	20,935	15,405	12,620	10,696
Mexico------	852	546	1,301	2,088	2,667
Spain-------	-	-	-	-	4
Venez-------	-	-	-	-	3
Thailnd-----	-	2	1	1	2
U King------	2	6	1	1	2
USSR--------	-	-	-	-	2
Rep Saf-----	1	5	-	-	1
Fr Germ-----	10	-	11	2	1
Switzld-----	-	-	-	-	1
All other---	98	70	89	62	1
Total---	19,177	21,563	16,808	14,775	13,379
	Unit value (per short ton)				
Canada------	$39.52	$42.32	$48.52	$55.64	$60.85
Mexico------	45.10	57.30	42.30	37.51	37.25
Spain-------	-	-	-	-	1,773.50
Venez-------	-	-	-	-	59.73
Thailnd-----	-	1,028.00	1,110.00	1,470.00	2,124.00
U King------	-	1,406.75	-	-	75.37
USSR--------	-	-	-	-	-
Rep Saf-----	43.00	43.07	-	-	56.00
Fr Germ-----	201.55	-	348.13	622.33	171.67
Switzld-----	-	-	-	-	76.18
All other---	168.36	991.28	1,157.60	1,322.13	266.33
Average--	39.92	42.76	48.25	52.29	54.06

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

Production costs and prices

Direct production costs of U.S. lime operations vary from plant to plant, depending on the location of energy sourcing, type of production facility, and fuel, power and raw material input costs. The following tabulation contains data on the various factors of production per short ton and the percent of total production costs accounted for each: 1/

	Value (dollars per short ton)	Percent of total production cost
Raw materials----------	$4.00-$8.00	13-20
Fuel-------------------	17.70-19.05	55-48
Power------------------	1.00- 1.75	03-04
Direct labor-----------	3.00- 4.00	09-10
Other costs------------	6.30- 7.20	20-18
Total production costs------------	32.00-40.00	100-100

The lime industry is energy intensive, having one of the highest rates of energy costs to material costs among industries, and requires more energy input per ton of production (4.2 million Btu) than most other industrial minerals. Lime production costs have increased significantly as a result of higher fuel costs, which represent about 48 to 55 percent of total production costs. About one-third ton of coal is needed to produce a ton of lime. Direct fuel sources for the commercial lime industry through 1983 were coal, 78 percent; natural gas, 14 percent; petroleum coke, 6 percent; and oil, 2 percent. 2/ The high costs of natural gas resulted in a 39-percent reduction in its use and a 28-percent increase in the use of coal and coke compared with that of 1980. Natural gas costs were 50 to 100 percent more expensive than coal in most areas. In addition to fuel, lime manufacturing kilns (primarily rotary and vertical types) consume significant amounts of electric power. The average power usage for a rotary kiln (149) is about 20 kilowatthours (kWh) per ton. U.S. plants with vertical kilns (112) require about 40 kWh per ton of line produced and plants with non-preheated rotary kilns require roughly 28 kWh per ton.

As a bulk commodity, transportation of the lime from production to its point of use is an important cost consideration; transport costs are estimated at about $0.10 per ton per mile. Transportation charges for deliveries beyond 200 to 300 miles are usually such a large factor in the final delivered cost that consumers must use closer suppliers. However, the deregulation of the trucking industry has allowed lime companies to negotiate lower rates with independent truckers. Lime is a relatively low-priced commodity manufactured to rigid industry specifications, with little product variations, and, therefore, price is a very important factor. Prices for large bulk shipments of lime are mainly sold on a delivered basis whereas smaller quantities are sold on a F.O.B. plant basis. The average price per ton of lime (f.o.b. plant) in 1984 was $53.00, up 19 percent from $44.34 per ton in 1980. 3/

1/ Estimated from information received from the U.S. lime industry and the U.S. Bureau of Mines.
2/ National Lime Association.
3/ U.S. Bureau of Mines.

Metals

Industry Profile 1/

The primary metals industries, which are the major consumers of metal ores, consist of about 550 firms that operate about 700 establishments throughout the United States. Although geographically dispersed, a high percentage of the firms are concentrated in the Midwest. The industries collectively employ almost 400,000 persons, about 300,000 of which are production related workers, as shown in the following tabulation: 2/

	Total employment	Production workers	Average hourly earnings of production workers: Ferrous 1/	Average hourly earnings of production workers: Nonferrous 2/
1980----------	582,500	449,100	$11.39	$10.63
1981----------	575,000	443,400	12.60	11.98
1982----------	449,700	332,500	13.36	12.94
1983----------	393,500	294,400	12.89	13.43
1984----------	390,300	298,000	12.99	13.44

1/ Blast furnace and basic steel products establishments (SIC 331).
2/ Primary nonferrous metal establishments (SIC 333).

Capital expenditures in 1982 totaled $2.6 billion, which represented about 5 percent of the total value of industry shipments.

During 1982-83, the primary metals industries were adversely affected by the economic recession, resulting in decreased demand, and in 1984 experienced increased import competition, which, in the case of steel, ferroalloys, and copper, led to the filing of unfair trade complaints, and/or complaints under section 201 of the Trade Act of 1974. 3/ During the 1980's, growth in the industries is expected to be limited by a number of factors, including materials substitution, import competition in primary and fabricated products, and continuing structural changes in demand brought about by such phenomena as the downsizing of automobiles. In the case of copper, these developments are expected to result in a continued decline in consumption throughout the balance of the 1980's, though at a lower rate of reduction than that of the past decade. 4/

U.S. market

Total metals consumption increased from $71.1 billion in 1980 to $81.1 billion in 1981, but declined to $59.5 billion during 1983 (table F-16). Consumption rose to $66.0 billion in 1984. Although demand for metals generally improved in 1983 and 1984, the value of consumption was fairly

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1/ Profile of establishments classified in SIC 3312, 3313, and 333.
2/ Compiled from data in the U.S. Department of Labor, Employment and Earnings.
3/ Under section 201, the President can provide industries trade relief when imports have been found to be a substantial cause of serious injury, or threat thereof, to a domestic industry.
4/ U.S. Department of Commerce, 1985 U.S. Industrial Outlook, pp. 20-3.

Table F-16.--Metals: U.S. producers' shipments, exports of domestic merchandise, imports for consumption, and apparent consumption, 1980-84

Year	Producers' shipments 1/	Exports 2/	Imports 2/	Apparent consumption	Ratio of of imports to consumption
	Millions of dollars				Percent
1980-------	63,180	8,868	16,786	71,098	23.6
1981-------	68,580	6,355	18,895	81,120	23.3
1982-------	48,060	3,540	15,406	59,926	25.7
1983-------	3/ 48,000	3,279	14,787	59,508	24.8
1984-------	3/ 50,000	3,542	19,584	66,042	29.7

1/ Shipments of steel mill products, merchant pig iron, and products in SIC product codes 33311-33410.

2/ Unwrought metals, including certain waste and scrap and certain wrought metals not specifically provided for. Trade in steel, however, consists of imports and exports of steel mill products.

3/ Estimated by the staff of the U.S. International Trade Commission.

Source: Official statistics of the U.S. Department of Commerce, except as noted.

stable, reflecting highly competitive pricing as overcapacity continued to pose problems for many metals industries.

Import penetration rose during 1980-84, from 23.6 percent of apparent consumption in 1980, to a high of 29.7 percent of consumption in 1984. The primary sources of imports were Canada and Japan (table F-17).

Table F-17.--Metals: 1/ U.S. imports for consumption, by principal sources, 1980-84

(Customs value, in millions of dollars)

Source	1980	1981	1982	1983	1984
Canada--------------	4,505	4,672	3,433	3,741	5,060
Japan---------------	3,435	3,977	3,532	2,018	3,168
West Germany--------	641	1,304	1,210	680	1,170
South Africa--------	1,022	1,071	689	674	968
Republic of Korea---	422	563	467	596	835
Brazil--------------	285	419	397	498	759
United Kingdom------	630	461	483	1,141	708
Mexico--------------	382	329	378	603	701
France--------------	538	732	604	453	588
Spain---------------	204	376	262	227	526
All other-----------	4,722	4,991	3,951	4,156	5,101
Total-----------	16,786	18,895	15,406	14,787	19,584

1/ Unwrought metals, including certain waste and scrap. Steel, however, is defined as steel mill products.

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

Exports fell during 1980-84, reflecting the effects of the global recession and the relative strength of the dollar in foreign markets, which adversely affected consumption of U.S. products. The primary market for exports during 1980-84 was Canada (table F-18).

Table F-18.--Metals: 1/ U.S. exports of domestic merchandise, by principal markets, 1980-84

(F.a.s. value, in millions of dollars)

Market	1980	1981	1982	1983	1984
Canada	1,524	1,376	856	1,204	1,249
Japan	798	618	554	577	541
United Kingdom	1,758	1,931	201	67	405
Mexico	998	737	278	143	193
Netherlands	368	142	269	246	171
West Germany	351	109	82	74	123
Switzerland	1,000	101	76	100	109
Republic of Korea	105	40	50	50	62
Taiwan	116	72	49	60	47
Saudi Arabia	92	109	147	97	41
All other	1,758	1,120	978	661	601
Total	8,868	6,355	3,540	3,279	3,542

1/ Unwrought metals, including certain waste and scrap. Steel, however, is defined as steel mill products.

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

Production costs and prices

The processing of metal ores into refined metals is a costly, energy-intensive activity that requires considerable capital investment. The value of the ore as a component of the total cost of producing the metal varies greatly. In the case of steel, ore costs account for about 15 percent of total steelmaking costs, with labor and energy costs (including coke) representing approximately 30 and 25 percent of cost, respectively.

Bauxite costs are estimated to account for only 3 to 5 percent of fabricated aluminum rod and sheet prices, and the prices of copper concentrates account for roughly 70 percent of the wholesale price of fabricated copper. 1/

Prices for most major metal products declined during 1980-84 because of poor demand (table F-19). The price of zinc rose during this period because of tight supplies. Steel prices are believed to have declined also. However,

1/ Walter C. Labys, Market Structure, Bargaining Power, and Resource Price Information, Lexington Books, 1980.

the decrease is not reflected in the steel price figures, because list prices posted by producers are generally relatively stable, but are apt to be discounted during periods of weak demand.

Table F-19.--Metal prices, 1980-84

Commodity	Units	1980	1981	1982	1983	1984 1/
Aluminum 2/	Cents per pound	76.1	59.8	46.8	68.3	61.1
Copper 3/	Cents per pound	96.1	79.0	65.6	70.3	62.6
Lead 4/	Cents per pound	41.2	33.3	24.7	19.3	20.1
Nickel 5/	Dollars per pound	$2.85	$2.67	$2.24	$2.20	$2.22
Platinum 6/	Dollars per troy ounce	$677	$446	$327	$424	$357
Steel	Dollars per short ton	$434	$484	$506	$524	$546
Tin 7/	Dollars per pound	$7.62	$6.50	$5.81	$5.89	$5.57
Zinc 8/	Cents per pound	37.4	44.6	38.5	41.4	48.0

1/ Estimated.
2/ U.S. market price quoted in Metals Week.
3/ London Metal Exchange.
4/ London Metal Exchange.
5/ New York dealer, cathode.
6/ New York, dealer price.
7/ London Metal Exchange.
8/ New York, delivered basis.

Source: U.S. Bureau of Mines, Mineral Commodity Summaries, 1985.

Methanol

Industry Profile

The U.S. synthetic methanol industry is composed of 11 companies, 1/ which operated 13 plants that produced either main-product or byproduct methanol in 1984. The majority of the U.S. methanol capacity is located on the gulf coast with approximately 70 percent of U.S. methanol capacity located in Texas, and approximately 25 percent located in Louisiana. As a result of a current world oversupply of methanol, coupled with reduced prices, two major domestic suppliers closed one plant temporarily and another major supplier withdrew from the merchant methanol market. 2/ The U.S. methanol industry currently has approximately 35 percent of the domestic plants shut- down, although those plants still operating may be running at almost nameplate

1/ One producer is a joint venture involving two firms; two other firms are now selling out of inventory as their plants are temporarily shutdown.
2/ "Dupont to Exit Merchant Methanol Business," Chemical and Engineering News, Sept. 10, 1984, p. 7.

capacity throughout 1985. 1/ Although several domestic producers participated in the worldwide trend to broadly expand methanol capacity during 1979-83, much of this new capacity is only replacing closed-down less efficient plants built earlier in the 1970's, and is not adding significantly to world supply.

U.S. Market

As there has been no real increase in demand for methanol related to the much discussed use, as either a neat fuel or a motor fuel blending stock, U.S. demand for methanol has not increased significantly during 1980-84. U.S. apparent consumption fluctuated during 1980-84, increasing overall from 7.1 billion pounds in 1980 to 9.1 billion pounds in 1984 (table F-20). However, because of the supply/demand situation that developed during this period, the unit value of apparent consumption declined from 9.4 cents per pound in 1980 to 6.6 cents per pound in 1984.

Table F-20.--Methanol: U.S. production, imports for consumption, exports of domestic merchandise, and apparent consumption, 1980-84

(Quantity in thousands of pounds, value in thousands of dollars, unit value in cents per pound)

Year	Production	Imports	Exports	Apparent consumption	Ratio (Imports) of imports to consumption
			Quantity		
1980---	7,152,974	235,950	323,304	7,065,620	3.34
1981---	8,576,597	170,994	831,055	7,916,536	2.16
1982---	7,554,588	296,903	1,110,199	6,741,292	4.40
1983---	7,981,771	615,969	653,490	7,944,250	7.75
1984---	1/ 8,279,984	1,127,166	282,794	9,124,356	12.35
			Value		
1980---	674,525	16,441	28,994	662,022	2.48
1981---	807,915	13,270	69,115	752,070	1.76
1982---	569,616	18,791	89,272	499,135	3.76
1983---	532,834	36,277	45,176	523,935	6.92
1984---	2/	56,622	26,770	2/	2/
			Unit value		
1980---	9.43	6.96	8.97	9.37	-
1981---	9.42	7.76	8.32	9.50	-
1982---	7.51	9.54	8.04	7.40	-
1983---	6.67	5.88	6.91	6.60	-
1984---	2/	5.02	9.45	-	-

1/ From Preliminary Report on U.S. Production of Selected Synthetic Organic Chemicals, December 1984.
2/ Not available.

1/ "Methanol," Chemical and Engineering News, Feb. 4, 1985, p. 13.

During 1980-84, the ratio of imports to consumption increased significantly, from 3.3 percent in 1980 to nearly 12.4 percent in 1984 (table F-20). The volume of U.S. imports also increased significantly, from 234 million pounds in 1980 to 1.1 billion pounds in 1984 (table F-21). The major source of these U.S. methanol imports throughout this period was Canada. In 1984, the Canadian share of the total value of U.S methanol imports was 90 percent; Trinidad accounted for 9 percent. The unit values of these Canadian and Trinidadian imports were $0.05 per pound in 1984.

U.S exports of methanol increased from 323 million pounds in 1980 to 1.1 billion pounds in 1982, or by 241 percent (table F-22). During 1982-84, however, U.S. methanol exports declined to 283 million pounds, or by 74 percent. A large part of these changes can be attributed to the increased volume of U.S. methanol exports to Japan during 1980-82 and the subsequent decline in volume of U.S. exports of methanol to Japan during 1982-84. Major export markets in 1984 were the United Kingdom and the Netherlands, together accounting for 49 percent of U.S. methanol exports.

Production Costs and Prices

The pattern of increasing costs along with a worldwide supply/demand imbalance has created pressure on domestic methanol producers to maintain their competitiveness. Costs for natural gas, the primary raw material used by the domestic industry for the production of methanol, ranged from $2.90 per thousand cubic feet to $3.40 per thousand cubic feet during 1984. 1/ As the amount of natural gas remaining under controlled prices dwindles, producers of methanol anticipate further cost increases.

Estimates of the volumes of natural gas needed to produce one gallon of methanol range from .095-.110 thousand cubic feet. Therefore, the range of cost attributable to natural gas for the manufacture of methanol during 1984 varied from approximately 28 to 37 cents per gallon, depending on the plant economics of the individual producer.

The ranges of other production costs for various plants are shown in the following tabulation (per gallon of methanol produced):

Operating costs:			
Utilities--------------	$0.015	-	0.0200
Catalyst and chemical--	.0055	-	.0070
Labor------------------	.0085	-	.0110
Maintenance------------	.0500	-	.0700
Over head--------------	.0150	-	.0250
Other------------------	.0350	-	.0550
Total----------------	.1290	-	.1880

These operating costs, when coupled with natural gas costs, yield total production costs ranging between 41 and 56 cents for the production of one

1/ All information regarding production costs for U.S. methanol produces are shown as ranges, and are derived from data provided by various industry sources.

Table F-21.--Methanol: U.S. imports for consumption, by principal sources, 1980-84

Source	1980	1981	1982	1983	1984
	Quantity (1,000 pounds)				
Canada	140,371	73,244	270,722	581,189	1,023,127
Trinid	0	0	0	0	96,037
N Zeal	0	0	0	0	7,807
Japan	0	1/	15	11	160
Fr Germ	1/	1	21	58	34
Belgium	0	0	0	0	1
U King	8,733	13,614	1/	0	1
India	0	0	0	1/	0
Mexico	57,295	43,127	9,774	34,709	0
Italy	0	0	0	1/	0
All other	27,551	41,008	16,370	2	0
Total	233,950	170,994	296,903	615,969	1,127,166
	Value (1,000 dollars)				
Canada	8,851	5,624	16,915	33,711	50,979
Trinid	-	-	-	-	5,241
N Zeal	-	-	-	-	314
Japan	-	1/	23	7	59
Fr Germ	2	8	15	22	25
Belgium	-	-	-	-	1
U King	654	1,079	1/	-	1
India	-	-	-	1	1
Mexico	4,694	3,430	668	2,535	-
Italy	-	-	-	1/	-
All other	2,241	3,129	1,169	1/	-
Total	16,441	13,270	18,791	36,277	56,622
	Unit value (per pound)				
Canada	$0.06	$0.08	$0.06	$0.06	$0.05
Trinid	-	-	-	-	0.05
N Zeal	-	-	-	-	0.04
Japan	-	3.54	1.54	0.65	0.37
Fr Germ	9.50	5.93	0.75	0.39	0.74
Belgium	-	-	-	-	2.01
U King	0.07	0.08	1.64	-	1.49
India	-	-	-	71.92	-
Mexico	0.08	0.08	0.07	0.07	-
Italy	-	-	-	3.19	-
All other	0.08	0.08	0.07	0.20	-
Average	0.07	0.08	0.06	0.06	0.05

1/ Less than 500.

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

Table F-22.--Methanol: U.S. exports of domestic merchandise, by principal markets, 1980-84

Market	1980	1981	1982	1983	1984
	Quantity (1,000 pounds)				
U King	17	32	13	26,331	45,008
Nethlds	48,542	212,872	295,937	290,392	94,089
Japan	56,033	194,221	346,881	52,480	11,718
Rep Saf	13,136	25,267	62,715	26,087	41,179
Venez	17,583	8,604	21,952	15,474	15,332
Brazil	15,834	6,581	8,748	2,192	15,523
Colomb	6,212	4,218	5,631	5,898	14,151
Canada	517	401	475	3,363	11,004
Romania	0	0	0	0	10,791
Chile	26,209	4,900	8,801	9,165	6,469
All other	139,221	373,958	359,049	222,109	17,531
Total	323,304	831,055	1,110,199	653,490	282,794
	Value (1,000 dollars)				
U King	3	11	2	1,670	8,159
Nethlds	2,567	14,377	27,243	18,479	5,623
Japan	5,746	14,948	24,073	3,270	3,551
Rep Saf	1,266	2,090	8,566	1,795	2,486
Venez	1,650	666	1,477	1,234	943
Brazil	1,783	564	855	146	921
Colomb	550	355	448	393	889
Canada	74	39	33	214	869
Romania	-	-	-	-	611
Chile	2,612	423	701	780	431
All other	12,693	35,642	25,874	17,194	2,237
Total	28,944	69,115	89,272	45,176	26,720
	Unit value (per pound)				
U King	$0.19	$0.33	$0.13	$0.06	$0.18
Nethlds	0.05	0.07	0.09	0.06	0.06
Japan	0.10	0.08	0.07	0.06	0.30
Rep Saf	0.10	0.08	0.14	0.07	0.06
Venez	0.09	0.08	0.07	0.08	0.06
Brazil	0.11	0.09	0.10	0.07	0.06
Colomb	0.09	0.08	0.08	0.07	0.06
Canada	0.14	0.10	0.07	0.06	0.08
Romania	-	-	-	-	0.06
Chile	0.10	0.09	0.08	0.09	0.07
All other	0.09	0.10	0.07	0.08	0.13
Average	0.09	0.08	0.08	0.07	0.09

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

gallon of methanol. As approximately one-third of the U.S. methanol production capacity is now shutdown, the majority of the plants remaining in operation are the most cost-efficient and economic producers of methanol. Also, these plants are running at close to maximum capacity, thereby maximizing production efficiency. Costs, therefore, to the U.S. producers during 1985 are probably tending to be more toward the lower end of the cost range.

Prices for U.S. domestic production of methanol declined from a high of 60 to 65 cents per gallon in 1981 to between 40 and 45 cents per gallon in 1984, 1/ and have since declined further in 1985, to 36-42 cents per gallon. 2/ However, a much improved supply/demand situation is expected to develop later in 1985 to help sustain and possibly boost the price of U.S.-produced methanol. 3/

Olefins

Olefins are a series of major petrochemical building blocks produced in various ratios by the cracking of crude petroleum-derived or natural gas-derived feedstocks both in dedicated olefins plants and as byproducts in refineries. Ethylene is the dominant olefin, with U.S. production that ranged as high as 29.9 billion pounds in 1979. The two other major olefin products are propylene and butadiene. The majority of the propylene and butadiene produced in the world that is used as petrochemical feedstocks for production of secondary petrochemicals occurs as by-product to the production of ethylene. 4/

Building block petrochemicals are those used to make a number of other products. For example, ethylene is used to make ethylene oxide, ethylene glycol, and polyethylene. Because of this wide use as building blocks, the state of the olefins industry reflects the general state of the petrochemicals industry.

Industry Profile

The U.S. ethylene industry was comprised of 26 companies with total capacity of approximately 35 billion pounds, as of January 11, 1985. 5/ The five U.S. companies with the largest reported ethylene production capacities accounted for 44 percent of total U.S. ethylene capacity; the next five largest capacity U.S. producers accounted for another 31 percent of domestic ethylene capacity. 6/ The major concentration of U.S. ethylene production capacity is in Texas, which has 71 percent of the domestic capacity, and

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1/ Priced data compiled from various submission. All prices quoted are F.O.B. U.S. Gulf Coast.

2/ "Methanol Producers See Nowhere Else To Go But Up, " Chemical Marketing Reporter, Feb. 4, 1985, p. 3.

3/ Ibid.

4/ Lewis F. Hatch and Sami Matar, From Hydrocarbons to Petrochemicals, Gulf Publishing Co.

5/ "Chemical Profile," Chemical Marketing Reporter, Jan. 14, 1985, p. 54.

6/ Closing of plants and otherwise changing capacity is usually referred to in the industry as capacity rationalization.

Louisiana with 21 percent of the domestic capacity. Other U.S. facilities are located in Delaware, Illinois, Iowa, and Kentucky.

There are no separate data regarding employment in the U.S. olefin industry. Investment in new olefin capacity in the United States during 1982-85 was limited to a 300-million-pound-per year capacity addition to an existing ethylene facility replacing an older plant at the same site. Other investment in ethylene facilities have involved renovations to older plants for improved operating efficiencies and the ability to accept various feedstocks (such as naphthas or other heavy petroleum fractions) in addition to natural gas liquids (NGL's).

In addition, recent industry trends include the expansion of the olefins plants ability to utilize a variety of feedstocks, the closing of plants and otherwise altering of capacity, 1/ which resulted in the removal of more than 6 billion pounds of capacity during 1982-85, increased capacity utilization rates during 1982-84 2/ resulting from the capacity rationalization, and a 25-percent increase in ethylene production during the same period. All of these strategies have helped bring U.S. supply and demand into balance. However, the U.S industry continues to have concerns about the large olefins facilities now entering or approaching their expected startup in the energy-rich nations.

U.S. Market

Neither U.S. production nor U.S. consumption of ethylene during 1980-84 approached the expectations of most industry analysts, resulting in the recent efforts toward capacity rationalization and limited new construction. The increased cost of ethylene feedstock during this period created a rising production cost scenario, and the worldwide economic situation significantly dampened expected ethylene demand. Because of the expected market growth, the U.S. industry increased its overall ethylene capacity to a peak of 41 billion pounds in 1982 and actual demand caused U.S. production to decline to less than 25 billion pounds in 1982 (table F-23). U.S. production has increased since 1982, exceeding 31 billion pounds in 1984.

Apparent consumption of ethylene in the United States closely parallels production trends, as trade in ethylene is limited because it is a gas which must usually be moved either by pipeline or at reduced temperatures in liquid form. Pipeline transportation is applicable only to Canada and Mexico, but the latter is very expensive.

U.S. apparent consumption declined from 29 billion pounds in 1981 to 24 billion pounds in 1982, and subsequently recovered to more than 31 billion pounds in 1984 (table F-23).

Although U.S. trade in ethylene is limited, trade in ethylene derivatives, or those petrochemicals made from the building block ethylene, often exceeds actual ethylene trade by more than 10 times. The following

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1/ Ibid., p. 52.
2/ Ibid.

Table F-23.--Ethylene: U.S. production, imports for consumption, exports of domestic merchandise and apparent consumption, 1980-84

(Quantity in millions of pounds, value in millions of dollars, unit value per pound)

Year	Production 1/	Imports	Exports	Apparent consumption	Ratio (percent) of imports to consumption
			Quantity		
1980	28,666	227	2/	2/	2/
1981	29,418	387	326	29,479	1.3
1982	24,501	146	114	24,469	0.6
1983	28,680	179	214	28,645	0.6
1984	3/ 31,178	333	226	31,285	1.1
			Value		
1980	6,221	25	2/	2/	2/
1981	7,325	82	72	7,335	1.1
1982	4,361	36	25	4,372	0.8
1983	5,363	36	37	5,362	0.7
1984	6,000	65	54	6,011	1.1
			Unit value		
1980	$0.22	$0.11	2/	2/	-
1981	.25	.21	$0.22	$0.25	-
1982	.18	.25	.22	.18	-
1983	.19	.20	.17	.19	-
1984	.19	.20	.24	.19	-

1/ Value of production estimated from unit value of sales reported to the U.S. International Trade Commission.
2/ Not available.
3/ Preliminary.

Source: Production, U.S. International Trade Commission, Synthetic Organic Chemicals, U.S. Production and Sales, 1980-84, and U.S. International Trade Commission, Preliminary Report on U.S. Production of Selected Synthetic Organic Chemicals, November, December, and Cumulative Totals, 1984; Trade Data, National Petroleum Refiners Association, Selected Petrochemical Statistics, December 1981-84.

tabulation shows net U.S. exports of the major ethylene derivatives 1/ for 1980-84, in terms of ethylene equivalents 2/ (in millions of pounds): 3/

Year	Net U.S. exports
1980	3,541
1981	3,062
1982	3,714
1983	3,668
1984	2,888

Tables F-24 through F-31 show trade data for four of the primary ethylene derivatives. Polyethylene production in the United States accounted for 53 percent of ethylene consumed domestically. U.S. production of ethylene oxide consumed 18 percent; U.S. production of ethylene dichloride consumed 16 percent. Ethylene glycol made from ethylene via ethylene oxide is a major consumer product (antifreeze) that accounts for a significant share of the international ethylene equivalents trade.

Production Costs and Prices

Production costs for ethylene are significantly influenced by the type of feedstock used. And, since there are a wide variety of feedstocks available for the production of ethylene, there is a wide range of costs for different feedstock.

The primary reason the difference in feedstocks influence production costs is that there are a number of chemical byproducts, such as propylene, butadiene, butylene, and butane, produced along with the ethylene. The amount of each of these byproducts produced per pound of ethylene depends upon the

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1/ Polyethylene, ethylene dichloride, vinylchloride, ethylbenzene, styrene, vinylacetate, ethylene oxide, ethyleneglycol, diethylene glycol, and triethylene glycol.

2/ An ethylene equivalent is the number of pounds of ethylene used to make a pound of an ethylene derivative. For example, each pound of ethylene oxide produced requires 0.91 pounds of ethylene, and each pound of low-density polyethylene made requires 1.02 pounds of ethylene. The conversion equivalents are taken from the February 1982 issue of the National Petroleum Refiners Association's monthly publication entitled, Selected Petrochemical Statistics: U.S. Trade Production and Consumption.

Ethylene equivalents enter trade in the following manner. Even if a country does not export or import ethylene as such, it is exporting or importing ethylene when it exports or imports ethylene derivatives. For example, for each pound of ethylene oxide traded, 0.91 pounds of ethylene are traded. Thus, if a nation produced 910 pounds of ethylene, used the 910 pounds in the country to produce 1000 pounds of ethylene oxide and when exported all the ethylene oxide, the country would essentially be exporting all of its ethylene production. The ultimate justification for the ethylene capacity would not be the domestic market, but rather the export market.

3/ Compiled from official statistics of the U.S. Department of Commerce based on information in National Petroleum Refiners Association, Selected Petrochemical Statistics, December 1984.

Table F-24.--Polyethylene resins: U.S. imports for consuption, by principal sources, 1980-84

Source	1980	1981	1982	1983	1984
	Quantity (1,000 pounds)				
Canada------	67,657	108,668	29,429	54,909	174,229
Brazil------	1	36	31	2,170	29,644
Chile-------	0	0	0	0	22,533
Argent------	0	0	21,915	59,506	23,948
Venez-------	0	1	0	0	11,172
Fr Germ-----	54,636	12,899	7,510	8,942	4,738
Japan-------	2,169	1,410	1,194	2,559	2,810
U King------	347	323	284	539	872
Belgium-----	216	1,026	100	237	742
Romania-----	0	0	0	0	1,091
All other---	2,749	8,093	1,733	1,538	1,575
Total---	127,776	132,457	62,195	130,400	273,356
	Value (1,000 dollars)				
Canada------	26,393	37,248	10,485	18,120	51,495
Brazil------	1/	14	2	668	8,936
Chile-------	-	-	-	-	7,719
Argent------	-	-	3,952	13,558	6,731
Venez-------	-	1	-	-	3,930
Fr Germ-----	23,710	7,170	4,627	4,809	2,993
Japan-------	4,060	1,578	1,042	2,380	2,356
U King------	449	334	298	496	594
Belgium-----	148	511	53	168	462
Romania-----	-	-	-	-	304
All other---	2,148	2,502	1,177	608	1,048
Total---	56,908	49,358	21,635	40,807	86,567
	Unit value (per 1,000 pounds)				
Canada------	$390.10	$342.77	$356.27	$330.00	$295.56
Brazil------	291.00	396.33	72.42	307.63	301.44
Chile-------	-	-	-	-	342.55
Argent------	-	-	180.32	227.85	281.07
Venez-------	-	863.00	-	-	351.78
Fr Germ-----	433.97	555.87	616.14	537.82	631.62
Japan-------	1,871.70	1,119.23	872.82	930.07	838.41
U King------	1,295.03	1,033.58	1,047.89	921.14	681.46
Belgium-----	685.41	497.72	525.72	709.50	622.49
Romania-----	-	-	-	-	278.58
All other---	781.23	309.16	678.94	395.04	665.48
Average--	445.38	372.64	347.85	312.94	316.68

1/ Less than 500.

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

Table F-25.--Ethylene oxide: U.S. imports for consumption, by principal sources, 1980-84

Source	1980	1981	1982	1983	1984
	Quantity (pounds)				
Canada	5,715,350	38,900,280	9,461,780	8,948,027	12,404,684
Fr Germ	2,866	6,702	3,307	40,985	35,825
U King	1,102	0	36,202	10,818	17,637
Sweden	0	0	0	72,000	0
Japan	4	0	3	1,102	0
France	1	0	0	0	0
Total	5,719,323	38,906,982	9,501,292	9,072,932	12,458,146
	Value (1,000 dollars)				
Canada	1,764	13,050	3,182	2,622	3,171
Fr Germ	3	6	1	17	22
U King	1	-	376	15	12
Sweden	-	-	-	40	-
Japan	1	-	1/	2	-
France	1	-	-	-	-
Total	1,769	13,056	3,559	2,695	3,205
	Unit value (per pound)				
Canada	$0.31	$0.34	$0.34	$0.29	$0.26
Fr Germ	0.93	0.85	0.33	0.41	0.62
U King	1.20	-	10.38	1.37	0.66
Sweden	-	-	-	0.56	-
Japan	162.50	-	163.33	1.36	-
France	717.00	-	-	-	-
Average	0.31	0.34	0.37	0.30	0.26

1/ Less than 500.

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

Table F-26.--Ethylene dichloride: U.S. imports for consumption, by principal sources, 1980-84

Source	1980	1981	1982	1983	1984
	Quantity (pounds)				
Brazil	0	4,544,194	1,508,671	11,156,183	18,563,483
Italy	0	0	0	0	8,119,233
Canada	22,332,517	156,416,369	93,623,418	0	1,891
Japan	0	0	0	0	1,014
Fr Germ	0	0	221	28,568,781	0
Mexico	0	0	33,911,466	0	0
U King	550	0	0	0	0
Total	22,333,067	160,960,563	129,043,776	39,724,964	26,685,621
	Value (1,000 dollars)				
Brazil	-	439	151	1,039	2,032
Italy	-	-	-	-	762
Canada	1,285	8,875	5,960	-	3
Japan	-	-	-	-	2
Fr Germ	-	-	1/	2,914	-
Mexico	-	-	1,993	-	-
U King	2	-	-	-	-
Total	1,287	9,314	8,104	3,953	2,799
	Unit value (per pound)				
Brazil	-	$0.10	$0.10	$0.09	$0.11
Italy	-	-	-	-	0.09
Canada	0.06	0.06	0.06	-	1.67
Japan	-	-	-	-	1.91
Fr Germ	-	-	2.11	0.10	-
Mexico	-	-	0.06	-	-
U King	4.03	-	-	-	-
Average	0.06	0.06	0.06	0.10	0.10

1/ Less than 500.

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

Table F-27.--Ethylene glycol: U.S. imports for consumption, by principal sources, 1980-84

Source	1980	1981	1982	1983	1984
	Quantity (pounds)				
Canada	12,744,095	11,853,611	23,796,756	24,444,216	28,584,420
Fr Germ	1,099,391	1,148,960	3,350,958	2,212,804	32,588,984
Spain	3,233,246	2,102,793	8,173,442	14,689,281	26,834,712
Romania	0	0	0	3,285,074	23,968,283
U King	0	0	0	0	4,154,862
Brazil	13,629,616	17,210,602	2,264,973	10,024,868	6,724,569
Nethlds	0	0	0	0	5,481,532
Italy	0	0	0	769,724	2,191,483
Sweden	0	0	0	0	1,721,270
France	0	0	0	0	837,756
All other	3,786	3,130,931	0	0	0
Total	30,710,134	35,446,897	37,586,129	55,425,967	133,087,871
	Value (1,000 dollars)				
Canada	1,952	1,916	3,641	3,856	5,953
Fr Germ	132	154	360	284	5,034
Spain	433	265	765	1,525	4,114
Romania	-	-	-	431	3,699
U King	-	-	-	-	749
Brazil	1,879	2,354	192	1,061	669
Nethlds	-	-	-	-	635
Italy	-	-	-	89	342
Sweden	-	-	-	-	324
France	-	-	-	-	153
All other	2	369	-	-	-
Total	4,398	5,058	4,957	7,246	21,670
	Unit value (per pound)				
Canada	$0.15	$0.16	$0.15	$0.16	$0.21
Fr Germ	0.12	0.13	0.11	0.13	0.15
Spain	0.13	0.13	0.09	0.10	0.15
Romania	-	-	-	0.13	0.15
U King	-	-	-	-	0.18
Brazil	0.14	0.14	0.08	0.11	0.10
Nethlds	-	-	-	-	0.12
Italy	-	-	-	0.12	0.16
Sweden	-	-	-	-	0.19
France	-	-	-	-	0.18
All other	0.59	0.12	-	-	-
Average	0.14	0.14	0.13	0.13	0.16

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

Table F-28.--Polyethylene resins: U.S. exports of domestic merchandise, by principal markets, 1980-84

Market	1980	1981	1982	1983	1984
	Quantity (1,000 pounds)				
China M	20,310	113,418	473,490	153,511	248,624
Canada	109,398	124,101	159,111	223,704	164,940
Mexico	317,020	377,202	340,681	386,267	157,794
Indnsia	90,228	83,457	146,422	132,534	95,278
Kor Rep	28,245	44,044	56,125	72,061	76,268
U King	26,937	30,388	34,431	34,973	37,010
Hg Kong	84,998	57,872	71,212	71,375	62,473
Nethlds	57,072	37,742	35,312	33,934	64,315
Belgium	26,642	14,203	35,198	31,108	23,908
China t	48,341	24,954	42,720	70,570	37,706
All other	1,089,259	700,688	780,171	811,004	572,334
Total	1,898,449	1,608,066	2,174,872	2,021,043	1,540,651
	Value (1,000 dollars)				
China M	6,959	38,373	133,468	46,915	74,505
Canada	46,924	55,206	58,175	78,735	69,685
Mexico	135,443	140,663	101,367	103,500	57,039
Indnsia	34,425	28,459	43,962	40,863	32,329
Kor Rep	14,030	21,022	22,654	28,687	30,300
U King	16,862	19,222	21,162	21,453	23,490
Hg Kong	31,729	19,885	22,816	21,267	19,428
Nethlds	19,159	15,066	16,746	11,701	18,468
Belgium	17,305	11,128	17,594	16,983	15,593
China t	15,867	8,940	12,127	23,849	14,090
All other	464,075	287,641	290,121	296,075	228,184
Total	802,778	645,605	740,191	690,028	583,112
	Unit value (per 1,000 pounds)				
China M	$342.65	$338.33	$281.88	$305.61	$299.67
Canada	428.93	444.85	365.62	351.96	422.49
Mexico	427.24	372.91	297.54	267.95	361.48
Indnsia	381.54	341.01	300.24	308.32	339.32
Kor Rep	496.71	477.29	403.64	398.09	397.28
U King	625.96	632.54	614.61	613.43	634.69
Hg Kong	373.29	343.60	320.40	297.97	310.98
Nethlds	335.71	399.20	474.22	344.83	287.15
Belgium	649.55	783.48	499.86	545.92	652.21
China t	328.22	358.26	283.87	337.94	373.68
All other	426.05	410.51	371.87	365.07	398.69
Average	422.86	401.48	340.34	341.42	378.48

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

Table F-29.--Ethylene oxide: U.S. exports of domestic merchandise, by principal markets, 1980-84

Market	1980	1981	1982	1983	1984
	Quantity (pounds)				
Canada	2,176,992	513,139	907,652	11,596,397	10,777,722
Mexico	80,679,518	53,283,549	379,034	14,138	9,584,556
Venez	2,348,473	591,854	1,235,398	1,214,380	3,814,234
Argent	17,206	23,392	26,921	28,088	53,739
Kor Rep	0	990	984	804,759	300,972
Fr Germ	67,863	57,120	76,507	46,262	20,405
Spain	20,499	21,160	35,619	12,823	19,265
Panama	1,172	21,330	638	0	69,840
Rep Saf	7,657	13,903	8,590	15,554	15,004
Switzld	9,038	11,423	11,622	11,526	10,959
France	26,039	109,282	110,457	8,488	5,276
Chile	6,567	12,229	4,724	10,103	6,935
All other	172,629	315,702	474,892	47,306	54,624
Total	85,533,653	54,975,073	3,273,038	13,809,824	24,733,531
	Value (1,000 dollars)				
Canada	1,069	204	429	3,201	2,925
Mexico	31,777	20,658	181	12	2,637
Venez	1,207	257	434	653	2,107
Argent	62	65	81	53	123
Kor Rep	-	1	3	415	121
Fr Germ	227	157	123	139	53
Spain	85	93	78	41	50
Panama	15	18	7	-	47
Rep Saf	21	36	24	39	34
Switzld	26	31	32	29	29
France	159	123	52	26	21
Chile	31	65	41	20	19
All other	581	602	3,537	128	136
Total	35,260	22,311	5,021	4,757	8,304
	Unit value (per pound)				
Canada	$0.49	$0.40	$0.47	$0.28	$0.27
Mexico	0.39	0.39	0.48	0.87	0.28
Venez	0.51	0.43	0.35	0.54	0.55
Argent	3.60	2.77	3.02	1.89	2.29
Kor Rep	-	1.36	3.23	0.52	0.40
Fr Germ	3.35	2.76	1.61	3.00	2.61
Spain	4.17	4.39	2.18	3.17	2.62
Panama	13.20	0.85	10.49	-	0.68
Rep Saf	2.79	2.57	2.75	2.51	2.29
Switzld	2.86	2.67	2.77	2.56	2.69
France	6.09	1.13	0.47	3.02	4.00
Chile	4.66	5.32	8.63	1.99	2.70
All other	3.37	1.91	7.45	2.71	2.49
Average	0.41	0.41	1.53	0.34	0.34

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

Table F-30.--Ethylene dichloride: U.S. exports of domestic merchandise, by principal markets, 1980-84

Market	1980	1981	1982	1983	1984
	Quantity (pounds)				
Japan	197,229,703	226,810,907	441,790,284	601,033,780	495,318,039
China †	265,825,813	325,424,827	316,145,173	318,070,360	128,122,666
Mexico	28,346,267	6,955,744	24,023	41,148,385	94,281,313
Colomb	0	0	0	0	18,435,019
India	0	10,831,777	0	0	11,028,335
Peru	10,796,861	38,093,681	12,535,487	3,768,995	6,768,587
Venez	0	3,850	0	0	4,637,211
Singapr	433,980	887,359	446,644	917,166	440,382
Canada	1,553,904	793,806	43,260	37,636	132,906
Belgium	0	0	7,273	0	42,010
All other	107,474,856	6,713,931	25,047,623	4,535,443	66,547
Total	611,661,384	616,515,882	796,039,767	969,511,765	759,273,015
	Value (1,000 dollars)				
Japan	23,677	23,207	41,579	66,682	52,258
China †	36,246	29,615	25,447	37,583	13,280
Mexico	2,849	562	4	5,190	11,012
Colomb	-	-	-	-	1,997
India	-	757	-	-	926
Peru	797	2,709	782	330	753
Venez	-	1	-	-	535
Singapr	68	126	68	140	65
Canada	189	91	5	4	18
Belgium	-	-	1	-	5
All other	11,559	409	2,222	687	11
Total	75,384	57,476	70,106	110,616	80,859
	Unit value (per pound)				
Japan	$0.12	$0.10	$0.09	$0.11	$0.11
China †	0.14	0.09	0.08	0.12	0.10
Mexico	0.10	0.08	0.15	0.13	0.12
Colomb	-	-	-	-	0.11
India	-	0.07	-	-	0.08
Peru	0.07	0.07	0.06	0.09	0.11
Venez	-	0.24	-	-	0.12
Singapr	0.16	0.14	0.15	0.15	0.15
Canada	0.12	0.11	0.12	0.11	0.14
Belgium	-	-	0.11	-	0.11
All other	0.11	0.06	0.09	0.15	0.16
Average	0.12	0.09	0.09	0.11	0.11

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

Table F-31.--Ethylene glycol: U.S. exports of domestic merchandise, by principal markets, 1980-84

Market	1980	1981	1982	1983	1984
	Quantity (pounds)				
Japan	89,878,650	20,974,986	181,906,195	176,651,366	157,438,038
Belgium	2,319,682	17,549,625	14,411,144	32,976,794	92,559,534
Kor Rep	33,761,280	47,759,435	62,132,616	79,634,887	81,640,183
Rep Saf	10,754,300	21,007,698	34,014,041	65,768,699	67,104,111
Turkey	0	13,046,439	37,964,073	60,746,804	57,966,042
Italy	0	1,544	1,753	34,494,321	56,545,594
China t	3,352,709	22,214,659	36,928,833	87,078,092	39,270,222
Venez	8,695,230	13,949,977	11,532,113	14,230,295	27,226,798
Spain	0	0	10,910,717	9,698,693	26,581,655
Colomb	15,183,640	16,641,675	11,336,814	14,953,773	18,037,774
All other	82,465,622	62,109,822	117,642,938	119,963,114	82,076,759
Total	246,411,113	235,255,860	518,781,237	696,196,838	706,446,710
	Value (1,000 dollars)				
Japan	19,486	4,323	30,059	28,712	28,572
Belgium	329	2,623	3,333	6,845	24,496
Kor Rep	8,115	10,064	10,651	12,614	14,962
Rep Saf	3,331	4,652	5,824	9,611	12,371
Turkey	-	3,440	6,371	10,309	10,255
Italy	-	2	3	4,670	9,051
China t	979	4,647	6,965	15,448	7,649
Venez	2,501	3,350	2,374	2,549	5,689
Spain	-	-	1,806	1,415	5,598
Colomb	4,051	3,684	2,099	2,470	3,434
All other	21,074	15,121	20,371	22,271	16,643
Total	59,865	51,906	89,856	116,912	138,721
	Unit value (per pound)				
Japan	$0.22	$0.21	$0.17	$0.16	$0.18
Belgium	0.14	0.15	0.23	0.21	0.26
Kor Rep	0.24	0.21	0.17	0.16	0.18
Rep Saf	0.31	0.22	0.17	0.15	0.18
Turkey	-	0.26	0.17	0.17	0.18
Italy	-	1.22	1.44	0.14	0.16
China t	0.29	0.21	0.19	0.18	0.19
Venez	0.29	0.24	0.21	0.18	0.21
Spain	-	-	0.17	0.15	0.21
Colomb	0.27	0.22	0.19	0.17	0.19
All other	0.26	0.24	0.17	0.19	0.20
Average	0.24	0.22	0.17	0.17	0.20

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

feedstock used. Light feedstocks such as ethane produce almost all ethylene; heavy feedstock such as gas oil produce many byproducts. Thus, the production cost per pound of ethylene depends upon the cost of the feedstock and the prices at which the byproducts can be sold. The following tabulation shows three different production cost schemes based on different feedstocks (in cents per pound of ethylene produced):

	(1)	(2)	(3)
Feedstock 1/----------	20 - 27	38 - 49	9 - 13
Byproduct credits-----	9 - 13	27 - 36	-
Net raw materials-----	11 - 14	11 - 13	9 - 13
General operating costs: 2/			
Utilities-------------	7.00 - 8.50		
Catalysts and chemicals-----------	.10 - .15		
Labor-----------------	.20 - .26		
Maintenance-----------	2 - 2.25		
Overhead--------------	.45 - .60		
Other (insurance, taxes, etc.)--------	1.65 - 2.25		
Total operating costs-----------	11.40 - 14.01		
Total cash costs------	22 - 27	22 - 27	20 - 27

1/ Feedstock cost based on industry averages during 1983-84; (1) = propane, natural gas-based; (2) = naphtha, petroleum-based; (3) = ethane, natural gas-based.

2/ General operating costs are independent of the feedstock, and are equivalent for each of the three feedstocks shown.

As can be seen in the previous tabulation, ethylene production costs using different feedstock streams are significantly influenced by the value of byproducts, (essentially what they can be sold for or are worth as raw materials in other downstream operations) such as other olefins. It should be noted that although the feedstock cost in scheme 2 is almost double that of scheme 1, the net raw material costs are about the same because byproduct credits are significantly greater under scheme 2.

Selling prices compared rather unfavorably with U.S. production costs during 1984, as ethylene prices f.o.b. Gulf Coast ranged between 17 and 21 cents per pound. Prices during 1979-83 tended to be higher and generated better returns on producers investments; feedstock prices were significantly lower earlier in this period. Ethylene prices f.o.b. Gulf Coast listed as high as 26 to 28 cents per pound in 1982 and raw material costs were as low as 7 to 11 cents per pound. Raw material costs accounted for 26 to 40 percent of the list price in 1982, compared with 117 to 129 percent of reported prices in 1984. Since raw material costs are so large a part of production costs and selling prices, the apparent production cost advantages that energy-rich nations with abundant low-cost raw materials have is highlighted.

Refining 1/

The petroleum refining industry, the major and essentially only crude petroleum consuming industry, processes crude petroleum into finished petroleum products such as motor gasoline. Refinery processes, particularly in the United States, have been generally designed to maximize the production of those light products with the greatest demand, such as motor gasoline. In 1984, motor gasoline production accounted for about 45 percent of all of the products refined from crude petroleum.

Production Costs

The average cost of production for refined products includes the refiner's cost to acquire a barrel of crude petroleum plus a cost of refining that varies widely depending upon the technological complexity, size, cost and so forth of the refinery. During 1978-82, the refiner acquisition cost for domestic and imported crude petroleum rose sharply before declining slightly in 1983 and 1984 as shown in the following tabulation (per barrel): 2/

Year	Refiner acquisition cost of crude petroleum	
	Domestic	Imported
1978	$10.61	$14.57
1979	14.27	21.67
1980	24.23	33.89
1981	34.33	37.05
1982	31.22	33.55
1983	28.87	29.30
1984	28.63	28.96

Actual refining costs are seldom referred to as such in the industry. Rather, crude petroleum is refined and the petroleum products are sold at market prices, and the cost of the crude petroleum is subtracted from the sales value. The resulting figure that will vary with the cost of crude petroleum and the sales value is a refining and marketing margin that should cover the cost of refining, other costs, and still leave a refining and marketing profit. U.S. refiners have indicated a squeeze on the refining and marketing margin to the point where it may just about cover refining, marketing, and other costs and leave little for profits; refinery experiences of less than 1 cent per gallon refining and marketing profit have been reported. 3/

1/ For information on the refining industry profile and the U.S. market, see the "World Market - Petroleum Products - U.S. Industry Profile" section of this report.

2/ U.S. Department of Energy, Monthly Energy Review, November 1984, p. 89.

3/ A National Petroleum Council study, now underway, requested by the U.S. Department of Energy will reportedly investigate refinery operations. The study is scheduled for release at the end of 1985.

For illustrative purposes, using published data, a refining and marketing margin in the range of 6.3 to 7.9 cents per gallon ($2.66 to $3.33 per barrel) may be calculated for the period 1982 to 1984 as the sample calculations indicate (per barrel):

	1982	1983	1984
Estimated realization from wholesale petroleum product sales 1/---------	34.97	32.32	31.29
Average refiner acquisition cost of crude petroleum 2/-----------------	31.87	28.99	28.63
Estimated refining and marketing margin----------------------------	3.10	3.33	2.66

1/ Independent Petroleum Refiners Association of America, IPAA Wholesale Oil Prices, Vol. 51, No. 4.
2/ U.S. Department of Energy, Monthly Energy Review, December 1984, p. 93.

The estimated refining and marketing margin is reduced by the refining and marketing operating costs to obtain the refining and marketing profit.

It should be emphasized that these sample calculations are, at best, averages based on public data and an array of assumptions. Individual refiners may have entirely different cost structures depending upon their individual circumstances.

Higher crude petroleum costs, lower realizations from products sales, or higher operating costs would tend to decrease the refining and marketing profit; conversely lower crude petroleum costs, higher realization from product sales, or lower operating costs would tend to inflate the refining and marketing profit.

If about one-half of the refining costs is assumed to be energy input required by the refining processes, total energy and feedstock costs should represent about 83 to 86 percent of the product of realization price. This range appears to correspond to 1977 Census data which shows that 75 percent of the value of petroleum products shipments accounted for by the cost of crude petroleum and natural gas, particularly when the increase in crude pretroleum costs since then are taken into consideration. 1/

Prices

The average retail prices for refined petroleum products are shown in the following tabulation, derived from official statistics of the U.S. Department of Energy (in cents per gallon, including tax): 2/

1/ U.S. International Trade Commission, The Probable Import on the U.S. Petrochemical Industry of the Expanding Petrochemical Industries in the Conventional-Energy Rich Nations, USITC Publication 1370, April 1983, p. 19.
2/ These prices are f.o.b.

Year	Motor gasoline 1/	Residual fuel oil	Distillate fuel oil 2/
1980	122.1	60.7	78.8
1981	135.3	75.6	91.4
1982	128.1	67.6	90.5
1983	122.5	65.1	91.6
1984	119.9	69.0	90.9

1/ Average of leaded regular, unleaded regular, and unleaded premium gasoline.
2/ No. 2 fuel oil.

In general, there has been a downward pressure on product prices that has led to reduced refining margins. The ready availability of most petroleum products because of conservation and other factors is one reason for the softness in prices. Another reason is the gradually decreasing differences in the prices of light and heavy products, particularly in some foreign countries. 1/

Under the circumstances described, it is often the topping refinery that has the technologically simpler processing scheme and thus the lower processing costs than the more technologically complex refinery. The petroleum industry, aware of these problems, commissioned studies to consider possible economic and national security aspects of additional petroleum product exports from new Middle East refineries by both the American Petroleum Industry and the National Petroleum Council. 2/

Steel

Industry Profile

The United States was the third largest raw steel producer in the world in 1984, with 91.5 million short tons, up 38 percent from that of 1983.

In 1983, the U.S. steel industry was composed of approximately 96 companies producing raw steel in some 153 plants. Of these, 16 integrated producers (firms with basic oxygen and/or open-hearth furnaces) operated approximately 53 plants. The integrated producers are located throughout the United States with significant concentrations in the northeast and north central regions. In 1983, Indiana, Ohio, and Pennsylvania accounted for 60 percent of the integrated producers' total raw steel production capacity. The remaining 80 nonintegrated producers (firms with only electric furnaces) operated some 100 plants that accounted for an estimated 20 to 25 percent of total U.S. raw steel production in 1983. The nonintegrated plants are also located throughout the United States with significant concentrations in the southern region, and in Pennsylvania, Illinois, and Texas.

1/ "What Lies Behind Those Weak Prices for Petroleum Products," Oil & Gas Journal, Feb. 25, 1985, p. 59.
2/ "OPEC Refining Alarms U.S. Oilmen," The New York Times, Nov. 14, 1984, p. D1.

Raw steel production declined 7.3 percent overall during 1980-84, increasing from 111.8 million tons in 1980 to 120.8 million short tons in 1981, then declining to 74.6 million short tons in 1982, before rising to 91.5 million short tons in 1984. U.S. raw steel capacity fell overall during 1980-84 and stood at 135.3 million short tons in 1984, representing a 10-percent drop from the capacity level of 1980. After declining to a low of 48.4 percent in 1982, capacity utilization rose to a rate of 67.6 percent in 1984 (table F-32).

Table F-32.--Raw steel: U.S. production, capacity, and capacity utilization, 1980-84

Year	Production	Production capacity	Capacity utilization
	1,000 short tons	1,000 short tons	Percent
1980	111,835	153,700	72.8
1981	120,828	154,300	78.3
1982	74,577	154,000	48.4
1983	84,615	150,000	56.2
1984	91,532	135,300	67.6

Source: Compiled from statistics of the American Iron & Steel Institute.

Employment in the steel industry declined steadily from 1980-84, falling 40 percent from 399,000 to 236,000. The December 1984 steel industry employment level of 213,000 persons, including 151,000 hourly workers, was the lowest such monthly figure recorded since the 1930's. 1/

Steel companies' capital expenditures in the steel production segments of their corporate holdings declined during 1980-83, from $2,606 million (76.9 percent of total steel industry corporate expenditures) to $1,882 million (58.2 percent of total steel industry corporate expenditures) 2/. Capital expenditures in 1983 were not enough to maintain the existing base of steelmaking facilities and capacity has declined. Capital investment is, however, increasing overall efficiency. Within a 3-year period through the end of 1984, 16 new continuous casters will have been installed, more than doubling previous steel casting capacity. Four more large continuous casters are being planned for construction over the next few years. 3/

U.S. Market

Apparent consumption of steel mill products rose from 95.2 million short tons ($48.5 billion) in 1980 to 105.4 million short tons ($57.5 billion) in 1981, then fell to 76.4 million short tons ($40.9 billion) in 1982 before

1/ American Iron and Steel Institute, Steel and America, May 1984, p. 20.
2/ American Iron and Steel Institute, 1983 Annual Statistical Report, p. 13.
3/ Steel and America, op. cit., p. 6.

recovering to 98.2 million short tons in 1984 (table F-33). The decline in 1981 and 1982 reflects weakened economic conditions and a downturn in demand for capital goods and consumer markets. Domestic shipments declined in 1980-84, falling from 83.9 million short tons ($44.2 billion) in 1980 to 73.0 million short tons in 1984, representing a 12.9 percent overall decline. Imports of steel mill products fluctuated upwards 69.0 percent during 1980-83, but increased sharply in 1984, reaching 26.2 million short tons ($10.2 billion) in 1984 (table F-34). U.S. exports of steel mill products fell steadily, from 3.2 million short tons ($1.9 billion) in 1980 to 783,000 short tons in 1984 (table F-35).

Japan was the largest source of imports during 1980-84, accounting for 29.7 percent of total U.S. steel imports. Canada was the second largest source of imports during 1980-84, accounting for 13.3 percent of total U.S. steel imports. Imports from Mexico rose from 67,393 short tons (0.4 percent of total steel imports) in 1980 to 796,812 short tons (3.0 percent of total steel imports) in 1984. Mexico was the principal market for U.S. steel exports during 1980-84, accounting for 23.7 percent of total exports. Shipments to Mexico have fallen, however, from 1.2 million short tons ($670.0 million) in 1980, to 137,918 short tons ($141.0 million) in 1984, representing an overall decline of 88.9 percent. Canada was the second largest export market, accounting for 21.7 percent of total exports (table F-35).

Table F-33.--Steel mill products: U.S. production/shipments, exports of domestic merchandise, imports for consumption, and apparent consumption, 1980-84

(Quantity in thousands of short tons; value in thousands of dollars)

Year	Production/ shipments	Exports	Imports	Apparent consumption	Ratio (percent) of imports to consumption
	Quantity				
1980	83,853	4,101	15,495	95,247	16.27
1981	88,450	2,904	19,898	105,444	18.87
1982	61,567	1,842	16,682	76,407	21.83
1983	67,584	1,199	17,076	83,461	20.46
1984	73,012	980	26,180	98,212	26.66
	Value				
1980	1/ 44,170	2,557	6,887	1/ 48,500	14.20
1981	1/ 49,483	2,275	10,247	1/ 57,455	17.83
1982	1/ 33,510	1,601	8,958	1/ 40,867	21.92
1983	1/ 32,664	1,044	6,392	1/ 38,012	16.82
1984	2/	910	10,206	2/	2/

1/ Estimated by the staff of the U.S. International Trade Commission.
2/ Not available.

Source: Producers' shipments, compiled from statistics of the American Iron & Steel Institute, except as noted; exports and imports, compiled from official statistics of the U.S. Department of Commerce.

Table F-34.--Steel mill products: U.S. imports for consumption by principal sources, 1980-84

Source	1980	1981	1982	1983	1984
	Quantity (short tons)				
Japan	6,006,845	6,220,099	5,185,147	4,236,915	6,630,005
Canada	2,369,072	2,898,749	1,844,101	2,378,617	3,167,308
West Germany	1,289,072	2,164,347	2,080,159	1,386,655	2,543,272
Republic of Korea	1,039,911	1,218,368	1,062,060	1,727,573	2,234,331
France	966,985	1,289,319	997,645	913,743	1,126,622
Spain	462,446	729,811	547,198	609,653	1,401,172
Brazil	457,719	547,886	604,653	1,257,006	1,460,848
Belgium and Luxembourg	869,865	1,108,317	929,154	615,008	921,036
Sweden	91,930	169,510	292,246	213,811	639,354
Italy	174,055	768,110	643,630	395,356	654,490
All other	1,766,492	2,783,467	2,495,748	3,342,109	5,401,668
Total	15,494,741	19,897,983	16,681,741	17,076,446	26,180,106
	Value (1,000 dollars)				
Japan	2,978,595	3,731,750	3,448,082	1,910,358	3,097,000
Canada	984,626	1,294,634	854,891	885,053	1,300,259
West Germany	532,848	1,193,251	1,127,679	549,140	991,650
Republic of Korea	401,568	538,939	447,813	563,485	817,205
France	395,877	598,505	532,405	373,649	497,821
Spain	186,666	340,363	245,452	202,608	431,308
Brazil	157,316	235,752	233,995	337,431	417,485
Belgium and Luxembourg	320,102	467,273	373,551	209,639	313,680
Sweden	150,897	185,709	207,119	141,091	295,905
Italy	91,351	442,968	424,191	184,634	280,931
All other	687,348	1,218,221	1,062,858	1,542,371	1,762,515
Total	6,887,194	10,247,365	8,958,036	6,392,319	10,205,759

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

Table F-35.--Steel mill products: U.S. exports of domestic merchandise, by principal markets, 1980-84

Source	1980	1981	1982	1983	1984
	Quantity (short tons)				
Canada	413,701	735,212	292,313	308,681	270,515
Mexico	1,102,890	726,367	261,985	116,941	160,708
Saudi Arabia	58,631	65,230	108,338	51,466	25,683
United Kingdom	35,060	18,505	20,349	10,567	11,726
Egypt	100,504	16,690	57,275	28,982	18,823
Republic of Korea	35,891	16,845	15,139	42,731	23,618
Colombia	20,739	17,233	15,576	15,958	15,081
Japan	27,640	7,474	5,295	6,470	5,856
Taiwan	78,161	38,103	25,394	26,614	10,574
Israel	8,702	4,804	4,670	11,047	5,377
All other	1,674,286	948,151	873,053	460,334	316,521
Total	4,100,718	2,903,864	1,842,309	1,198,631	980,414
	Value (1,000 dollars)				
Canada	321,890	486,650	275,092	266,238	241,125
Mexico	529,633	465,115	182,353	89,374	116,947
Saudi Arabia	75,954	85,197	131,371	84,049	37,300
United Kingdom	45,457	42,509	36,392	20,364	20,966
Egypt	33,677	17,390	36,242	22,138	16,424
Republic of Korea	25,444	21,794	34,114	29,505	16,025
Colombia	18,275	21,888	26,282	14,075	13,867
Japan	21,417	20,276	16,627	10,356	11,179
Taiwan	55,984	44,518	37,100	22,866	10,289
Israel	9,662	9,136	8,117	9,497	9,704
All other	979,599	763,302	676,407	347,375	265,611
Total	2,556,617	2,275,267	1,601,430	1,044,410	909,780

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

Production Costs and Prices

The United States is potentially self-sufficient in four of the fundamental raw materials of iron and steelmaking: iron ore, coal, limestone, and scrap. Iron ore is reduced to molten pig iron in blast furnaces, which requires coke, converted from coal as fuel, and limestone and other fluxing agents to remove impurities, or slag. The following tabulation shows an estimate of the percent of total production cost accounted for by each factor of production:

	Percent
Raw material------------	20-30
Labor-------------------	26-30
Maintenance-------------	10-15
Overhead----------------	10-15
Depreciation------------	4-7
Insurance---------------	1-2
Energy------------------	14-20

In 1983, the domestic steel industry improved its overall energy efficiency as a result of higher operating rates and through the use of energy conservation measures. Domestic steelmakers used 24.73 million British Thermal Units (Btus) of energy per ton of finished steel shipped, according to the American Iron and Steel Institute. This represents a 17.4-percent decline from the 29.94 million Btus of energy used per ton of steel shipped in 1982. 1/ The distribution of energy mix to produce 1 ton of finished steel in 1983 was as follows: coal, 62.3 percent; natural gas, 25.8 percent; electricity, 7.5 percent; petroleum, 4.4 percent. 2/ Consumption of natural gas in the production of finished steel amounted to approximately 6.4 mm Btu per short ton.

Energy consumption in steelmaking is dependent upon the type of furnace used to produce the raw steel. Although raw steel output from the scrap-based electric furnace steelmaking process has increased rapidly to more than one-third of total steel production, nearly two-thirds of all raw steel in the United States is still produced in basic oxygen furnaces using molten iron (pig iron) and lime. Open-hearth furnaces, which use a combination of blast furnace iron (pig iron) and scrap, account for a declining proportion of raw steel production.

The principal uses of energy vary according to the steelmaking process. In coke ovens, coal is heated to produce coke, which is used to smelt iron ore in blast furnaces. Oil and gas are used in open-hearth furnaces to melt scrap and pig iron to produce raw steel. Electricity is used in electric-arc furnaces to melt scrap and to power the rolling mills and machinery which finishes the steel products. Gas is used to convert coal into coke, to heat steel in preparation for rolling, and for cutting and finishing operations.

1/ Steel and America, op. cit., p. 24.
2/ Steel Comments, American Iron and Steel Institute, 1984.

The average U.S. production cost during 1980-84 for 1 short ton of finished steel produced at an integrated mill is estimated at $482.00. Actual selling prices vary widely from list prices due to cyclical business trends, inflation, interest rates, and general economic conditions. Although the major mill domestic list price increased from $464.96 per short ton in 1980 to an estimated $573.80 in 1984, actual domestic price realization ranged from $452.93 in 1980 to $517.93 in 1984. 1/ According to data obtained from the Commission in investigation No. TA-201-51, Carbon and Certain Alloy Steel Products, the average unit value of domestic shipments of carbon and alloy steel products stood at $459.00 per short ton in 1980, rose to $521.00 per short ton in 1981, then fell to $448.00 per short ton in 1983.

OTHER MAJOR CONSUMING INDUSTRIES

Aluminum

The aluminum industry is highly energy intensive; energy costs are therefore a major concern for producers. In the United States, hydroelectric power and thermal coal power are the principal energy sources used by most of the 27 primary aluminum plants. A few reduction plants located in Texas and Louisiana rely on natural gas as a source of energy. About one-third of the domestic aluminum capacity is located in the Pacific northwest where the Bonneville Power Administration supplies hydroelectric power to smelters. The Tennessee Valley Authority and the New York Power Authority are major sources of hydroelectrical power and thermal coal power to a significant portion of the domestic aluminum industry.

Two companies currently produce aluminum in Canada, both of which are using abundant and relatively low-cost hydropower as the primary source of energy. These companies account for approximately 55 percent of total U.S. aluminum imports. Although pricing policies are found to exist in Canada with respect to its petroleum and natural gas industries, they do not affect U.S. aluminum producers since Canadian smelters rely almost exclusively on hydropower.

There is one producer of aluminum in Mexico using both petroleum and hydropower for energy. U.S. imports of aluminum from Mexico, however, are negligible compared with total imports.

Ceramic Floor and Wall Tiles

The Tile Council of America, Inc. (TCA), a trade association representing U.S. title manufacturers and firms producing supplies and equipment for the tile industry, alleges that a natural gas price subsidy by the Mexican Government is largely responsible for the rapid growth in exports of Mexican-produced tiles to the United States during 1982-84. TCA states that ceramic tile manufacturing is an energy-intensive process and estimates that the natural gas price subsidy offered by the Mexican Government translates into a production cost savings of 0.864-3.576 cents per square foot for the Mexican tile industry.

1/ Peter F. Marcus, Karlis M. Kirsis, The Steel Strategist, #9, World Steel Dynamics, Paine Webber Mitchell Hutchins Inc., February 1984.

Fuel costs, relative to other competitive factors, have a more limited impact on the competitive position of the U.S. tile industry. Fuel costs represent about 17 percent ($26.0 million) of the U.S. tile industry's total material costs, 1/ and about 37 percent of the value of shipments for the U.S. tile industry, compared with an average material cost of 58 percent of shipments for all U.S. manufacturing establishments.

Although the alleged energy pricing subsidies may have contributed to the growth in U.S. imports of tiles from Mexico during 1982-84, they were unlikely to have been largely responsible for this growth. Imports from Mexico increased by 76 percent (17.2 million square feet) during 1982-84 to 39.7 million square feet ($16.5 million) in 1984. Imports from other countries such as Italy posted stronger growth during this period, and the share of total U.S. imports supplied by Mexico decreased by 1 percentage point during 1982-84 to 9 percent in 1984. Mexican-produced tiles increased their average price advantage over U.S.-produced tiles by 10 cents per square foot during this period to 83 cents per square foot in 1984. Alleged natural gas pricing subsidies equating production cost savings of 0.864-3.576 cents per square foot would likely represent a small portion of the U.S.-Mexican market price differential. Other factors such as lower Mexican labor rates and the strength of the U.S. dollar relative to the Mexican peso are believed to be more significant to the size of this price differential and the growth of tile imports from Mexico.

Glass Containers

Although natural gas pricing is a significant factor in glass container production costs due to the energy-intensive nature of the industry, Canada and Mexico have emerged as principal trading partners largely due to their proximity to the U.S. market. Energy costs for the glass container industry accounted for approximately 27 percent of total materials cost. An estimated 19 percent of total materials cost was accounted for by fuels consumed (particularly natural gas); the remaining 8 percent is believed to be purchased electric energy. 2/

U.S. imports of glass containers are largely limited to border trade, due to high transportation costs, and to shipments of specialized glass containers such as perfume bottles from France and Italy. However, factors other than energy pricing have had a much greater effect on the competitive position of the U.S. glass container industry; most notably, the inroads made by plastic containers into glass container markets, domestic overcapacity, and the exchange rate advantage accruing to foreign suppliers because of the strong dollar that makes imported containers cheaper to purchase in the U.S. market.

In 1984, U.S. producers' shipments of glass containers amounted to an estimated $5.2 billion. Total U.S. imports reached $98.6 million, an estimated 1.9 percent of apparent consumption ($5.2 billion). Canada was the principal import source, accounting for 36 percent of U.S. imports. Mexico was the third leading supplier, accounting for 20 percent.

1/ Data compiled from official statistics of the U.S. Department of Commerce.
2/ Based on the 1982 Census of Manufactures for glass containers.

APPENDIX G

INPUT-OUTPUT ANALYSIS OF THE EFFECTS OF PRICING POLICIES ON CERTAIN NATURAL RESOURCES ON PRODUCTION COSTS OF ENERGY-INTENSIVE INDUSTRIES

Introduction

Governments of countries with abundant natural resources sometimes employ policies of pricing these resources to domestic industrial users substantially below their export price or the world price. Such pricing policies reduce the local production costs of commodities that use these resources intensively. An industry enjoying this cost advantage may follow a strategy of temporarily selling at a price below the world price to increase its share of the world market, thus bidding down the world price. These lower export prices would adversely affect U.S. producers of like products and would benefit U.S. producers that use these products as inputs.

In this study, input-output analysis is used to estimate the effect of pricing policies of certain natural resources on production costs of commodities using these resources. The effect on U.S. imports and consequent effect on competing U.S. producers is then estimated. Finally, the effect of the reduced import prices on production costs is estimated for selected U.S. industries that use these imports as inputs.

The study is organized as follows. The first section describes the input-output methodology used to estimate the effect of pricing policies on production costs and it presents empirical estimates of the cost advantage for the relevent resource-intensive industries. The second section discusses the effect of lower production costs in these countries on the prices and volume of imports to the United States and presents estimates of these effects for major import categories. Finally, the last section investigates the potential cost saving of the U.S. agriculture sector resulting from cheaper imports of inputs.

Input-Output Analysis

Methodology

Artificially low prices on natural resources reduce production costs in the home country for a resource-intensive commodity in two ways. First, they reduce these costs directly by reducing costs of the production process for the commodity. Second, they may also reduce these costs indirectly by reducing the cost of intermediate inputs used to produce the commodity. The extent to which these policies effect production costs indirectly, (i.e., by reducing the prices of intermediate inputs), depends upon whether the cost advantage associated with the production of an intermediate input will be passed on in the form of lower prices to domestic users of that input. In the absence of any additional government pricing policy, none of the cost advantage is passed on if the intermediate input can be sold on the world market at competitive prices, since producers should charge the same price to domestic users as to foreign users. Even if the industry is vertically integrated from some initial processing stage to some final end use, the economic cost associated with an intermediate input includes the value of the next best alternative use of that input. Hence, the likelihood that the cost advantage resulting from a natural resource pricing policy is passed on to downstream users diminishes with each stage in the production process if there are world markets for these intermediate inputs.

In this study, both the direct and total (direct plus indirect) effects of pricing policies on production costs of a commodity are calculated by applying input-output analysis to the direct effects. Estimates of the direct effects on production costs are a lower bound for the actual effect of pricing policies. Estimates of the total (direct and indirect) effects on production costs are an upper of the actual effect of the pricing policies because only part of the advantage enjoyed by producers of intermediate inputs is usually passed on to downstream users.

The direct effects of government pricing policies on production costs per unit of output in industry i is given by the equation:

$$\Delta p_i = \sum_k c_{ik} \Delta p_k \qquad (1)$$

where Δp_i is the change in production costs for industry i, c_{ik} is the ratio of the value of primary input k to the value of output in industry i, and Δp_k is the difference in price in the export and domestic markets of primary input k resulting from these pricing policies. Since this study is primarily concerned with estimates of the percentage change in cost per unit of output, equation (1) can be altered to:

$$\Delta p_i / p_i = \sum_k c_{ik} (\Delta p_k / p_k)$$

where p_k is the export or world price of primary input k.

Where the cost advantage enjoyed by producers of intermediate inputs is completely passed on to downstream users, the equation for the effect of pricing policies on production costs per unit of output in industry i is:

$$\Delta p_i = \sum_j a_{ij}^D \Delta p_j + \sum_k c_{ik} \Delta p_k \qquad (2)$$

where Δp_i is the change in production costs for industry i, a_{ij}^D is the ratio of the value of domestic production of intermediate input j to the value of output in industry i, Δp_j is the change in the costs of production of intermediate input j caused by government pricing policies, c_{ik} is the ratio of the value of primary input k to the value of output in industry i, and Δp_k is the difference in price in the export and domestic markets of primary input k resulting from these pricing policies. 1/

Expressing equation (2) in percent terms yields:

$$\Delta p_i / p_i = \sum_j a_{ij}^D (\Delta p_j / p_j) + \sum_k c_{ik} (\Delta p_k / p_k) \qquad (3)$$

1/ This discussion draws heavily from Bayard, Tom and Don Rousslang, "The Effect of OSHA and EPA Regulations on U.S. Trade," Department of Labor working paper, November 1980.

where p_j is the cost of production in the absence of pricing policies per unit of input j and p_k^* is the export or world price of primary input k.

The first term on the right-hand-side of equation (2) or (3) is the sum of the effects of pricing policies on prices of the intermediate inputs used by industry i. The second term in each equation is the sum of the effects of these policies on production costs of the primary inputs in industry i.

Equation (2) must be solved for all industry outputs i and inputs j. Using matrix notation, equation (2) is solved simultaneously for n industries using the equation:

$$P = (I - A^{D'})^{-1} C$$

where P is a vector (nx1) of percent differences between domestic production costs of output caused by both the direct and indirect effects of natural resource pricing policies, AD is a matrix (nxn) of domestic input requirements per unit of output, and C is a vector (nx1) of the percent differences in natural resource prices caused by governments' natural resource pricing policies.

Assumptions and limitations

With this methodology, the estimates of the cost advantage afforded to industries as a result of natural resource pricing policies take into account not just that afforded to primary users of the resource but also that which may be passed on to downstream users. However, the technique is subject to a number of limitations stemming from some of the assumptions associated with the input-output analysis. Also, there are difficulties in estimating the difference between the export and domestic price of certain natural resources.

The input-output technique assumes that all inputs enter production in fixed proportions. Furthermore, in this study it is assumed that the proportion of inputs used in production in other countries is the same as that used in the United States. For some industries, these assumptions are reasonable, if the analysis is confined to the short run so that input substitution is very limited and if the countries have similar technologies or resource endowments. However, for certain industries, such as those which use energy resources intensively, the mix of energy inputs can vary considerably over a short period of time or from one country to another. Hence, the results of this analysis must be interpreted with care.

Reliable estimates of the difference between the market price of a resource and the price set by government pricing policies of a resource are often very difficult to obtain due to problems in determining internal prices in a country, as discussed in the main text of this report. Furthermore, prices and world market conditions are rapidly changing. Hence, in this analysis, a range of prices was chosen that reflect recent price trends. Finally, even where good data on prices are available, estimates of price differentials may be difficult to quantify, because of transportation costs and other costs of trade, or to interpret, in the case of nonmarket economics.

The problem of transportation costs is particularily troublesome for natural gas, which can only be transported by means of a pipeline or by liquefying, transporting, and regasifying. Hence, while it may appear that domestic industries of a country are enjoying a cost advantage associated with some government policy that sets the price of gas below the export price, this difference may be attributed to processing and transportation costs. Indeed, the high cost of liquefying, transporting, and regasifying or the great distances required for pipelines may prohibit the export of natural gas for some countries. In these countries, natural gas has no alternative use and would otherwise be flared at the wellhead. Therefore, no pricing policy on natural gas is assumed to exist in Saudi Arabia, which previously flared its natural gas before developing its petrochemical industry. 1/

The application of the above analysis to nonmarket economies poses special problems. In these countries, where resources are allocated through some central planning process, prices often do not measure true resource costs. 2/ Hence, even though the government administers prices of its natural resources, export prices of the resource-intensive products are also likely to be administered and not necessarily reflective of cost. Therefore, estimates of the cost advantage associated with a government pricing policy for natural resources is not very meaningful.

Empirical results

The types of resources examined in this study include natural gas, petroleum, and metal ores. Evidence of some type of government pricing policy was found for natural gas in Canada and Mexico and for refined petroleum in Mexico. No evidence of pricing policies was found for metal ores. The analysis in this study, therefore, is restricted to energy-intensive industries and energy-intensive primary metal ore production.

Energy-intensive industries were identified using estimates of total (direct plus indirect) input requirements per dollar of output. These estimates were constructed using the Department of Commerce input-output table for 534 industries. The industries identified as energy intensive are shown in table G-1. They include selected products from petroleum refining and related industries, chemicals and selected chemical products, plastics and synthetic materials, stone and clay products, glass and glass containers, paints and allied products, and primary iron and steel manufacturing.

1/ See "Comments Submitted by Petroleos Mexicanos," p. 13; "Submission of the Ad Hoc Committee of Domestic nitrogen Producers to the U.S. International Trade Commission," p. 9; submissions to the USITC, Feb. 19, 1985; and 130 Cong. Rec. H7916-17 (1984).

2/ See Alec Nove, The Soviet Economic System, (Surrey, Great Britain: Biddles, Ltd.) 1977, Chap. 7; U.S. International Trade Commission, 38th Quarterly Report to the Congress and the Trade Policy Committee on Trade Between the United States and the Nonmarket Economy Countries during January-March 1984, USITC Publication No. 1547, pp. 52-53; and 49 F.R. 19370.

Because of the difficulties in quantifying the difference between the domestic and fair market value of a resource, a high and low estimate of the price difference was calculated for each of these resources. Where appropriate, estimates were corrected for differences in transportation costs.

Canada

The price at which Canadian industrial users purchase natural gas varies from US$1.65 per thousand cubic feet (MCF) in Alberta to $2.90 per MCF in Ontario. 1/ Until November 1, 1984, the Canadian Government priced natural gas to the United States at a uniform price of $4.31 per MCF for the first 50 percent of contract volumes and $3.31 per MCF for additional volumes. 2/ The average price of natural gas exported to the United States in January 1985 was $4.14 per MCF. 3/

It is difficult to measure transportation costs of Canadian gas because of the variation in distances from the wellhead to both domestic users and U.S. importers. Transportation costs from the wellhead to regions in western Canada, for example, are likely to be comparable with transportation costs to the border of western United States but are likely to be considerably lower than the delivery costs to the northeast regions of Canada and the United States. Furthermore, despite differences in transportation costs, the Canadian Government set a uniform border price policy for exports to all regions of the United States.

To address this problem, a maximum price difference is estimated by assuming that transportation costs to western Canada and western United States are equal and then subtracting the price in Alberta from the average price to the United States. Similarily, a minimum price difference is estimated by subtracting the price in Ontario from the average price to the United States. Thus, the price to Canadian industrial users is estimated to be between 30 percent and 60 percent lower than the price of Canadian exports to the United States.

High and low estimates of the cost advantage enjoyed by Canadian industries arising from the Government pricing policy for natural gas are estimated. The high estimate is based on the larger estimate of the price difference together with estimates of the total (direct plus indirect) input requirements per dollar of output. The low estimate uses the smaller estimate of the price differential together with estimates of the direct input requirements. Results are shown on table G-2. Using the high estimates, Canadian production costs are generally between 2 percent and 3 percent lower than world production costs. Using the lower estimates, the cost advantage to Canadian producers is generally very small, less than 1 percent. According to both sets of estimates the industries enjoying the greatest cost advantage are producers of brick and structural clay tile, structural clay products, lime, carbon black, cement, and glass containers.

1/ Industry sources.

2/ "Canada moving to Capture Bigger Slice of U.S. Gas Market," Oil & Gas Journal, Jan. 28, 1985, pp. 57-62. Estimates of prices were converted to MCF from MMBTU using a conversion factor of 1.021 MMBTU/MCF.

3/ Compiled from official statistics of the U.S. Department of Energy.

Table G-1.—Total direct and indirect input requirements of refined petroleum and natural gas per dollar of output in energy-intensive industries

Industry	Natural gas	Refined petroleum
Petroleum refining and related industries:		
Lubricating oils and greases	.03879	.16600
Products of petroleum and coal, n.e.c	.04337	.56261
Paving mixtures and blocks	.04470	.34819
Asphalt felts and coatings	.05197	.24771
Plastics and synthetic materials:		
Plastics materials and resins	.05973	.05784
Synthetic rubber	.06895	.05700
Cellulosic man-made fibers	.07106	.06172
Organic fibers, noncellulosic	.03789	.04918
Chemicals and selected chemical products:		
Industrial organic and inorganic chemicals	.07574	.05927
Nitrogenous and phosphatic fertilizers	.10628	.04640
Agricultural chemicals, n.e.c	.05044	.04332
Adhesives and sealants	.04028	.06666
Printing ink	.03929	.10594
Carbon black	.13673	.41014
Chemical preparations, n.e.c	.04937	.06495
Active surface agents	.04653	.07058
Stone and clay products:		
Cement, hydraulic	.09019	.05932
Brick and structural clay tile	.18116	.05437
Structural clay products, n.e.c	.19592	.04337
Lime	.14859	.07933
Paints and allied products	.03566	.05411
Glass and glass products:		
Glass containers	.09314	.04333
Primary iron and steel manufacturing:		
Blast furnaces and steel mills	.05800	.04225
Electrometallurgical products	.06633	.04616
Primary metal products, n.e.c	.04444	.04306

Source: U.S. Department of Commerce, The Detailed Input-Output Structure of the U.S. Economy, 1977. (Washington, D.C.: U.S. Government Printing Office) 1984.

Table G-2.—Cost advantage of Canadian energy-intensive industries from Government pricing policy on natural gas

(In percent)

Industry	Reduction in unit costs	
	High 1/	Low 2/
Petroleum refining and related industries:		
Lubricating oils and greases	2.33	.11
Products of petroleum and coal, n.e.c	2.61	.23
Paving mixtures and blocks	2.69	.41
Asphalt felts and coatings	3.13	.48
Plastics and synthetic materials:		
Plastics materials and resins	3.59	.30
Synthetic rubber	4.15	.33
Cellulosic man-made fibers	4.27	.84
Organic fibers, noncellulosic	2.28	.10
Chemicals and selected chemical products:		
Industrial organic and inorganic chemicals	4.56	.85
Nitrogenous and phosphatic fertilizers	6.39	1.25
Agricultural chemicals, n.e.c	3.03	.39
Adhesives and sealants	2.42	.13
Printing ink	2.36	.07
Carbon black	8.22	2.19
Chemical preparations, n.e.c	2.80	.29
Active surface agents	2.97	.17
Stone and clay products:		
Cement, hydraulic	5.42	1.38
Brick and structural clay tile	10.89	3.36
Structural clay products, n.e.c	11.78	3.54
Lime	8.94	2.73
Paints and allied products	2.14	.06
Glass and glass products:		
Glass containers	5.60	1.48

1/ Based on an estimated price difference for natural gas of 60.14 percent, using total input requirements.

2/ Based on an estimated price difference for natural gas of 29.95 percent, using direct input requirements.

Mexico

Estimates of natural gas prices to Mexican domestic industrial users ranged from US$0.42 per MCF to $1.72 per MCF during 1982 through 1984. The price of natural gas at the U.S. border was $4.40 per MCF, until exports ceased in November 1984, while U.S. prices range from $3.00 to 3.50 per MCF. Industry sources estimate the transportation costs from the wellhead to the domestic user to range from $0.86 to 0.72 per MCF, they also estimate transportation costs to the U.S. border to range from $0.94 to $1.25 per MCF. 1/

Using these estimates, a maximum and minimum price differential is estimated. The maximum difference in price is obtained using the lower domestic price of $0.42 per MCF and an export price of $4.40 per MCF. No domestic transportation costs are included, and the transportation cost to the U.S. border is assumed to be $1.00 per MCF. The minimum price difference is obtained using the higher local price in Mexico of $1.72 per MCF and a U.S. price of $3.25 per MCF. Domestic transportation costs and delivery costs to the U.S. border are assumed to be $0.72 per MCF and $1.25 per MCF, respectively. Thus the price to Mexican domestic industrial consumers is estimated to be roughly from 50 percent to 87 percent lower than the fair market price.

To estimate the difference in the domestic and export prices of refined petroleum, price differences for heavy fuel oil and carbon black feedstock are assumed to be representative of the price differences of all refined petroleum products. 2/ Estimates of domestic prices of heavy fuel oil range from US$1.25 to $5.00 per barrel(BBL) compared to the world price of around $27.36 per BBL. 3/ Carbon black feedstock is priced to domestic consumers at between $2.00 and 6.00 per BBL compared with a world price of around $25.00 per BBL. 4/ Using these estimates, the price to domestic industrial users is estimated to be roughly from 75 percent to 90 percent lower than the world price.

High and low estimates of the cost advantage enjoyed by Mexican industries resulting from pricing policies on both petroleum and natural gas are shown in table G-3. Using the higher estimates, production costs are 10 percent to 60 percent lower than world production costs. Using the lower estimates, production costs are 0.8 percent to 30 percent lower. For both the high and the low estimates, industries enjoying the greatest cost advantage

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1/ This information was obtained from "Statement of Kaiser Cement Corporation and Southwestern Portland Cement Company," p. 9; "Statement of the Tile Council of America," p. 4; "Submission of the Ad Hoc Committee of Domestic Nitrogen Producers to the International Trade Commission," p. 5; Submissions to the USITC, Feb. 19, 1985.

2/ The input-output table does not distinguish between different petroleum feedstocks. Since these products are close substitutes in many applications, this assumption is reasonable.

3/ "Statement of Kaiser Cement Corporation and Southwestern Portland Cement Company," p.9; "Statement of Moore McCormack Cement, Inc.," p. 5; Submissions to the USITC, Feb. 19, 1985; and discussions with industry sources.

4/ Cabot Corp. "Potential Effects of Foreign Governments' Pricing Policies on Pricing Natural Resources," submission to the USITC, Feb. 19, 1985; and discussions with industry sources.

Table G-3.—Cost advantage of Mexican energy-intensive industries from Government pricing policy on natural gas and refined petroleum

(In percent)

Industry	Reduction in unit costs	
	High 1/	Low 2/
Petroleum refining and related industries:		
Lubricating oils and greases	19.24	8.43
Paving mixtures and blocks	37.14	24.37
Asphalt felts and coatings	28.20	17.88
Plastics and synthetic materials:		
Plastics materials and resins	10.76	1.90
Synthetic rubber	11.48	.81
Cellulosic man-made fibers	12.12	3.24
Organic fibers, noncellulosic	8.01	1.36
Chemicals and selected chemical products:		
Industrial organic and inorganic chemicals	12.30	2.84
Nitrogenous and phosphatic fertilizers	13.75	2.87
Agricultural chemicals, n.e.c	8.55	1.34
Adhesives and sealants	9.89	2.79
Carbon black	51.12	31.56
Chemical preparations, n.e.c	10.28	2.49
Active surface agents	11.06	2.64
Stone and clay products:		
Cement, hydraulic	13.57	4.52
Brick and structural clay tile	21.07	8.24
Structural clay products, n.e.c	21.31	7.48
Lime	20.59	8.51
Paints and allied products	8.28	1.62
Glass and glass products:		
Glass containers	12.29	3.98
Primary iron and steel manufacturing:		
Blast furnaces and steel mills	9.11	1.96
Electrometallurgical products	10.21	1.19
Primary metal products, n.e.c	8.01	1.05

1/ Based on an estimated price difference for natural gas of 87.65 percent and for refined petroleum of 95.42 percent, using total input requirements.

2/ Based on an estimated price difference for natural gas of 50.00 percent and for refined petroleum of 76.00 percent, using direct input requirements.

are producers of carbon black, lubricating oils and greases, asphalt felts and coatings, hydraulic cement, structural clay products, and brick and structural clay tile.

Effect of Government Pricing Policies on U.S. Imports of Resource-Intensive Commodities

Methodology

In the preceding section, the cost advantage to foreign producers arising from government pricing policies of energy resources was estimated for energy-intensive industries. Local producers in these industries are likely to pass part of the cost advantage on to foreign buyers to gain market shares. To the extent that this increases the total volume of world production, prices of these commodities will be driven down.

The effects of foreign pricing policies on the price and quantity of a commodity imported into the United States cannot be directly observed, even if we know the effect on foreign production costs. This is true because these effects depend on the relevent supply and demand elasticities. The extent to which foreign producers pass their cost advantage on to U.S. consumers depends on two factors: the willingness of U.S. consumers to increase purchases of a commodity from a particular country in response to a reduction in price (the import demand elasticity) and the willingness of producers in the exporting country to supply to the United States at given prices (the export supply elasticity).

The reduction in the export price of a commodity will be some proportion of the reduction in unit production costs caused by government pricing policies, depending on the import demand and export supply elasticity. Specifically, this proportion can be estimated using the equation:

$$\Delta P/\Delta C = e_s/(e_s+e_d) \qquad (4)$$

where ΔP is the change in the export price and ΔC is the change in unit cost, resulting from pricing policies and e_s is the elasticity of export supply and e_d is the elasticity of import demand.

Given the estimated change in the import price of a commodity, the change in value of imports to the United States is measured by a movement along the U.S. import demand curve. Hence the change in the value of imports can be estimated using the equation:

$$\Delta M = M(\Delta P/P)e_d \qquad (5)$$

where M and P are the total value of imports from a country and the current price, respectively, ΔM and ΔP are the change in the value of imports and the change in price arising from the cost advantage employed by an industry due to government pricing policies, and e_d is the import demand elasticity.

Limitations and assumptions

The major problem with this estimation technique is that very little is known about import demand elasticities and even less is known about export supply elasticities. Import demand elasticities have been estimated for highly aggregated categories of commodities and these estimates are usually for all imports into the United States rather than those from a particular country. These elasticities are likely lower than the elasticity for imports of a more disaggregated commodity group from an individual country. 1/ Hence, these estimates probably understate the responsiveness of U.S. importers to changes in import prices.

Estimates of export supply elasticities are extremely difficult to obtain. 2/ Given this lack of information, high and low estimates of the export supply elasticity are used. An infinite supply elasticity is used for the high estimate. Under this assumption, the full cost advantage to foreign producers arising from government pricing policies is passed on to U.S. buyers in the form of lower export prices. This gives the maximum potential effect on import prices and on the value of imports arising from government pricing policies of natural resource inputs. An elasticity of one is assumed for the low estimate.

Empirical results

The greater the share of the U.S. market held by a particular country, the greater is the effect of its export prices on prices in the U.S. market. Where exports of a particular country account for a very small share of the U.S. market, the effect is likely negligible. Hence, the analysis of the effects of government pricing policies of a country on U.S. imports is restricted to imports of commodities where the beneficiary foreign exporters account for a significant share (15-20 percent or more) of total U.S. imports. Tables G-4 and G-5 show the value of U.S. imports from Mexico and Canada of energy-intensive commodities by input-output category and the percent of total U.S. imports accounted for by each of these countries.

High and low estimates of the effects on prices and on the value of imports are made using the following assumptions. For the high estimate, export supply is assumed perfectly elastic (i.e., the full cost advantage is passed through in the form of lower prices) and the larger estimate of the cost advantage (from the previous section) is used. For the low estimate, a supply elasticity of one is assumed and the smaller estimate of the cost advantage is used.

The potential reduction in import prices is estimated using equation (4). These estimates are based on estimates of import demand elasticities, summarized by Stern, Francis, and Schumacher, 3/ and shown in

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1/ To the extent that a commodity within an aggregated category can be substituted for another commodity in the same category, importers are likely to be more responsive to price for a particular commodity than for the aggregated group. Similarily, to the extent that commodities from one country can be substituted for commodities from another, importers are likely to be more responsive to price from a particular country than from all countries.

2/ John Suomela, and Don Rousslang, "Calculating the Consumer and Net Welfare Cost of Import Relief." ITC working paper, in process, p. 11.

3/ Sterm, Robert M., Jonathan Francis, and Bruce Schumacher, Price Elasticities in International Trade, (London, Great Britain: The Macmillan Press Ltd.), 1976.

table G-6, and the assumptions about export supply elasticities that are discussed above. For some categories, estimates of demand elasticities vary considerably. Therefore, the "best" estimate given by Stern is used. Given estimates of the reduction in export prices, the effects on imports are estimated using equation (5).

Table G-4.—Energy-intensive U.S. imports from Canada, 1984

Industry	Imports	Percent of total U.S. imports
	1,000 dollars	
Petroleum refining and related industries:		
Lubricating oils and greases	19,577	12.55
Products of petroleum and coal, n.e.c	7,058	25.72
Paving mixtures and blocks	54,021	19.98
Asphalt felts and coatings	27,926	84.27
Plastics and synthetic materials:		
Plastics materials and resins	130,379	19.24
Synthetic rubber	156,887	46.88
Cellulosic man-made fibers	6,539	24.34
Organic fibers, noncellulosic	37,755	12.40
Chemicals and selected chemical products:		
Industrial organic and inorganic chemicals	962,134	15.80
Nitrogenous and phosphatic fertilizers	397,502	40.07
Agricultural chemicals, n.e.c	11,270	17.24
Adhesives and sealants	4,966	9.19
Printing ink	5,780	25.47
Carbon black	27,174	64.12
Chemical preparations, n.e.c	33,226	7.41
Active surface agents	10,665	11.41
Stone and clay products:		
Cement, hydraulic	118,382	40.24
Brick and structural clay tile	1,790	8.33
Structural clay products, n.e.c	615	31.73
Lime	11,703	73.84
Paints and allied products	12,641	15.60
Glass and glass products:		
Glass containers	35,253	35.74

Source: Compiled from official statistics of the U.S. Bureau of Census.

Table G-5.—Energy-intensive U.S. imports from Mexico, 1984

Industry	Imports	Percent of total U.S. imports
	1,000 dollars	
Petroleum refining and related industries:		
Lubricating oils and greases	9	.01
Paving mixtures and blocks	32,168	11.90
Asphalt felts and coatings	4,195	12.66
Plastics and synthetic materials:		
Plastics materials and resins	33,301	4.91
Synthetic rubber	21,100	6.31
Cellulosic man-made fibers	1,741	6.48
Organic fibers, noncellulosic	27,936	9.18
Chemicals and selected chemical products:		
Industrial organic and inorganic chemicals	274,215	4.68
Nitrogenous and phosphatic fertilizers	53,211	5.36
Agricultural chemicals, n.e.c	774	1.18
Adhesives and sealants	75	.14
Carbon black	7,762	18.32
Chemical preparations, n.e.c	48,928	10.91
Active surface agents	6,218	6.49
Stone and clay products:		
Cement, hydraulic	64,855	22.04
Brick and structural clay tile	15,863	73.81
Structural clay products, n.e.c	67	3.46
Lime	2,701	17.04
Paints and allied products	138	.17
Glass and glass products:		
Glass containers	19,776	20.05
Primary iron and steel manufacturing:		
Blast furnaces and steel mills	259,959	2.56
Electrometallurgical products	17,438	3.25
Primary metal products, n.e.c	25	.03

Source: Compiled from official statistics of the U.S. Bureau of Census.

Table G-6.—Import demand elasticity estimates

Commodity	Range	"Best" estimate
Petroleum refineries	-.63 to -1.30	-.96
Miscellaneous products of petroleum and coal	1/	-.96
Plastic products, n.e.c	1/	-2.53
Rubber products	-3.13 to -6.00	-5.26
Industrial chemicals	-.60 to -5.46	-2.53
Other chemical products	1/	-2.53
Pottery, china, and earthenware	-1.30 to -4.60	-2.85
Glass and products	-1.60	-1.60
Other nonmetallic mineral products	1/	-2.00
Iron and steel basic industries	-.85 to -2.00	-1.42

1/ Not available.

Source: Robert M. Stern, Jonathan Francis, and Bruce Schumacher, Price Elasticities in International Trade, (London, Great Britain: The Macmillan Press Ltd.), 1976, p. 22.

Table G-7 shows high and low estimates of the change in price and consequent change in value of imports demanded for selected commodities from Canada arising from government pricing policies. For many of these commodities, the effect on price and the value of imports under the "low" assumptions was negligible because the estimate of the cost advantage was less than 0.5 percent. The low estimate for the change in the export price was always less than 1 percent and the consequent change in the value of imports was 1 to 3 percent. The high estimates of the change in price range from 2 percent to 10 percent are the change in the value of imports ranged from 3 percent to 30 percent. These estimates indicate the maximum potential effect of government pricing policies on U.S. imports of resource-intensive commodities. The results indicate that commodities for which the impact on the U.S. market is greatest are structural clay products, carbon black, lime, and nitrogenous and phosphatic fertilizers.

Estimates of the effect of government pricing policies on selected imports from Mexico are shown in table G-8. The analysis is restricted to five commodities—those which account for at least 15 percent of total U.S. imports of that commodity. Low estimates of the percentage change in price range from 8 percent for carbon black to roughly 2 percent for other commodities, resulting in a change in the quantity demanded of 23 percent for carbon black and 2 percent to 6 percent for other commodities. The high estimates of the effect of pricing policies on export prices and on the value of imports are considerably greater than the low estimates. The price of carbon black is estimated to be 50 percent of what it would be in the absence of pricing policies and the estimated change in the value of imports is greater than $10 million. Since the total value of imports from Mexico in 1984 was only $7 million, the high estimate is clearly too high. This suggests that the export supply elasticity for carbon black from Mexico is not

Table G-7.—Estimated changes in prices and value of U.S. imports of selected commodities from Canada

Commodity	High estimate		Low estimate	
	Change in price	Change in value of imports	Change in price	Change in value of imports
	Percent	1,000 dollars	Percent	1,000 dollars
Products of petroleum and coal, n.e.c	2.61	177	0	0
Paving mixtures and blocks	2.69	1,395	0	0
Asphalt felts and coatings	3.13	839	0	0
Plastics materials and resins	3.59	11,842	0	0
Synthetic rubber	4.15	34,247	0	0
Cellulosic manmade fibers	4.27	4,079	.84	227
Printing ink	2.36	345	0	0
Nitrogenous and phosphatic fertilizers	6.39	64,263	.35	3,561
Industrial organic and inorganic chemicals	4.56	111,999	.24	5,861
Agricultural chemicals, n.e.c	3.03	864	0	0
Carbon black	8.22	5,651	.62	427
Paints and allied products	2.14	684	0	0
Glass containers	5.60	3,159	.57	321
Cement, hydraulic	5.42	12,833	.46	1,089
Structural clay products, n.e.c	11.78	206	.92	16
Lime	8.94	2,093	.91	213

Table G-8.—Estimated changes in prices and value of U.S. imports of selected products from Mexico

Commodity	High estimate		Low estimate	
	Change in price	Change in value of imports	Change in price	Change in value of imports
	Percent	1,000 dollars	Percent	1,000 dollars
Carbon black	51.12	10,039	8.94	1,756
Cement, hydraulic	13.57	17,602	1.50	1,954
Brick and structural clay tile	21.07	9,526	2.14	968
Lime	20.59	1,113	2.84	153
Glass containers	12.29	736	1.53	92

perfectly elastic. For other commodities, the percentage change in price ranges from 12 percent to 20 percent, resulting in changes in the value of imports of 20 to 60 percent. Again, the high-range estimates indicate the maximum potential effect of government pricing policies on the U.S. market for these commodities.

The Effect of Lower Import Prices of Inputs on Agricultural Industries

The preceding sections estimated the cost advantage to foreign exporters that results from artificially low domestic energy prices of energy-intensive products in certain countries. Given this cost advantage, the effect on prices of U.S. imports was estimated. Reduced import prices clearly benefit U.S. producers that use these imports as inputs. In this section, the effect of lower import prices of fertilizers and other chemicals on the production costs of agricultural industries is estimated.

The effect of lower prices of agricultural inputs on unit costs of agricultural production is estimated using input-output analysis. Table G-9 shows the total (direct plus indirect) requirements of the major energy-intensive inputs that were analyzed in this study for a dollar of output of selected agricultural industries. These inputs are industrial organic and inorganic chemicals, nitrogenous and phosphatic fertilizers, and other agricultural chemicals.

Of these commodities, Canada accounts for 15 to 40 percent of total U.S. imports and Mexico only accounts for 1 to 5 percent of U.S. imports, as indicated on tables G-9 and G-10. Therefore, the effects on the U.S. market of reduced prices and increased volumes of imports from Canada could be significant, but the effects of imports from Mexico are probably negligible. 1/ However, if Mexico's exports are directed at certain regions of the United States, then Mexican producers may reduce prices for export to these regions, reducing costs for the local agricultural producers. Therefore, the effect of lower prices of imported inputs is estimated using two approaches. First, it is assumed that Mexican producers export most of these inputs at the world price, and only the effects of Canadian pricing strategies on the U.S. market are considered. Second, the cost advantage that may be enjoyed in a particular region due to lower Mexican import prices is estimated. This advantage can only apply for a small U.S. region. It cannot be widespread, because the volume of imports from Mexico are too small to have any significant effect on the average cost of U.S. agricultural output.

1/ One exception to this is the effect on the U.S. market for imports of ammonia from Mexico where, according to industry sources, prices of imports from Mexico are 15-30 percent lower than average U.S. domestic prices, driving prices in the U.S. market down. However, since ammonia is only part of the fertilizer input category and since the total fertilizer input requirement is only about 5¢ per dollar of output, the effect of reduced prices of ammonia on unit production costs of agricultural output will be small. (For a discussion of Mexican export prices of ammonia, see "Submission of the Ad Hoc Committee of Domestic Nitrogen Producers" op. cit.; and Economic Consulting Services, Inc., "Effect of Potential Countervailing Duties on the Price of Ammonia and Area Fertilizers in the USA." Submission to the USITC, February 19, 1985).

Table G-9.—Total direct and indirect requirements of energy-intensive inputs per dollar of output in agricultural industries

Industry	Industrial organic and inorganic chemicals	Nitrogenous and phosphatic fertilizers	Agricultural chemicals, n.e.c.
Cotton	.03748	.06642	.05127
Food grains	.03613	.12175	.01566
Feed grains	.05568	.14975	.02323
Grass seeds	.02835	.04890	.01963
Tobacco	.02983	.04871	.01242
Fruits	.03494	.04306	.03433
Tree nuts	.02453	.03844	.02169
Vegetables	.02213	.04530	.01531
Sugar crops	.02270	.06677	.02492
Miscellaneous crops	.03631	.10591	.01317
Oil bearing crops	.01925	.01798	.02378

Source: U.S. Department of Commerce, The Detailed Input-Output Structure of the U.S. Economy, 1977, (Washington, D.C.: U.S. Government Printing Office), 1984.

Estimates of the reduction in unit production costs of agricultural commodities resulting from lower input prices are based on the percent reduction in U.S. import prices from Canada that were estimated in the previous section. Using the low range estimates of the reduction in import prices, the cost reduction in agricultural output is always less than 0.5 percent. Table G-10 presents the reduction based on the high-range estimates of the change in import prices. These estimates indicate that the reduction in input prices resulting from Canadian natural resource pricing policies had very little effect on unit costs of U.S. agricultural production.

Estimates of the possible effect of reduced import prices of inputs from Mexico to a region of the United States is restricted to estimates of the maximum potential effect. (Estimates of the minimum effect would all be insignificant). Therefore, it is assumed that the entire cost advantage enjoyed by Mexican producers is passed through to U.S. consumers in the form of lower prices and the higher range estimates of the Mexican cost advantage in producing these inputs is used. The reduction in unit production costs of agricultural commodities under these assumptions is shown in table G-11 These estimates indicate that the maximum effect on agricultural production costs of low-priced imported inputs from Mexico are low, ranging from 1 to 2 percent.

This section provided estimates of the maximum effect of foreign natural resource pricing policies on the production costs in U.S. agriculture. Even so, these estimates indicate that the effects are very small.

Table G-10.—Cost advantage of U.S. agriculture producers resulting from lower Canadian import prices of energy-intensive inputs

(In percent)

Industry	Reduction in unit cost
Cotton	.75
Food grains	.99
Feed grains	1.28
Grass seeds	.50
Tobacco	.49
Fruits	.54
Tree nuts	.43
Vegetables	.44
Sugar crops	.64
Miscellaneous crops	.89
Oil bearing crops	.26

Table G-11.—Potential cost advantage of U.S. agriculture producers resulting from lower Mexican import prices of energy-intensive inputs

(In percent)

Industry	Reduction in unit cost
Cotton	1.81
Food grains	2.24
Feed grains	2.95
Grass seeds	1.19
Tobacco	1.15
Fruits	1.31
Tree nuts	1.02
Vegetables	1.02
Sugar crops	1.47
Miscellaneous crops	2.02
Oil bearing crops	.69

APPENDIX H

CHARLS E. WALKER ASSOCIATES, INC. BRIEF SUBMITTED FEBRUARY 19, 1985
TO THE COMMISSION ON ITC INVESTIGATION NO. 332-202 ON BEHALF
OF THE AD HOC COMMITTEE OF DOMESTIC NITROGEN PRODUCERS
AND
A REPORT BY THE ECONOMIC CONSULTING SERVICES INC. WASHINGTON,
ENTITLED EFFECT OF POTENTIAL COUNTERVAILING DUTIES ON
THE PRICE OF AMMONIA AND UREA FERTILIZERS IN THE USA,
REPORTEDLY RELEASED JULY 1984

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February 19, 1985

Mr. Kenneth R. Mason
Secretary
U.S. International Trade Commission
Room 156
701 E Street, N.W.
Washington, D. C. 20436

RE: ITC Investigation No. 332-202

Dear Mr. Mason:

The following submission is made on behalf of the Ad Hoc Committee of Domestic Nitrogen Producers. The Ad Hoc Committee consists of the following companies:

Agrico Chemical Company
American Cyanamid Company
CF Industries, Inc.
First Mississippi Corporation
W. R. Grace & Co.
Mississippi Chemical Corporation
Olin Corporation
Terra Chemicals International

The Ad Hoc Committee has been actively involved since 1979 in raising the issue of state energy pricing policies of certain foreign governments and their impact on trade and the U.S. domestic ammonia industry. The Ad Hoc Committee or some of its members have been involved directly in the 1979 and 1980 Section 406 cases against Soviet ammonia imports before the International Trade Commission; Section 337 and countervailing duty cases against Mexican ammonia in 1982; and various legislation in the 96th, 97th and 98th Congresses, including legislation to amend U.S. trade laws regarding nonmarket economies and the natural resource subsidy provision affecting two-tier energy pricing in the debate over the 1984 Trade Act.

While this submission concerns itself primarily with Mexican energy pricing practices, it also illustrates the problems which arise from state ownership of energy resources, particularly crude oil and natural gas which are then refined or used directly to produce downstream petrochemical products such as ammonia, methanol and ethylene derivatives. The Soviet Union, PRC and most Eastern European countries, of course, utilize state ownership and administered pricing of virtually all production inputs as part of their basic political economic system of government. Other countries such as Mexico exercise wholly integrated or monopoly state ownership of their energy sectors through the production of primarily petrochemicals. Other countries such as Saudi Arabia utilize a mix of state ownership of the basic energy resource with joint ventures on some downstream production with private companies, including U.S. based corporations. In the case of ammonia, state ownership has shifted since 1970 from approximately 30 percent state ownership of ammonia production to approximately 70 percent state ownership of production today.

Neither state ownership of the natural resource or downstream production will create trade distortions automatically. Likewise, price regulation per se of natural resources like natural gas will not create below market value pricing of such natural resources. The existence of state ownership of this nature combined with administered pricing does clearly create the potential for such government energy producers to directly or indirectly lower the production costs of their downstream producers. Where such practices are combined with restrictions on the purchase of the lower-priced energy feedstocks by foreign producers or with investment restrictions which limit the construction of competing downstream plants in those countries, the stage is set for price manipulation, discrimination and distortion of trade. Where such practices are combined in a manner which artificially lowers production costs for those foreign producers, a clear incentive is created to construct excess production capacity and export energy-intensive products like petrochemicals into U.S. and world markets at prices below comparable production costs for private producers. This practice has been particularly evident in the U.S. market for certain petrochemicals and refined petroleum products in the last few years. Such state-owned or state-controlled foreign producers are provided the means to undercut prices of private producers in export markets, oversupply such markets and force the shutdown of otherwise competitive production in those markets.

In most instances, we believe the Commission will be unable to find specific written or official national policies that establish such artificial natural resource price discrimination. We believe, however, that the Commission will find such pricing policies in effect take place or result in several of the countries which the Commission has indicated are under investigation. The fact that there is no written official policy or law to be found does not alter the effect and result of such policies. Such foreign state-owned producers can simply sell their excess production in export markets at whatever price it takes without regard to the supply/demand balance in those markets and the resulting price suppression or depression which inevitably occurs. Such foreign producers are able to simply absorb what would otherwise be commercial losses. In the case of crude oil, or natural gas which is utilized as a feedstock in downstream production, such governments can explicitly or implicitly discount the value of that crude oil or natural gas from its market value down to its actual out-of-pocket production costs. Such producers are also not required to make a profit or return on their investment in order to stay in business. Such potential profits can simply be deducted from the true or fair market value of the feedstock.

With regard to natural gas, transportability is a major factor in reaching major commercial markets. Transportability is not a significant factor in crude oil or refined petroleum products. Countries like Mexico clearly have direct access—to major commercial markets for their gas in the United States. The same is true of the Soviet Union and Canada. Other gas rich countries such as Saudi Arabia and Trinidad do not have such commercial access. Thus, the fair market value of gas in the former group of countries should be much higher than its value in the latter group. In addition, some of these countries appear to believe that a comparative advantage in basic energy resources such as crude oil or natural gas automatically produces a comparative advantage in downstream production of petrochemical or refined petroleum products. That is clearly not the case, since these are also capital-intensive industries and such countries must consider the allocation or capital between energy-intensive enterprises and labor-intensive enterprises. Many developing countries simply do not have the location or the infrastructure to allocate scarce capital resources excessively to such enterprises. Capital and construction costs tend to be significantly higher in such locations, productivity is lower as a rule and increased transportation costs to major export markets offset any comparative advantage that might be present in the production of the energy feedstock. Mexico, for instance, would clearly gain more hard currency revenue from exporting more natural gas to the United States and utilizing less capital in ammonia production. We believe that Mexico provides an example of the misallocation of both capital resources and energy resources that such energy pricing policies produce. A clear example is the sale of ammonia by PEMEX in Mexico at prices below their own gas costs. Thus, ammonia export sales are directly subsidizing domestic ammonia sales.

These practices and trade effects are on the increase, particularly since the oil price shocks of the 1970's and the increase in state ownership and control of basic energy resources. It is clear that U.S. trade laws which were developed with no anticipation of such pricing and trading practices are inadequate to address this form of discrimination and trade distortion that is occuring on an increasing basis.

Respectfully submitted on behalf of
the Ad Hoc Committee of Domestic
Nitrogen Producers,

Philip H. Potter

ammonia./36 Mexican officials were quoted in Green Markets, the fertilizer trade weekly, August 13, 1984, saying that they envisioned a withdrawal from the U.S. market./37 However, this curtailment may not actually occur. Mexico's decision to export greater quantities of petrochemicals to make up for lost natural gas export revenues seems to conflict with the Green Markets report. Increased urea shipments may be used to offset the decline in shipments of anhydrous ammonia.

The threat of renewed price depression caused by low-cost imports has caused the U.S. ammonia industry to disinvest. Despite estimates of rising demand for ammonia-based fertilizers by American farmers, the U.S. industry has no plans to expand domestic facilities. No new U.S. plant with a capacity of over 100,000 short tons per year has come on stream since 1981./38 At this time, no new plants are under construction, and none are planned for future construction.

U.S. producers cannot own ammonia plants in Mexico to take advantage of the low domestic energy prices, nor can they export gas feedstock at the low domestic price from Mexico. In addition, U.S. producers cannot export ammonia to Mexico due to prohibitive tariffs.

In terms of its discriminatory energy pricing and investment policies for basic petrochemicals like ammonia, Mexico operates in much the same way as the Soviet Union. Both countries price energy to domestic users at below-market levels and bar investment in-country by foreign firms to prevent subsidizing them. The Soviet Union, for instance, sells natural gas to its West European pipeline customers at much higher prices than to its own ammonia plants or to its COMECON satellites. It is hard to pinpoint the prices charged to Soviet ammonia producers by central authorities, but the following observations by an industry consultant give some perspective:

> As far as gas costs are concerned $4.0[0] per million BTUs is a reasonable estimate for new gas for a US Gulf [ammonia] project -- if there were one. It is also of the right order for West Europe generally, perhaps on the high side for the expanding Dutch industry. $2.0[0] [per MCF] gas in Russia is what their technical press implies: it's certainly more than the gas cost involved in some ammonia export business from the USSR recently and it's less than the opportunity cost if exporting gas to West Europe were the alternative./39

III. Effect of the policy on the resource allocation in Mexico.

By intentionally setting natural gas prices below foreign market prices, the Mexican government has influenced the use of capital resources in Mexico. The policy directs investment capital towards energy- and capital-intensive industries. This occurs in order to take advantage of the below-market energy prices for production inputs. While Mexico undoubtedly has a "comparative advantage" in hydrocarbon supplies in comparison to domestic need, the Mexican government's artificial

29 Testimony of Schnittker Associates, In the Matter of: Anhydrous Ammonia from the U.S.S.R., TA-406-5, before the U.S. International Trade Commission, p III-51.

30 Testimony of L.L. Jaquier, Executive vice president, W.R. Grace & Co, on Behalf of the Domestic Nitrogen Producers Ad Hoc Committee, given before the Trade Subcommittee of the House Committee on Ways and Means. May 8, 1980, p.2.

31 Exhibit Four.

32 Ibid.

33 Ibid.

34 Ibid.

35 Ibid.

36 Ibid.

37 "Market Watch", Green Markets, January 9, 1984 p.2.

38 "Mexican energy plan envisions diminishing exports of ammonia", Green Markets, August 13, 1984, p.1.

39 Exhibit Four, Ammonia Fact Sheet.

40 "Outlook for the International Nitrogen Industry", presentation by Philip Croney, Consultant, FERTECON Ltd., to the AMA Ag-Chem Market Research Group, Washington, D.C., October 25, 1983.

41 The Probable Impact on the U.S. Petrochemical Industry of the Expanding Petrochemical Industries in the Conventional-Energy-Rich Nations, U.S. International Trade Commission, April 1983, p.114.

42 Increasing Competition in the Natural Gas Market, p. s3.

43 See Footnotes 4 and 5.

EXHIBIT FOUR

EXHIBIT FOUR, No.1.

U.S. AMMONIA CAPACITY PRODUCTION, CONSUMPTION AND TRADE

1970 - 1983

(000 Short Tons Nitrogen)

YEAR	U.S. AMMONIA INDUSTRY		U.S. AMMONIA CONSUMPTION			U.S. AMMONIA TRADE		
	CAPACITY[1]	PRODUCTION[2]	FERTILIZER	OTHER[3]	TOTAL[4,5]	EXPORTS	IMPORTS	NET EXP. (IMP.
1970	13,040	10,870	7,459	2,873	10,332	1,594	900	694
1971	13,679	11,420	8,134	3,201	11,335	1,206	964	242
1972	13,785	12,070	8,022	3,942	11,964	1,122	883	239
1973	13,674	12,792	8,295	4,092	12,387	1,511	954	557
1974	13,758	12,854	9,157	3,703	12,860	1,278	1,143	135
1975	14,172	12,294	8,601	3,978	12,579	1,126	1,285	(159)
1976	14,844	13,596	10,412	3,332	13,744	1,248	1,276	(28)
1977	15,562	13,987	10,647	4,205	14,852	1,258	1,997	(739)
1978	17,014	13,719	9,965	4,096	14,061	1,811	2,041	(230)
1979	16,445	14,475	10,715	4,006	14,721	2,489	2,314	175
1980	16,504	15,827	11,407	4,602	16,009	2,659	2,730	(71)
1981	16,604	16,085	11,924	3,778	15,702	3,107	2,622	485
1982	16,181	14,330	10,983	3,653	14,636	2,502	2,717	(215)
1983	15,106	11,375	9,195	3,092	*2,287	2,039	2,883	(844)
1984	14,823	12,701	10,990*	3,872*	14,862*	2,043	4,127	(2,084)

*Estimates: no finals till November

NOTES

ALL NUMBERS BY FERTILIZER YEAR (ending June 30)
1 ton ammonia = .82 tons nitrogen.

1. Total production capability basis 340 days operation at design daily capacity.

2. Gross U.S. ammonia production netted for change in producer inventories of anhydrous ammonia and converted nitrogen products.

3. Other use includes industrial use, process losses and unaccounted disappearance.

4. Total use includes by-product nitrogen, i.e., ammonia liquor and coke oven ammonium sulphate and phosphate, and natural organic material used as fertilizer.

5. Production + Net Exp. (Imp.) + By-Product = Total U.S. Consumption.

6. Sources: U.S. Department of Commerce and private industry estimates.

Source: ACG

U.S. Nitrogen Imports
By Major Importer
Percent of Total U.S. Imports
(000 Short Tons Nitrogen)

	U.S.S.R.		Canada		Mexico		Trinidad		Balance of World	Total Imports
	Tons	%	Tons	%	Tons	%	Tons	%		
1975	--		372	28.9	5	.4	145	11.3	763	1285
1976	15	1.2	451	35.3	12	.9	160	12.5	638	1276
1977	--		848	42.5	36	1.8	167	8.4	946	1997
1978	99	4.9	1026	50.3	100	4.9	213	10.4	603	2041
1979	371	16.0	1045	45.2	324	14.0	272	11.8	302	2314
1980	760	27.8	1047	38.4	315	11.5	304	11.1	304	2730
1981	922	35.2	992	37.8	235	9.0	286	10.9	187	2622
1982	618	22.7	1033	38.0	523	19.2	287	10.6	256	2717
1983	510	17.7	1117	38.7	434	15.1	321	11.1	331	2883
1984	954	23.1	1448	35.1	502	12.2	555	13.4	668	4127

Fertilizer Year (ending June 30)

Source: ACG
11-7-84

EXHIBIT FOUR, No. 2.

U.S. AMMONIA CAPACITY
U.S. PLANTS IN OPERATION
1970 - 1984

YEAR	NUMBER OF PLANTS
1970	106
1971	105
1972	102
1973	102
1974	103
1975	109
1976	116
1977	124
1978	126
1979	112
1980	97
1981	100
1982	99
1983	88
1984	79

NOTES

1. If a plant operated at any time during a year, it is listed as operating.
2. Numbers shown are net of closures and additions.
3. Fertilizer year (ending June 30).

Source: ACG

EXHIBIT FOUR, No. 3.

AMMONIA FACT SHEET

Prepared by the Ad Hoc Committee
of Domestic Nitrogen Producers

HOW AMMONIA IS MADE

Ammonia, made from a hydrocarbon feedstock, primarily natural gas and air, is 82 percent nitrogen.

One ton of ammonia contains .82 tons of nitrogen.

Since most ammonia is used as nitrogen, it is often helpful to express ammonia production or tonnages in terms of nitrogen, e.g. 20.7 million short tons of ammonia (x .82) equals 17 million short tons of nitrogen (N).

Ammonia is sold in "short" tons (2,000 lbs) and "metric" tons (2,204 lbs). The price of a metric ton is 10 percent higher than the price of a short ton.

Natural gas is the major cost factor in ammonia production, accounting for about 75 percent of direct production costs.

U.S. ammonia producers use about 35,000 cubic feet of natural gas to make a short ton of ammonia.

Ammonia plants must operate at full capacity to achieve design efficiency and satisfactory return on investment. New ammonia plants are designed to operate 24 hours a day, seven days a week, 340 days a year. The production capacity of an ammonia plant is based on production achievable within this timeframe.

The four major ammonia producing states, Louisiana, Oklahoma, Alaska and Texas, account for over 60 percent of U.S. ammonia production. Florida is important as a production center of ammonium phosphates (DAP and MAP).

At full capacity, the U.S. ammonia industry consumes 3-4 percent of U.S. natural gas consumed annually (about 600 billion cubic feet out of 17 trillion cubic feet).

In the ammonia production process, a principal by-product is carbon dioxide. Carbon dioxide is combined with ammonia to make urea, a solid, stable form of nitrogen fertilizer. Virtually all urea is made at the same site where ammonia is produced, utilizing the pure by-product carbon dioxide from ammonia manufacture. In other words, imported ammonia cannot be used efficiently to make urea.

USES

Ammonia is virtually the sole source of nitrogen used in fertilizer and by industry. About three-fourths of all ammonia used in the U.S. is used as nitrogen fertilizer by farmers.

Application of nitrogen fertilizers is the key to high-yield harvests of corn and wheat. These crops are two major U.S. agricultural export items.

Nitrogen fertilizers are also required for high yields of other major crops such as sorghum and cotton.

Ammonia may be injected directly into the soil by machine, as in corn production, or converted into other nitrogen-based fertilizers such as urea (46 percent nitrogen) and nitrogen solutions (typically about 30 percent nitrogen), or combined with phosphates to make ammonium phosphates (DAP and MAP).

Imported ammonia can be used as directly-injected fertilizer, in production of DAP and MAP, and for industrial use.

Direct ammonia application methods require high-cost machinery and mechanized farming technologies primarily used in the United States.

U.S. farm use of ammonia (excluding the 1983 PIK period) is normally over 11 million short tons nitrogen (13.4 million short tons ammonia). Taking 1984 estimates as a base, this use is predicted to increase at an annual rate of 2-3 percent through 1990.

About two-thirds of U.S. nitrogen fertilizer use occurs during the Spring planting, mainly applied on corn. This means that over 7 million tons of nitrogen fertilizer normally must be delivered to farmers by producers and distributors over a 6-8 week period in the Spring. The remainder is applied in the Fall. Timely delivery to meet farmers' requirements is crucial to maximum farm productivity.

Demand for nitrogen fertilizer fluctuates in accordance with the number of acres to be planted, weather conditions and grain prices.

Use of nitrogen fertilizer centers in the Corn Belt and the Plains States. States using the most nitrogen fertilizer (over 500,000 tons annually) are, in order, Iowa, Illinois, Texas, Nebraska, Kansas, California, Minnesota, and Indiana (1982 data).

Nitrogen fertilizer use in the U.S. peaked at about 12 million short tons nitrogen in 1981, undergoing an unprecedented decline to only 9.2 million short tons nitrogen in 1983. Nitrogen fertilizer use is expected to rebound to pre-PIK levels in the Spring of 1984, or about 11 million short tons nitrogen for 1984 as a whole.

Though most ammonia is used by farmers as nitrogen fertilizer, there are also military and industrial users of ammonia.

Non-farm use of ammonia (including losses incurred in conversion and distribution), which peaked in 1980 at 4.0 million short tons of ammonia (3.3 million short tons nitrogen), fell to 3.7 million short tons of ammonia (3.0 million short tons nitrogen) in 1983. Demand is expected to begin recovery in 1984 and increase at a 3 percent annual rate through 1990.

LOGISTICS

Ammonia must be transported and stored under pressure or at low temperatures to keep it in a liquid state. It is very expensive to handle.

U.S. Gulf Area and Southern Plains ammonia production is transported to the Midwest and the Plains using the Mississippi River System, two major pipelines and rail. Domestic product produced in other regions is transported primarily by rail and truck. Domestically-produced ammonia is sent to Florida's DAP and MAP plants primarily by barge/pipeline and rail.

By the time that farmers are ready to accept delivery of ammonia for the Spring planting, inventory is stored from the local distributor back through the pipeline, barge and terminal system to the production facility itself. This storage system (storing six months' production) must be full to capacity at the start of the planting season or shortages may result.

Excluding Canadian product, imported ammonia arrives mainly at the three major ports of entry of Tampa, New Orleans and Savannah. There are also terminals in Gibbstown and Wilmington to accept East Coast shipments, and terminals in Sacramento, Stockton and Portland serving the West Coast.

A substantial increase in imported ammonia would require additional port facilities and pipeline systems for distribution.

Pipeline and other distribution costs are currently financed by U.S. producers. Foreign exporters do not own U.S. distribution systems. Increased reliance on imports may require revision of the current low-cost delivery and storage services now provided by domestic producers.

U.S. INDUSTRY STATUS

U.S. ammonia production capacity peaked in 1978 at 20.7 million short tons of ammonia (17 million short tons nitrogen).

In 1981, U.S. production capacity was 20.2 million short tons ammonia (16.6 million short tons nitrogen).

At the end of calendar year 1983, U.S. capacity had fallen to 17.9 million short tons ammonia (14.7 million short tons nitrogen).

Since 1981, no new U.S. plant with a capacity over 100,000 short tons has opened, while 11 such plants have been forced to close. No new U.S. ammonia plants are under construction or scheduled for construction in the future, despite increasing U.S. and world demand.

A new "world-class" ammonia plant capable of producing 400,000 to 500,000 short tons per year costs over $200 million to construct and would take two or three years to complete.

Most U.S. producers currently pay $3.50-$4.00/mcf for natural gas under long-term (over one year) supply contracts. The current market clearing price for short-term contracts to U.S. ammonia producers is somewhat less.

Some 2.5 million tons of U.S. ammonia is still produced using low-cost natural gas obtained from long-term contracts negotiated back in the 1960's. When these low-cost contracts expire in 1984-1986, another 14 percent of remaining U.S. capacity will be threatened.

The <u>average</u> natural gas price paid by all U.S. ammonia producers, including low-cost gas users, was about $2.90/mcf in 1983.

The <u>average</u> production cost per ton of ammonia for U.S. producers in 1983, including low-cost gas producers, was about $137 per ton. This amount does not include any sales expense, distribution expense, corporate overhead or return on investment to the producer. (35,000 mcf @ $2.90/mcf equals gas input cost of $102; add to that cost the costs of utilities, labor, plant overhead, and depreciation equaling about $35 on average. This represents the average U.S. production cost on the plant site.)

For <u>most</u> U.S. producers in 1983, the cost of ammonia production per ton was around $157-$175. Again, this amount does not include any sales expense, distribution expense, corporate overhead or return on investment to the producer. (35,000 mcf

@ $3.50-$4.00/mcf equals gas input cost of $122-$140. Add to that cost the costs of utilities, labor, plant overhead and depreciation equaling about $35 on average. This figure represents the production cost on the plant site paid by <u>most</u> U.S. producers.)

In 1973, the average cost of natural gas to ammonia producers was $.32/mcf. This cost rose steadily through 1977 to $.98/mcf. In 1978 the Natural Gas Policy Act (NGPA) began gradual decontrol of U.S. gas prices. The price in 1978 of $1.25/mcf rose to about $2.90/mcf in 1983, and will continue to rise until decontrol takes full effect in 1985. Market forces can now be said to establish current U.S. clearing prices for natural gas purchased by U.S. ammonia producers.

IMPORTS AND EXPORTS

The four major nitrogen exporters to the U.S. are, in order, Canada, the Soviet Union, Mexico, and Trinidad. These nations account for 83-93 percent of all nitrogen imports, and virtually all imports of ammonia.

A large part of Canadian and Trinidadian exports are "captive." These imports originate from U.S. companies operating in those countries and are meant for use by those U.S. companies operating domestically. Such imports must earn an adequate rate of return on investment, compete fairly in the market, and are not part of the problem.

Before 1978, imports from Mexico and the Soviet Union were insignificant. Since 1978, Mexico and the Soviet Union have exported 6.2 million short tons of ammonia to the United States. In 1983 they accounted for 33 percent of all nitrogen imports, and about half of all ammonia imports.

In 1983 the U.S. exported only 430,000 short tons of ammonia. The U.S. imported 2.1 million short tons of ammonia.

Through 1974, the U.S. was a net exporter of nitrogen fertilizer. Beginning in 1975, the U.S. status began shifting between net exporter and net importer. In 1982 an irreversible trend of net importation commenced.

U.S. nitrogen exports go mainly to the Far East (including Japan), Latin America and Western Europe.

U.S. nitrogen exports, primarily composed of ammonium phosphates and urea, peaked in 1981 at three million tons. Exports have declined 33 percent, to two million tons, and are expected to continue to decline or, at best, remain at that level.

Soviet and Mexican ammonia and urea export quotas are determined by government policy, not by market forces of supply, demand and price.

While no new U.S. ammonia plants are planned or being built, the Mexicans and the Soviets are undertaking expansion of their ammonia and urea facilities.

The Soviet Union is the world's largest ammonia producer already, with production capacity now at about 29.8 million short tons of ammonia (24.4 million short tons nitrogen). By 1988 their capacity is expected to reach 34.9 million short tons of ammonia (28.6 million short tons nitrogen), a 17 percent increase.

Mexican ammonia capacity is projected to increase from 3.4 million short tons (2.8 million short tons nitrogen) this year to 5.1 million short tons (4.2 million short tons nitrogen) by the end of the decade, a 50 percent increase.

A good example of supply manipulation: Mexican and Soviet exports, over the past several years, have oversupplied the U.S. market during periods of depressed demand, causing price depression. In 1984, when U.S. demand is expected to return to pre-PIK levels, both of these subsidized exporters will cut back or maintain previous levels of export to the U.S. U.S. farmers can expect to pay higher prices for fertilizer this Spring, and the non-market response of the subsidized exporters during 1982-1983 and in First Quarter 1984 could cause spot shortages as well.

A good example of price manipulation: In 1983, the Mexican exports to the U.S. market were priced at about $120 per ton. This price was less than what most U.S. producers paid for the natural gas needed to make a ton of ammonia.

U.S. AMMONIA SUPPLY AND DEMAND

Total U.S. ammonia demand has three elements: 1) farm demand for nitrogen; 2) industrial demand; and 3) nitrogen which is made here and exported.

Total U.S. ammonia supply consists of total U.S. production plus imports.

Total U.S. ammonia consumption consists of U.S. production minus exports plus imports.

Ammonia is sold like a commodity, at high volumes with low per-unit profit margins. A one-percent change in supply generates a 4-5 percent change in price.

Nitrogen fertilizer demand is not price-sensitive. Generally a specific amount is applied to produce a target yield. Lowering the price doesn't increase the demand. Only higher anticipated grain prices or increases in the number of acres to be planted can increase demand.

During the period 1981-1983, U.S. production fell from 16.1 to 11.4 million short tons nitrogen, a 29 percent drop. U.S. domestic consumption fell from 15.7 million to 12.3 million short tons nitrogen, a 22 percent drop. The drop in domestic production was greater than the drop in consumption. During this period, imports increased by 10 percent.

The 1981-1983 drop in demand was caused by two factors: 1) the PIK farm program, which removed about 36 million acres of corn and wheat from production; and 2) depressed grain prices, due to the effect of worldwide recession on agricultural exports and grain overproduction in the U.S. during 1981 and 1982.

U.S. ammonia demand is predicted to rebound in 1984 to previous farm and industrial use levels.

U.S. consumption of ammonia is expected to increase from 18 million short tons (14.8 million short tons nitrogen) in 1984 to 21.4 million short tons ammonia (17.5 million short tons nitrogen) by 1990, an increase of 18 percent.

U.S. production, under the best-case scenario (if plants now receiving low-cost gas can remain in operation after low-cost contracts expire, and other U.S. producers can remain in business using current facilities) is expected to remain at 1984 levels of about 17 million short tons ammonia (14 million short tons nitrogen) through 1990.

U.S. exports of nitrogen are expected, under the best-case scenario, to remain at about two million short tons nitrogen through the end of the decade.

In 1984, net U.S. nitrogen imports (imports minus exports) will exceed one million tons. Under the best-case scenario, by 1986 they may reach two million tons. In 1988-1989 they could reach three million tons.

This means that, if current conditions remain unchanged, imports will increase by at least 69 percent, from 3.2 million short tons nitrogen in 1984 to 5.4 million short tons nitrogen by 1990.

If U.S. low-cost gas contract plants shut down when their old contracts expire, an additional 2.5 million tons of imports will be needed to meet U.S. demand. This will happen only if subsidized ammonia imports continue to depress U.S. ammonia prices below U.S. costs of production.

If U.S. trade law is not modernized to offset the effect of unfairly-subsidized imports, virtually all future growth in U.S. ammonia demand after 1984 must be met by imports.

However, if U.S. trade law is brought up-to-date, the domestic ammonia industry could be expected to benefit from the projected increase in domestic demand through the end of the decade. Fairly-traded imports would still play an important role, but unfairly-subsidized imports would not force otherwise competitive U.S. producers out of the U.S. ammonia market.

WORLD AMMONIA PRODUCTION

While U.S. ammonia production stagnates or declines from current levels, total world production capacity is increasing. Increased export capacity will be centered mainly in the Middle East, the Soviet Union, and Latin America. Other countries such as China, India and Indonesia are also increasing their ammonia capacity, but domestic needs outweigh the possibility of export.

In 1983, total world capacity was 133 million short tons ammonia (109 million short tons nitrogen). By 1990, total world capacity is expected to reach 176 million short tons ammonia (144 million short tons nitrogen), a 32 percent increase.

Total world nitrogen fertilizer use is expected to increase from 67 million short tons nitrogen (82 million short tons ammonia) in 1983 to 89 million short tons nitrogen (109 million short tons ammonia) in 1990, a 33 percent increase. In addition, other disappearance (non-farm use and losses) is expected to grow from 16.7 million short tons nitrogen (20 million short tons ammonia) to 24.8 million short tons nitrogen (30 million short tons ammonia) by 1990, a 50 percent increase.

U.S. companies are in direct competition with foreign governments. In 1970, 42 percent of world capacity was owned by governments. By 1975, government-owned producers controlled 52 percent of world production capacity. Last year, governments controlled 67 percent of capacity. By decade's end, governments will probably control 72 percent of ammonia capacity. A similar situation exists regarding world urea production.

If the U.S. does not find suitable remedies to unfair trade practices such as those used by Mexican and Soviet government-owned ammonia producers, private companies will be forced out of the U.S. and world ammonia markets.

The alternative to unfair trade remedies is either U.S. government subsidization of domestic ammonia (and other petrochemical) production, or increasing dependence on unreliable foreign suppliers, precipitating potential supply disruptions and higher nitrogen prices to farmers.

ECONOMIC CONSULTING SERVICES INC.

EFFECT OF POTENTIAL COUNTERVAILING DUTIES ON THE PRICE OF AMMONIA AND UREA FERTILIZERS IN THE U.S.A.

We have been asked to estimate the increases in prices paid by farmers for ammonia and urea fertilizers should countervailing duties be imposed on imports from countries that subsidize natural gas and currently are not GATT members and thus are exempt from an injury test. Our calculations, based on very conservative assumptions, indicate that ammonia prices could increase by roughly 17 percent and urea prices could increase by roughly 19 percent, as a result of the duties.

The high ammonia duties probably would exclude some or all of these imports. If certain of the idled U.S. capacity were to be recalled to replace these imports, the partial easing of the supply constraint caused by the imports' withdrawal would be at least partially offset by the high costs at these facilities, due to obsolete equipment and high cost gas contracts. The costs at the idled ammonia facilities that might be recalled have been estimated at as much as $240 per ton,1/ and average about $200 per ton.1/ The average price for ammonia in 1984 is $210 without these high cost facilities, and production costs at the producing facilities average about $160 per ton. Factoring in an

1/ Estimated by SRI International.

1320 NINETEENTH STREET, N. W., WASHINGTON, D. C. 20036 (202) 466-7720

amount for profit at the high-cost facilities, and taking into account that the demand for nitrogenous fertilizers is relatively insensitive to changes in price and that U.S. ammonia and urea producers have lost money during the last several years, if high cost domestic production replaced Soviet and Mexican ammonia, the U.S. price of ammonia could increase by almost as much as if there were no replacement or by 17 percent.

The projected ammonia price increase does not take into account the seasonality of ammonia shipments and prices. Because the bulk of the demand for ammonia is coincident with the growing season, the price effect of an import-induced supply restriction during this period would be greatly amplified during that period. Thus, 17 percent is a conservative estimate.

Urea is currently being imported from non-GATT countries exemplified by the U.S.S.R., Eastern Europe, and Mexico. As above with ammonia, we estimate the domestic producers of urea would increase prices by 19 percent. Should imports from Canada and Western Europe, GATT signatories, be shown to cause injury, urea prices would increase by significantly more than the projected 19 percent.

Moreover, for a new plant to be built to replace an obsolete one, the price of ammonia would need to rise to roughly $260 per ton. Thus, the presence of a duty on nitrogenous fertilizer would exert steady upward price pressure on ammonia and urea.

CALCULATION OF ESTIMATED COUNTERVAILING DUTIES ON IMPORTS OF AMMONIA AND UREA FROM MEXICO AND THE USSR

	Mexico	USSR
External Price ($/mcf)	4.40 1/	6.17 4/
Internal Price ($/mcf)	1.35 3/	2.85 5/
Estimated Subsidy ($/mcf)	3.06	3.32
Estimated Duty Per Ton, Ammonia (Difference x 35) 6/	$107	$116
Estimated Duty Per Ton, Urea (Difference x 20) 7/	$61	$67

Note: These calculations are based on estimates and, in some instances, contract prices. Actual duties calculated by the Department of Commerce probably would be based on prices actually paid, and hence would differ from the above.

1/ Contract price for U.S. imports of natural gas from Mexico. Nitrogen Values, a study prepared by SRI International, indicates that this is the prevailing price paid in the United States for Mexican gas.

2/ Priticon Fertilizer Economic Studies, Ltd., in Fertilizer and Nitrogen, World Trends in Supply, Demand, Trade and Price Economics, indicates that the prices paid for natural gas by ammonia producers in the Soviet Union and Mexico are lower than shown. ($2.00 per thousand cubic feet and $0.60 per thousand cubic feet, respectively).

3/ Estimated domestic price in Mexico for natural gas.

4/ Contract price for Soviet gas sold in Europe.

5/ Domestic cost of gas from the U.S.S.R. estimated from U.S. Department of Commerce trade statistics, by taking 75 percent (the percentage of total ammonia value in the U.S. accounted for by natural gas) of the average unit customs value of U.S. ammonia imports from the U.S.S.R. and dividing this by 35, (because 35,000 cubic feet of gas are used in making one ton of ammonia).

5/ The estimated domestic subsidy per thousand cubic feet of gas (i.e., the difference between internal and external prices) is multiplied by 35 to calculate the per ton duty on ammonia, because 35,000 cubic feet of gas are required to produce one ton of ammonia.

6/ The estimated domestic subsidy per thousand cubic feet of gas is multiplied by 20 to calculate the per ton duty on urea, as 20,000 cubic feet of gas are required to produce one ton of urea. This is based on the fact that 0.57 tons of ammonia is used in producing one ton of urea.

Notes on Methodology for Calculating the Effect of Potential Countervailing Duties on the Price of Ammonia and Urea Fertilizer in the U.S.A.

To calculate the potential price increase resulting from a countervailing duty on ammonia, we have estimated the percent decline in supply that would result if all imports from Mexico and the U.S.S.R. were excluded from the U.S. market as a result of the increased duties. To this percent decline, we have applied a price elasticity factor supplied by the U.S. Department of Agriculture. This factor indicates that prices for nitrogenous fertilizers would increase by 2.5 percent for every 1 percent decline in supply. Thus, if supply were to fall by the 6.7 percent accounted for by ammonia imports from Mexico and the U.S.S.R., this would translate to a price increase of 17 percent, or $35 per ton, assuming a prevailing market price to farmers of $210 per ton. The price increase for urea was calculated similarly, assuming a prevailing market price to farmers of $160 per ton in the Gulf region, and assuming that imports from Eastern Europe would be excluded from the market as well as imports form the U.S.S.R. and Mexico.

APPENDIX I

CHARLS E. WALKER ASSOCIATES, INC. SUBMISSION DATED MARCH 20, 1985 (COVER LETTER ONLY) AND MARCH 21, 1985 TO COMMISSION STAFF MEMBER ON SOVIET NATURAL GAS AND AMMONIA PRICING

CHARLS E. WALKER ASSOCIATES, INC.
1730 PENNSYLVANIA AVENUE, N.W.
WASHINGTON, D.C. 20006
TELEPHONE (202) 393-4760 TELECOPIER (202) 393-5728

March 20, 1985

Mr. Ed Taylor
International Trade Commission
Room 118
701 E Street, N.W.
Washington, D.C. 20436

Dear Mr. Taylor:

Per your requests, we have enclosed additional information on (1) U.S. plant prices FOB U.S. Gulf Coast; (2) FAS, CIF and Customs values for Soviet ammonia imports to the U.S. Gulf Coast; and (3) an industry source estimate of production values in the Soviet Union for ammonia.

In using this information, please keep in mind that, concerning (1), that ammonia pricing is seasonal and reflects demand. "Average" yearly prices do not demonstrate the range of prices which affect the market pricing of ammonia. For instance, 1982 calendar year U.S. Gulf FOB plant prices averaged $126 - $132 per short ton. However, the monthly price range during 1982 was a low of $114 per short ton in October and a high of $159.88 in March by spot quote calculation. Such price variations reflect the volatility of ammonia pricing on the U.S. Gulf Coast.

Concerning item (2), Soviet CIF prices averaged $166.60 per short ton on the U.S. Gulf Coast in calendar 1982, but ranged from $81.98 in January in Tampa up to $182.56 in October. Such swings affect the spot market pricing of ammonia.

Concerning item (3), production cost data are provided by an industry source. This data reflects estimates only, based on what is known about conditions and plants in the Soviet Union, and using market based comparisons for pipeline costs, transportation costs and other costs. As you have pointed out, even the CIA cannot determine these production cost values with certainty.

We hope this information is of some use to you. Please call with any questions.

Sincerely,

Philip H. Potter

CHARLS E. WALKER ASSOCIATES, INC.
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March 21, 1985

Mr. Edward J. Taylor
International Trade Analyst
Energy and Chemicals Division
U.S. International Trade Commission
Washington, D. C. 20436

Dear Mr. Taylor:

Enclosed please find a typed version of the handwritten notes that we provided you yesterday. I have added a note at the bottom of the first page as an example of what happens if you assume a gas price of $1.00 per mcf. or $2.00 per mcf. instead of the $0.50 assumed in the example. In addition, I made some minor editing changes in the footnotes and would appreciate it if you would publish them in this form.

Sincerely,

Philip H. Potter

Enclosure

NETBACK ESTIMATE OF RESULTING NATURAL GAS COST AT SOVIET AMMONIA PLANT, TOGLIATTI, USSR

The following is based on W. R. Grace experience at Woodward, Oklahoma ammonia plant. Technology comparable to Togliatti plant. Woodward on line in 1977. Togliatti on line in 1978. Woodward is 1,200 ton per day plant. Togliatti is 1,500 ton per day plant. Togliatti could produce up to 500,000 short tons per year at 95 percent of design capacity (1,500 t/day x 340 days). As a general rule, the USSR has interrupted deliveries in January and February due to gas diversion and cold weather. The general view in the industry is that Soviet plants have operated only at 80 percent capacity or less on average. This estimate, however, assumes the maximum operating rate.

Togliatti, USSR

Estimated Capital Costs ($000)		
Fixed Capital	$149,000	(a)
Total Capital Employed	$172,000	(b)
$ Per Annual Ton (500,000 s.t/yr)		
Fixed Capital	$298	
Total Capital Employed	$345	
Assumed Natural Gas Costs ($MMBTU)	50¢	(c)
Production Costs, $/short ton		
Natural Gas	$ 20	(d)
Processing Costs and Internal Shipping	35	(e)
Depreciation	20	(f)
F.O.B. Plant Cost	$ 75	
Freight and Terminal Cost to U.S. Gulf Coast	$ 63	(g)
Total Cost to U.S. Gulf Coast	$138	
1st Quarter 1985 Gulf Coast Price Ammonia/s.t. Green Markets 3/4/85	$146-148	
Gross Profit, $/short ton	$ 8-10	

NOTE: If terminal costs of $9/t. are added to offload ammonia at the Gulf Coast port, Soviet ammonia would be breaking even at current ammonia prices and natural gas at $0.50 per MMBTU. If the assumed gas cost is $1.00/MMBTU add $20/s.t. to the production cost for a $20 loss. If the assumed gas cost is $2.00/MMBTU add $60/s.t. to the production cost for a $60 loss.

FOOTNOTES

(a) Fixed capital -- $149,000,000

Based on ACG's Woodward plant capital cost of $108,250,000 (onstream in 1977), escalated by 10 percent to account for one year inflation (Russian plant assumed onstream in 1978); further 10 percent added as location differential; scaled up from 1,200 t/d to 1,500 t/d using scale factor of 0.6, which adds another 14 percent (rounded).

(b) Total capital -- $172,500,000

Fixed capital plus:

1) Expensed investment, assumed at $11 million, which ties back to experience with the Woodward and Tringen plants.

2) Working capital, assumed at $12.5 million, based on 30 days receivables @ Gulf Coast sales price, plus 30 days inventories @ FOB plant cost. (Some liberties with rounding were taken.)

(c) Natural gas cost -- 50¢/MMBTU

Represents a nominal charge.

(d) Natural gas cost -- $20/s. ton

Assumes natural gas usage of 40 MMBTU/ton, roughly what original usage was at Woodward. Assumes that no energy savings equipment has been installed. There is nothing in the literature to indicate such installations.

(e) Ammonia Processing and Shipping -- $35/s. ton

This is a general industry average and consistent with ACG experience, $32/s. ton.

Add storage and shipping of $3/ton per approximate ACG costs ($2.40 - $3.40/ton), $35/s. ton.

(f) Depreciation - $20/s. ton

Assumes 15 year life of fixed capital, annual production of 500,000 tons.

(g) Freight and Terminal Cost - $63/s. ton

Pipeline transportation, Togliatti - Odessa, $19/ton, modeled after Gulf Central pipeline rate of $11.69/ton for 800 miles (December 1984), ratioed up to 1,200 miles, some inflation added to get to 1985 average.

$35 ocean freight, per Marine Transport Lines (MTL).

$9 terminal charge in U.S., per 1978 Gulf Central tariff, escalated to 1985. This is used as loading cost at Odessa. The same charge would be added to offload at U.S. Gulf port.

APPENDIX J

CHARLS E. WALKER ASSOCIATES, INC. BRIEF SUBMITTED FEBRUARY 19, 1985 TO COMMISSION STAFF MEMBER ON ITC INVESTIGATION No. 332-202 ON BEHALF OF ASHLAND OIL, INC.

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February 19, 1985

The Honorable Kenneth R. Mason
Secretary
U.S. International Trade Commission
Washington, D.C. 20436

Dear Mr. Mason:

Enclosed is a written submission made by Ashland Oil, Inc. for the record in your investigation No. 332-202.

Sincerely,

Roy T. Englert

Roy T. Englert

Enclosure

Document 1

DISCOUNT PRICES OF PRODUCTS FROM OPEC COUNTRY REFINERIES

Attached are two tables demonstrating that export refineries in the OPEC domain are as a rule heavy discounters of their own crude oil prices. The tables contain the product yield or realization (average product selling price) based on three different markets and both topping-reforming and cracking refinery structures in the six large refining centers.

The cost of shipping the products between the refinery and the market is calculated by determining the percentage of total production for each product produced and applying to that percentage the freight costs to ship that product to the market. Freight rates for light clean products (gasolines and distillates) were assumed to be based on Worldscale 100. Dirty heavy product freight rates were based on Worldscale 65. Worldscale is simply an index of standard freight costs for oil shipments via tanker. Clean product tankers generally are in shorter supply so their rates are higher. For Yanbu and Kuwait, the Suez Canal was the cheapest transportation route; therefore, a toll of 60¢/barrel was added to Worldscale costs.

The refiners netback or average price received at the refinery for the slate of products was calculated by subtracting freight costs from the market realization or product yield. As shown in the table, most netbacks were less than the export countries posted crude price. This is a clear indication that they are effectively discounting crude oil via refinery and marketing products.

SOURCE REFINERIES AND THEIR MARKETS

TOPPING-REFORMING

Country Refinery	Crude	Product Yield	Freight	Netback	Price at Seller's Source*	Balance
Algeria	Saharan Bl.					
Skikda	To: Italy	$27.13	$0.31	$26.82	$30.50	-$3.68
	To: R'dam	28.58	0.63	27.96	30.50	-2.54
	To: N.Y.	29.70	1.12	28.57	30.50	-1.93
Arabia	Arab Light					
Yanbu	To: Italy	26.85	1.25	25.60	29.25	-3.65
	To: R'dam	27.64	1.81	25.83	29.25	-3.42
	To: N.Y.	28.49	2.31	26.18	29.25	-3.07
Kuwait	Kuwait					
Shuaiba	To: Italy	26.36	2.31	24.31	27.30	-2.99
	To: R'dam	26.97	1.81	24.37	27.30	-2.93
	To: N.Y.	27.63	3.12	24.51	27.30	-2.79
Libya	Brega					
Brega	To: Italy	26.55	0.36	26.19	30.15	-3.96
	To: R'dam	27.96	0.89	27.07	30.15	-3.08
	To: N.Y.	28.94	1.37	27.56	30.15	-2.5
U.S.S.R.	Ural					
Batumi	To: Italy	27.23	0.67	26.57	27.75	-1.18
	To: R'dam	27.99	1.25	26.75	27.75	-1.00
	To: N.Y.	28.80	1.75	27.05	-	-
Venezuela	T-J Medium**					
P. la Cruz	To: Italy	27.44	1.38	26.06	27.03	-0.97
	To: R'dam	28.46	1.27	27.19	27.03	0.16
	To: N.Y.	29.11	0.68	28.43	27.03	1.40

* Posted Prices
** Tijuana Medium

SOURCE: Platt's OILGRAM Price Report, September 24, 1984

SOURCE REFINERIES AND THEIR MARKETS

CRACKING

Country Refinery	Crude	Product Yield	Freight	Netback	Price at Seller's Source*	Balance
Algeria	Saharan Bl.					
Skikda	To: Italy	$28.88	$0.33	$28.55	$30.50	-$1.95
	To: R'dam	30.25	0.66	29.59	30.50	-0.91
	To: N.Y.	31.44	1.19	30.26	30.50	-0.24
Arabia	Arab Light					
Yanbu	To: Italy	29.37	1.31	28.06	29.25	-1.19
	To: R'dam	29.99	1.92	28.07	29.25	-1.18
	To: N.Y.	30.95	2.46	28.49	29.25	-0.76
Kuwait	Kuwait					
Shuaiba	To: Italy	29.02	2.19	26.83	27.30	-0.47
	To: R'dam	29.40	2.79	26.61	27.30	-0.69
	To: N.Y.	30.15	3.36	26.79	27.30	-0.51
Libya	Brega					
Brega	To: Italy	29.07	0.39	28.68	30.15	-1.47
	To: R'dam	30.40	0.97	29.43	30.15	-0.72
	To: N.Y.	31.51	1.50	30.01	30.15	-0.14
U.S.S.R.	Ural					
Batumi	To: Italy	29.18	0.71	28.46	27.75	0.71
	To: R'dam	29.69	1.34	28.35	27.75	0.60
	To: N.Y.	30.64	1.88	28.76	-	-
Venezuela	T-J Medium**					
P. la Cruz	To: Italy	30.15	1.52	28.63	27.03	1.60
	To: R'dam	30.88	1.40	29.48	27.03	2.45
	To: N.Y.	31.72	0.74	30.98	27.03	3.95

* Posted Prices
** Tijuana Medium

SOURCE: Platt's OILGRAM Price Report, September 24, 1984

NOTE: The tables above are exactly as they appear in Platt's OILGRAM Price Report of September 24, 1984, and discrepancies contained therein have not been corrected.

APPENDIX K

OCCIDENTAL CHEMICAL AGRICULTURAL PRODUCTS, INC., TAMPA, FLORIDA, SUBMISSION OF MARCH 28, 1985 TO THE STAFF ENTITLED U.S.S.R. VALUE OF NATURAL GAS

Occidental Chemical Agricultural Products, Inc.

TAMPA, FLORIDA

OXY®

U. S. S. R.

VALUE OF NATURAL GAS

MARCH 28, 1985

The following data is not the opinion of Occidental Chemical Corporation but only the collection of data from the following sources:

- The British Sulphur Corporation
- SRI International
- Blue, Johnson & Associates
- Fertecon

Occidental Chemical Company has reviewed the pricing of natural resources in various countries in order to place a value on the cost of natural gas in the U.S.S.R. We reviewed Mexico, Trinidad, Canada and the U.S. We feel that the best surrogate country would be the U.S. because they are the only country with comparable ammonia capacities and logistical systems.

Conclusion

After applying actual surrogate costs for terminalling, ocean freight, pipeline transport and plant conversion costs, the value that could be applied to natural gas would be approximately $2.71MM BTU. This is certainly higher than the value paid to Louisiana natural gas producers ($2.35MM BTU) and equal to what the total U.S. natural gas cost for all producers ($2.65 - 2.75MM BTU). Furthermore, this represents 200-300% more than that the obtained by Trinidad and Mexico.

The following describes what was used and the basis for using it. All data was based on 1984 actual costs.

Market Value - Ammonia

The U.S. Gulf Coast market price ex-terminal was $164.66 per short ton (SRI) in 1984. The price was within $2 of what Occidental paid for U.S.S.R. ammonia and is also within $2 of what Occidental received from its Taft, Louisiana facility for that year.

If anything, this established rate may be too high because Gulf Central does not utilize its pipeline evenly, therefore its capacity is less. Knowing that their tariffs include profit, it's feasible that a charge of $20.00 per short ton would be more comparative. However, we used the higher charge of $25.66 per short ton.

Other Cash Costs

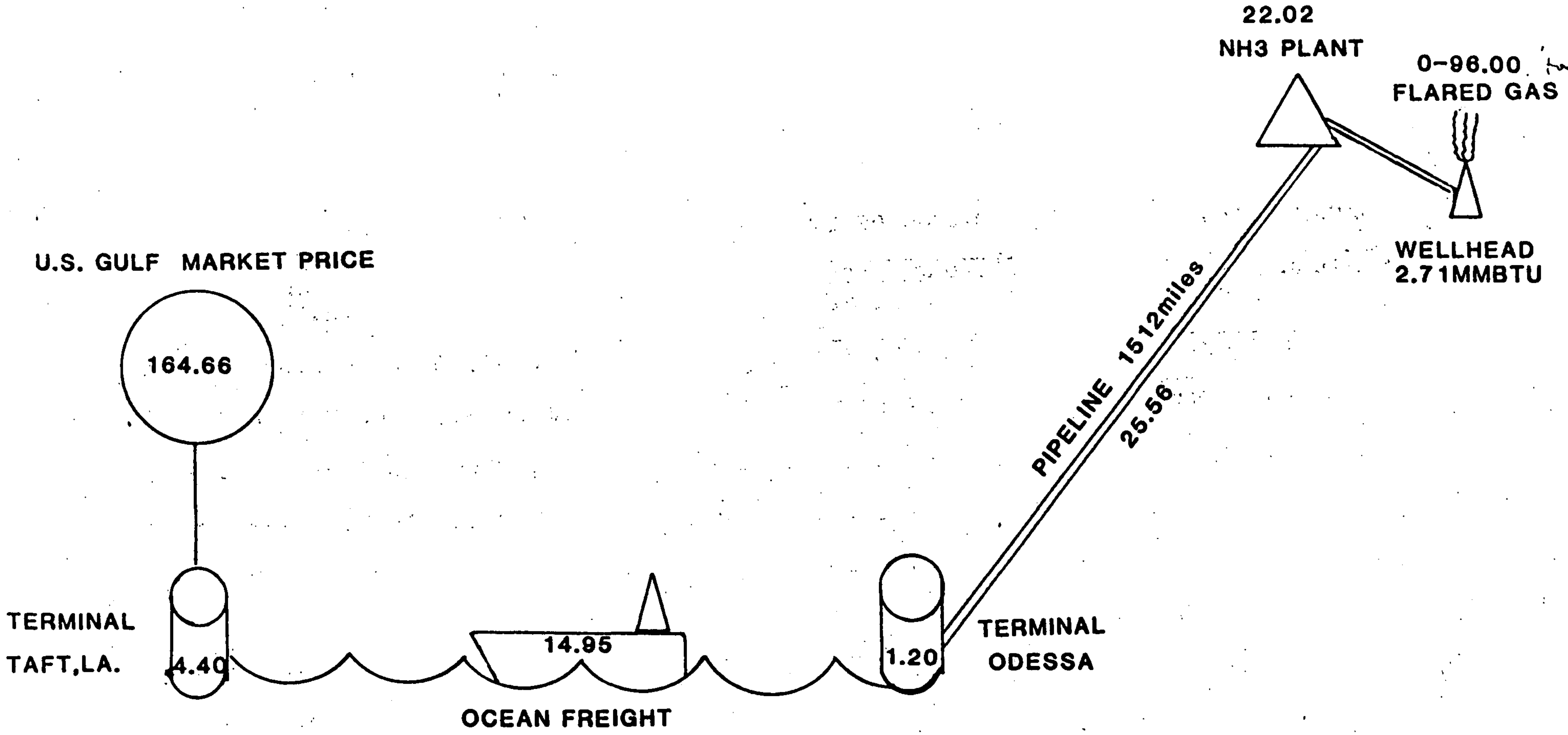
In developing other cash costs in the production of ammonia, we took the cost associated with the Louisiana producers for 6.8MM tons which average $22.02. This strongly represents costs for world size plants of which the U.S.S.R. has the most capacity.

Gas Cost or Value

The Togliatti complex is near to Kuybyshev. Kuybyskev itself is one of the main oil producing centres of the Soviet Union. We assume that gas supplies to the complex would be primarily associated gas at very low opportunity cost (British Sulphur).

In order to establish a gas cost we could have used Trinidad gas cost of $.90 - 1.25MM BTU; Mexican gas costs of $1.08MM BTU; U.S. Gulf (Louisiana) producers $2.35MM BTU or even the total U.S. ammonia producer gas costs of $2.65 - 2.75MM BTU. Also, a 1982 U.S.S.R. published gas charge of $2.46MM BTU ($2.08 escalated 6% per year). However, it is believed that a value for natural gas using surrogate systems would provide the most accurate value for gas at the well head. The reason being that this is the value that the U.S.S.R. receives for its product.

1984 U.S.S.R. AMMONIA
GAS VALUE AT WELLHEAD
($/SHORT TON)



1984 U.S.S.R.
NATURAL GAS VALUE
($/SHORT TON)

	OXY PURCHASE	GULF COAST MARKET
	$167.83	$164.66
TERMINAL COST (TAFT)	(4.40)	(4.40)
OCEAN FREIGHT (ODESSA)	(14.95)	(14.95)
TERMINAL COST (ODESSA)	(1.20)	(1.20)
PIPELINE COST (TOGLIATTI)	(25.56)	(25.56)
CONVERSION COST (PLANT)	(22.53)	(22.53)
	99.70	96.53
	÷ 35.5 MMBTU'S	÷ 35.5 MMBTU'S
	$2.80/MMBTU	$2.71/MMBTU

TRINIDAD
1984
NATURAL GAS VALUE

	$/ST GRACE/STATE	$/ST FEDCHEM (GRACE)	$/ST AMOCO/STATE
MARKET PRICE (GULF)	164.66	164.66	164.66
TERMINAL COST (U.S.)	(13.60)	(13.60)	(13.60)
OCEAN FREIGHT	(12.50)	(12.50)	(12.50)
TERMINAL COST (TRINIDAD)	(4.39)	(7.05)	(2.39)
CONVERSION COST	(18.00)	(22.00)	(34.00)
NATURAL GAS VALUE	116.17	109.51	102.17
	- 39 MMBTU'S	- 40 MMBTU'S	- 38 MMBTU'S
NATURAL GAS VALUE (MMBTU'S)	2.97	2.73	2.68
ACTUAL GAS COST (MMBTU'S)	.90	1.25	.90
ACTUAL GAS COST ($/ST)	35.10	50.00	34.20
PROFIT/(LOSS)	81.07	59.51	67.97
VOLUME	200M	255M	361M
$/MM	16.2MM	15.2MM	24.5MM

GRS6:33:9

1984
AMMONIA PRICE
GULF COAST

	$/SHORT TON
JAN	191
FEB	195
MAR	186
APR	172
MAY	158
JUN	145
JUL	153
AUG	157
SEP	160
OCT	160
NOV	153
DEC	146
AVERAGE	164.66

* SOURCE: SRI 1984/85 PROGRAM, REPORT NO. 1

TRANSPORTATION COSTS

FREIGHT COST

COMMERCIAL CARRIER FROM ODESSA TO TAFT, LOUISIANA IN 50,000 METON VESSEL. QUOTED FREIGHT IN NOVEMBER 1984 WAS $16.48 PER METON OR $14.95 PER SHORT TON.

PIPELINE TRANSPORTATION COST

- USING THE GULF CENTRAL PIPELINE AS A SURROGATE SYSTEM WE HAVE PRORATED ITS COSTS USING THEIR EXISTING TARIFFS EFFECTIVE OCTOBER 1984.
- THIS DISTANCE FROM TOGLIATTI TO ODESSA IS 1,512 MILES.
- THIS DISTANCE FROM FORTEER, LA. TO AURORA, NEB. IS 1,388 MILES
- THE DIFFERENCE BETWEEN THE TWO IS 124 MILES.

FREIGHT COST

FORTEER TO AURORA	24.95
FORTEER TO BLAIR	24.34
DIFFERENCE	.61

THEREFORE	1,388 MILES @	24.95
	124 MILES @	.61
		25.56

GRS6:33:6

GULF CENTRAL PIPELINE COMPANY
SUMMARY OF TARIFF CHARGES

DESTINATION	FORTIER	LULING	DONALDSONVILLE	POLLOCK	STERLINGTON	TERRE HAUTE
EL DORADO, AK	$ 8.85	$ 8.63	$ 8.63	$ 8.63	$ 6.63	
HERMANN, MO	$15.74	$15.57	$15.44	$15.21	$14.96	
PALMYRA, MO	$15.74	$15.57	$15.44	$15.21	$14.96	
COWDEN, IL	$20.49	$20.25	$20.14	$19.77	$19.59	$7.81
TRILLA, IL	$20.92	$20.67	$20.49	$20.20	$20.07	
TERRE HAUTE, IN	$21.39	$21.21	$21.10	$20.79	$20.38	
CRAWFORDSVILLE, IN	$22.06	$21.88	$21.70	$21.39	$21.16	$7.87
FRANKFORT, IN	$22.47	$22.24	$22.06	$21.75	$21.63	$8.47
WALTON, IN	$22.84	$22.59	$22.47	$22.12	$21.99	$9.37
HUNTINGTON, IN	$23.44	$23.32	$23.08	$22.71	$22.54	$9.88
FT. MADISON, IA	$21.99	$21.75	$21.63	$21.21	$21.10	
WASHINGTON, IA	$22.54	$22.41	$22.12	$21.88	$21.70	
MARSHALLTOWN, IA	$22.90	$22.71	$22.54	$22.24	$22.06	
IOWA FALLS, IA	$23.08	$22.90	$22.71	$22.47	$22.24	
GARNER, IA	$23.44	$23.32	$23.08	$22.71	$22.54	
ALGONA, IA	$23.50	$23.38	$23.20	$22.84	$22.59	
SPENCER, IA	$23.80	$23.55	$23.44	$23.08	$22.90	
HOLSTEIN, IA	$24.04	$23.80	$23.55	$23.38	$23.08	
BLAIR, NE	$24.34	$24.22	$23.86	$23.55	$23.44	
FREMONT, NE	$24.46	$24.34	$24.22	$23.80	$23.55	
DAVID CITY, NE	$24.58	$24.46	$24.34	$24.04	$23.80	
AURORA, NE	$24.95	$24.70	$24.53	$24.34	$24.22	

EFFECTIVE OCTOBER 15, 1984

(LOUISIANA P.S.C. #87 TAFT TO: DONALDSONVILLE, FORTIER, LULING, POLLOCK & STERLINGTON $8.14)
(IOWA INTRASTATE TARIFF #1 TO: WASHINGTON, IOWA FROM GARNER IOWA $11.00)

GULF CENTRAL PIPELINE TARIFF SUMMARY SHEET
PREPARED BY DEBBIE CARRINGTON

TERMINAL COSTS
($MM)

	THRU-PUT	LABOR	SEMI FIXED	VARIABLE	FIXED	TOTAL
U.S.S.R.	2750M	.7	.7	.9	1.0	3.3

$3.3MM - 2750M = 1.20/ST

U.S.	500M	.6	.6	.1	.9	2.2

$2.2MM ÷ 500M = 4.40/ST

NOTE: THESE COSTS ARE BASED ON OXY'S ACTUAL COSTS BASED ON 500,000 SHORT TONS THROUGHPUT AND PRORATED FOR U.S.S.R. WHO HAVE BUILT SIMILAR FACILITIES IN ODESSA. INCLUDED IN THE FIXED COSTS ARE CAPITAL RECOVERY.

1984
LOUISIANA AMMONIA
CASH COSTS*

COMPANY	LOCATION	VOLUME 000'S TONS	GAS USE MMBTU/ TON	$/MMBTU'S GAS COST	$/TON OTHER CASH COSTS	$/TON TOTAL CASH COST
AGRICO	DONALDSONVILLE	450	35.5	3.25	23	138
AIR PRODUCTS	NEW ORLEANS	245	38.0	2.05	20	96
AM CY	AVONDALE #1	400	38.0	1.55	21	80
AM CY	AVONDALE #2	370	29.0	1.55	58	103
AMPRO	DONALDSONVILLE	460	36.0	2.90	21	125
AAC	GEISMAR	400	35.5	3.25	21	145
BORDEN	GEISMAR	370	35.5	1.20	23	66
CF IND.	DONALDSONVILLE #1,2	750	38.0	1.20	17	63
CF IND.	DONALDSONVILLE #3,4	920	35.5	3.35	20	139
CHEVRON	LULING	238	37.0	3.20	18	137
FARMLAND	POLLOCK	475	35.0	3.25	16	130
GEORGIA PACIFIC	PLAQUEMINE	200	25.5	.40	105	115
IMC	STERLINGTON #2	500	35.5	3.25	17	132
MONSANTO/CHEVRON	LULING	238	37.0	3.35	16	140
OLIN	LAKE CHARLES	490	39.5	1.85	22	95
TRIAD	DONALDSON	375	37.5	.25	18	28
	TOTAL	6881				
AVERAGE COST			35.45	2.35	(22.08)	108

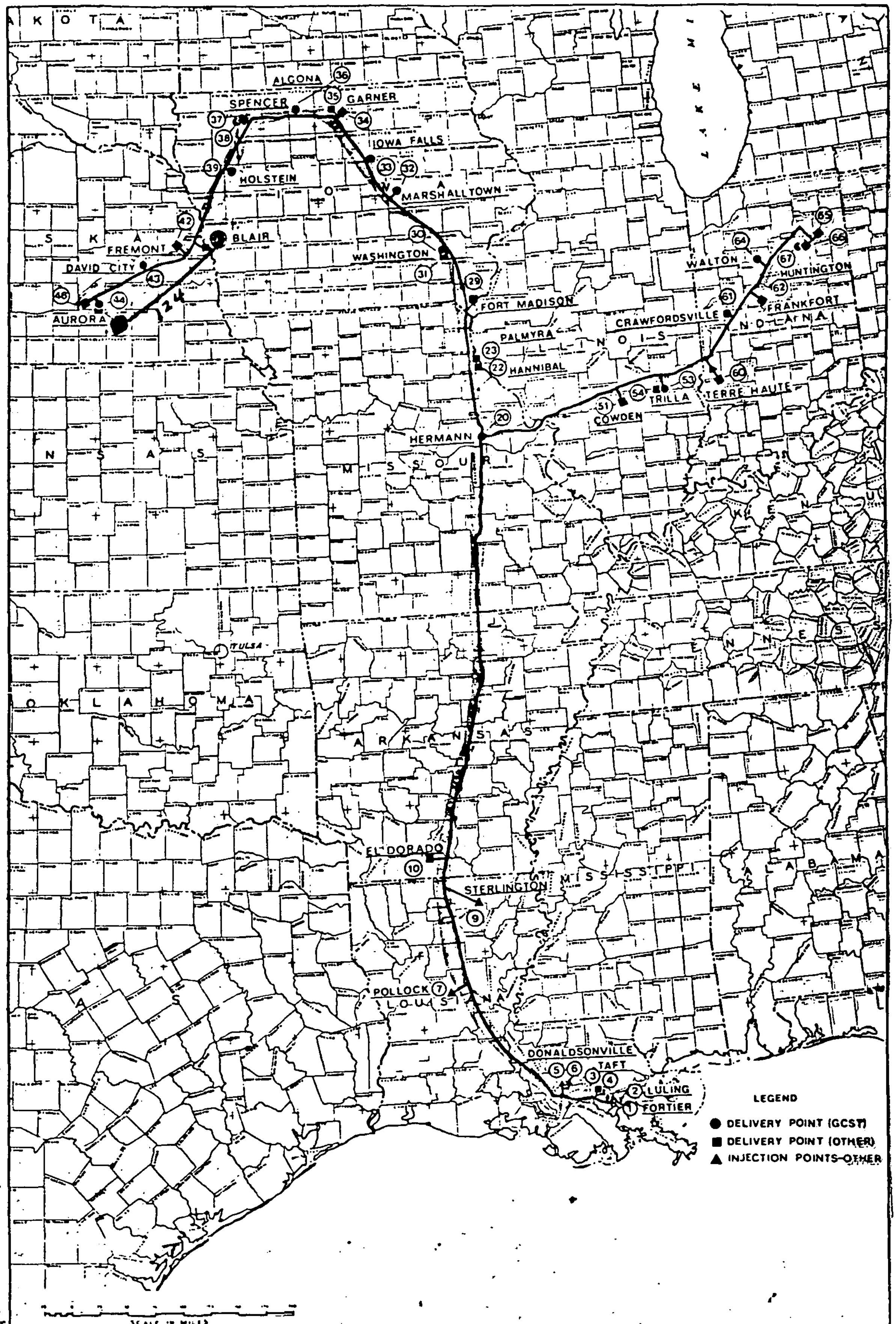
GULF CENTRAL PIPELINE COMPANY
SUMMARY OF TARIFF CHARGES

DESTINATION	FORTIER	LULING	DONALDSONVILLE	POLLOCK	STERLINGTON	TERRE HAUTE
El Dorado, AK	$ 8.85	$ 8.63	$ 8.63	$ 8.63	$ 6.63	.....
Hermann, MO	$15.74	$15.57	$15.44	$15.21	$14.96	.....
Palmyra, MO	$15.74	$15.57	$15.44	$15.21	$14.96	.....
Cowden, IL	$20.49	$20.25	$20.14	$19.77	$19.59	$7.81
Trilla, IL	$20.92	$20.67	$20.49	$20.20	$20.07	.....
Terre Haute, IN	$21.39	$21.21	$21.10	$20.79	$20.38	.....
Crawfordsville, IN	$22.06	$21.88	$21.70	$21.39	$21.16	$7.87
Frankfort, IN	$22.47	$22.24	$22.06	$21.75	$21.63	$8.47
Walton, IN	$22.84	$22.59	$22.47	$22.12	$21.99	$9.37
Huntington, IN	$23.44	$23.32	$23.08	$22.71	$22.54	$9.88
Ft. Madison, IA	$21.99	$21.75	$21.63	$21.21	$21.10	.....
Washington, IA	$22.54	$22.41	$22.12	$21.88	$21.70	.....
Marshalltown, IA	$22.90	$22.71	$22.54	$22.24	$22.06	.....
Iowa Falls, IA	$23.08	$22.90	$22.71	$22.47	$22.24	.....
Garner, IA	$23.44	$23.32	$23.08	$22.71	$22.54	.....
Algona, IA	$23.50	$23.38	$23.20	$22.84	$22.59	.....
Spencer, IA	$23.80	$23.55	$23.44	$23.08	$22.90	.....
Holstein, IA	$24.04	$23.80	$23.55	$23.38	$23.08	.....
Blair, NE	$24.34	$24.22	$23.86	$23.55	$23.44	.....
Fremont, NE	$24.46	$24.34	$24.22	$23.80	$23.55	.....
David City, NE	$24.58	$24.46	$24.34	$24.04	$23.80	.....
Aurora, NE	$24.95	$24.70	$24.53	$24.34	$24.22	.....

Effective October 15, 1984

(Louisiana P.S.C. #87 Taft to: Donaldsonville, Fortier, Luling, Pollock & Sterlington $8.14)
(Iowa Intrastate Tariff #1 to: Washington, Iowa from Garner Iowa $11.00)

GULF CENTRAL PIPELINE TARIFF SUMMARY SHEET
Prepared by Debbie Carrington



GULF CENTRAL PIPELINE COMPANY
SYSTEM MAP

K-17

THE BRITISH SULPHUR CORPORATION LIMITED.

Parnell House 25 Wilton Road London SW1V 1NH — Telephone 01-828 5571 and 828 2917
Telex 918918 sulfex g · Telegrams Sulfex London SW1

MNP/MCR

28th February 1985

Mr. A.A. Guffey,
Vice President,
Occidental Chemical Agricultural Products Inc.,
5404 Cyprus Center Drive,
P.O. Box 25597,
Tampa,
Florida 3362,
USA.

AE

Dear Mr. Guffey,

Following our recent telephone conversation please find enclosed some notes that I have put together covering my understanding of recent developments in Soviet gas pipelines, gas prices and the likely cost of feedstock to the Togliatti complex.

I have also enclosed some maps and a copy of a special report on the Soviet Gas Industry that was prepared for as by an outside consultant who is familiar with the industry. This should be useful as additional background information.

If you have any further questions please call.

Yours sincerely,

Murray Park

Murray Park

of credit for construction of pump stations; steel pipe was also purchased on advantageous terms from France.

Austria is more dependent on Soviet supplies than other West European countries and has less leverage on prices. The only major source of supply is the Soviet Union. Recently contracted supplies from the new pipeline will peak at 1.4 billion cu. metres by 1989.

Ammonia pipeline Togliatti to Odessa

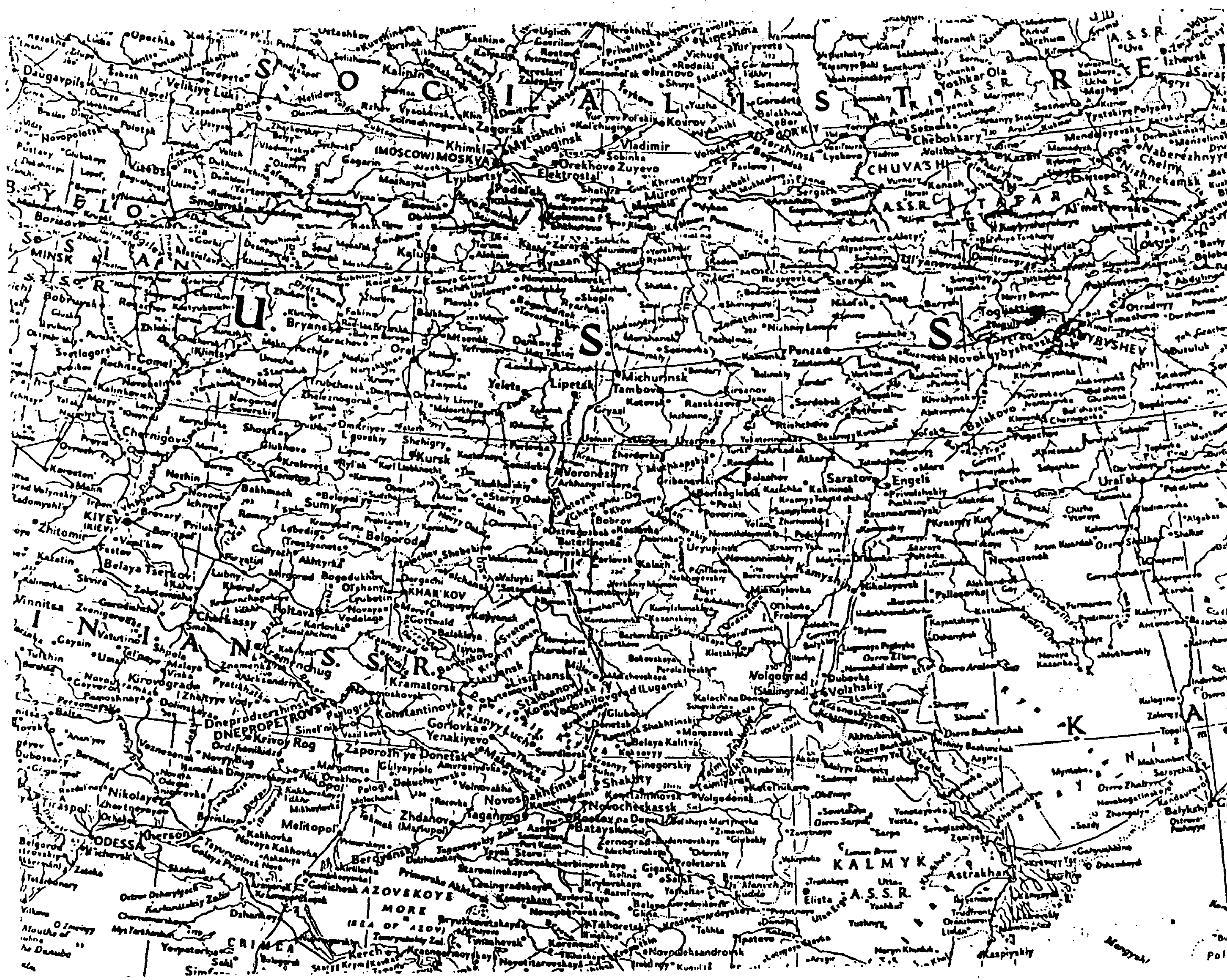
This is a comparable pipeline system to the Gulf Central System in the USA and transmission costs could probably be calculated using this system as a surrogate.

The pipeline from Togliatti to Odessa is 2400 km. There is a spur of 800 km to Gorlovka. The line cuts through 37 railway lines, 89 roads, 107 rivers and reservoirs. There are 14 pumping stations and the capacity is 2.5 million t/a of ammonia.

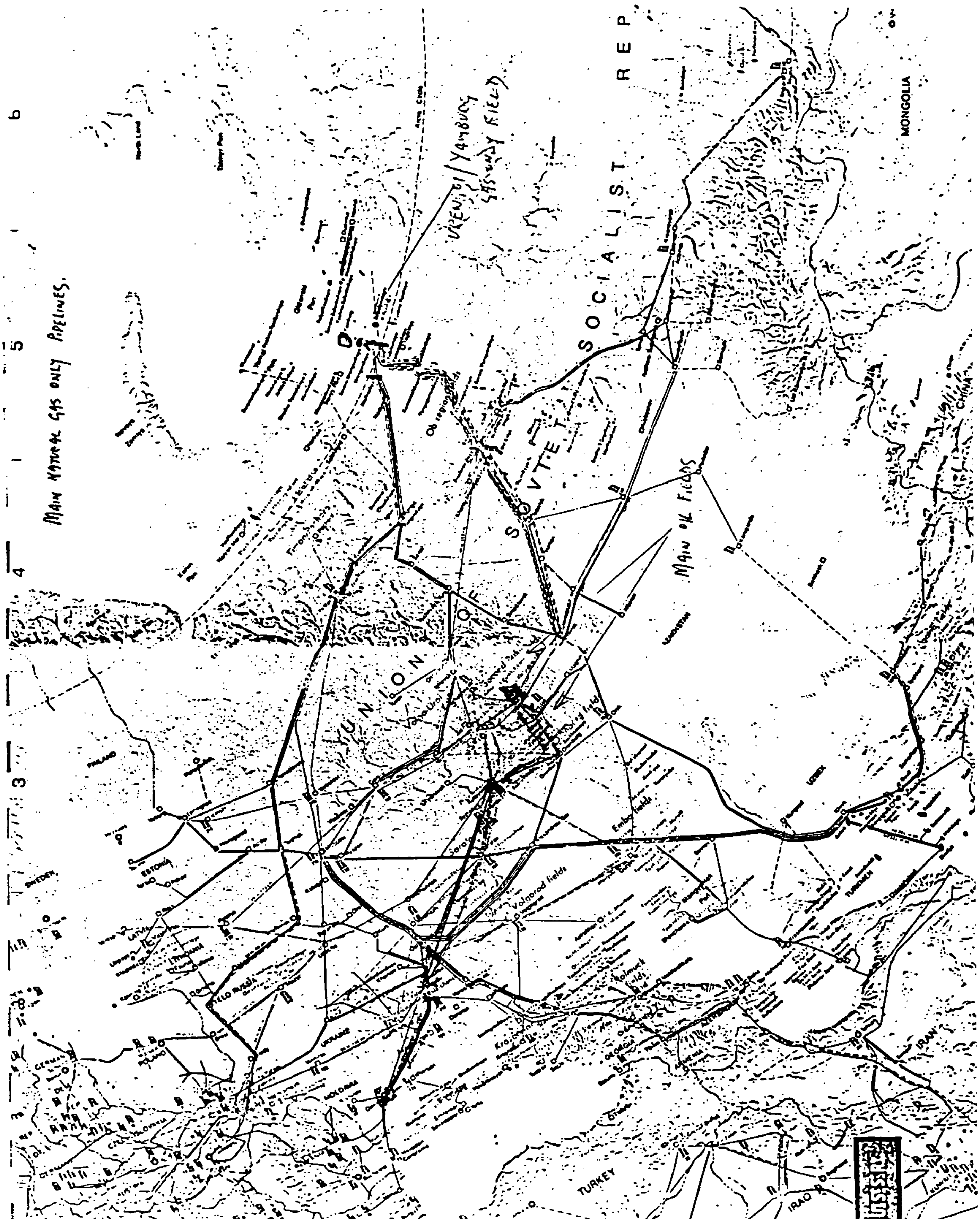
The pipeline also serves the agricultural regions en route with 29 distribution centres.

The pipeline was built on a compensation basis using equipment supplied primarily by Occidental, Williams Bros and France.

The Togliatti complex is on the Volga river near to Kuybyshev. Kuybyshev itself is one of the main oil producing centres of the Soviet Union and we assume that gas supplies to the complex would be primarily associated gas at very low opportunity cost.


S O C I A L I S T
R E
U. S. S
B Y E L O
R U S S I A N
S. S. R.
U K R A I N I A N S. S. R.
K A
(MOSCOW) MOSKVA
KIYEV (KIEV)
KHAR'KOV
DNEPROPETROVSK
ODESSA
KUYBYSHEV
Volgograd (Stalingrad)
Voroshilovgrad (Lugansk)
AZOVSKOYE MORE (SEA OF AZOV)
CRIMEA
KALMYK A.S.S.R.
CHUVASH A.S.S.R.
TATAR A.S.S.R.
Vladimir
Kalinin
Smolensk
Bryansk
Orel
Kursk
Voronezh
Tambov
Lipetsk
Penza
Saratov
Engels
Gomel'
Chernigov
Poltava
Kremenchug
Kirovograd
Zhitomir
Vinnitsa
Nikolayev
Kherson
Tiraspol
Zaporozh'ye
Donetsk
Zhdanov (Mariupol')
Melitopol'
Taganrog
Rostov na Donu
Novocherkassk
Astrakhan
Kerch
Ryazan'
Kaluga
Tula
Gor'kiy
Ul'yanovsk
Cheboksary
Kazan
Syzran'
Tol'yatti
Belgorod
Sumy
Kramatorsk
Gorlovka
Makeyevka
Berdyansk
Elista
Kamyshin
Balakovo
Ural'sk
Minsk

K-19


MAIN NATURAL GAS ONLY PIPELINES.
UNION OF SOVIET SOCIALIST REP
URENGOI/YAMBURG GAS-ONLY FIELD
MAIN OIL FIELDS
MONGOLIA
CHINA
IRAN
IRAQ
TURKEY
FINLAND
ESTONIA
SWEDEN

INTERORE NEW YORK

TO: Gary Shepard

DATE March 20, 1985

FROM: M. G. Hefferen

MEMO NO.

SUBJECT: Ammonia Freight Rates

COPY

As per our phone conversation we indicated the following freight rates:

MT of Ammonia	Freight Rate
10/15,000	USD 16.00/MT
20,000	USD 14.00/MT
25/30,000	USD 12.00/MT

These rates are subject to vessel availibility from Trinadad to the U.S. Gulf. Presently for end March/early April, there seems to be a shortage of vessels. Therefore, the freight rates that we have shown above, which are based on competitive bids from owners, could vary by USD 3-6.00/MT. Please be guided accordingly.

MGH/cn

INTERORE NEW YORK

TO: G. Shepard DATE March 22, 1985

FROM: W. J. Hueston MEMO NO.

SUBJECT: AMMONIA COPY

Enclosed please find three telex offers covering ammonia vessels offered to us for shipment in November 1984. The first two telexes cover two 35,000 tonners at which the freight rate is $22-21.00 per M/T respectively. The last telex covers on the one hand an offer of 35,000 tons shipped on a 50,000 ton vessel and the freight rate is $19.00 per ton slightly lower than the 35,000 tonner. However, if 50,000 tons were to be loaded the concession would result in a freight rate on the total cargo of $16.48!

This gives you some idea of the savings when shipping in large lots.

Regards.

WJH:nm

Enc.

233560 IOF UR
NYK OCTOBER 29,84

ATTN: MR. M.HEFFERIN

U R G E N T

PLEASE FIND BELOW TERMS OF AGREEMENT TO FIXTURE OF GOLAR FROST WHICH SUBJECT ONLY TO RECEIVERS APPROVAL WHICH DECLARABLE LATEST NOON LONDON 30 OCTOBER 1984 :

A) VESSEL GOLAR FROST

B) CHARTERERS : SOJUZCHEMEXPORT OR NOMINEE

C) VOVAGE: ONE VOYAGE TO USA

D) CARGO :
TO BE 35,000 MT 5 PCT MOLOO WITH CHARTERER'S OPTION UP TO FULL CARGO. CARGO TO BE FULLY REF NH3

E) LOAD : ONE SAFE BERTH/PORT ODESSA
DISCHARGE :
ONE SAFE BERTH IN
ONE OR TWO SAFE PORTS USG AND/OR USEC.

F) LAYCAN : 10-15 NOV 1984. ETA 6 NOV 1984

G) PRESENTATION : VESSEL TO PRESENT WITH CARGO TANKS UNDER BREATHABLE AIR. UPON VESSEL'S ARRIVAL CHARTERERS WILL MAKE COOLANT AVAILABLE BUT LAYTIME ONLY TO START FROM 10/NOV OR WHEN VSL FULLY COOLED AND READY TO LOAD WHICHEVER LATER. CHARTERERS TO MAKE BEST ENDEAVOURS TO ACCEPT VESSEL EARLIER THAN 10/11 PROVIDED VESSEL IS READY. CHARTERERS TO PROVIDE COOLANT TO MASTERS REQUIREMENT BUT THE QUANTITY USED TO BE INCLUDED INTO CARGO LOADED AND TO BE FOR CHARTERERS ACCOUNT. TIME PREPARING VESSEL TO POIN WHERE VESSEL COOLED AND PURGED AND READY FOR LOADING FULLY REF NH3 TO BE FOR OWNERS ACCOUNT.

H) LAYTIME : 84 HRS TOTAL PER VOYAGE SHINC

I) FREIGHT :
USD 19 PER MT BASIS USEC
USD 21 PER MT BASIS USG

IF CHARTERERS REQUIRE SECOND DISPORT IN USA CHARTERERS TO PAY EXTRA USD 1.5 PER MT ON B/L QUANTITY.
36,750 MT BASIS USA FREIGHT
FOR EXCESS QUANTITY TO BE CHARGED AT 50 PCT OF ABOVE RATES.

J) DEMURRAGE : USD 13,500 PDPR

K) ASBATANKVOY - GA ARB LONDON - ENGLISH LAW
P AND I PROTECTION CLAUSE DELETE TOVALOP - YA 74

L) NOTICES TO BE GIVEN IMMEDIATELY/5 DAYS/2 DAYS/1 DAY FROM ARRIVAL LOADPORT, THEN IMMEDIATELY ON SAILING/5 DAYS/2 DAYS/1 DAY FROM ARRIVAL DISCHARGE PORT

7

RECEIVED

MAR 1 3 1985

GARY SHEPARD

USSR GAS PRICE ESTIMATE

In Feb. 1982 issue of Khim. Prom. reference was made to a plant modification which reduced gas consumption by 4.5 million cu. m - and gave an economic benefit of 250,000 Rbl. per year.

This information implies the value of gas for ammonia production is 55.6 Rbl per cu. m.

Assuming $US 1 = 0.758 Rbl.
and 1 cu.m = 35.3 cu. ft
the corresponding price thus becomes $2.08 per MCF

****

ECONOMICS

TECHNICOECONOMIC ASPECTS OF IMPROVING THE EFFICIENCY OF LARGE-TONNAGE AMMONIA PLANTS

V. M. Kiryushkin, E. Z. Kazhdan, V. P. Semenov, M. Kh. Sosna

Technical reoutfitting in the nitrogen industry is being solved by building ammonia plants with capacities of 600 and 1360 t/day.

"Tekhniko-ekonomicheskie voprosy povysheniya effektivnosti raboty krupnotonnazhnykh argegatov po proizvodstvu ammiaka," Khim. prom., 1982 (2), 119-122. UDC 661.53.023.002.237

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FERTECON

JOHN V. PELLICCIOTTI

1950 West Gray, Suite 12, Houston, TX 77019
Telephone: (713) 529-5335

1984
GAS AND CASH COSTS

		$/SHORT TON		
	$/MM BTU GAS PRICE	AVERAGE GAS COST	OTHER CASH COST	TOTAL CASH COST
GULF COAST (1)	2.50	88	22	110
TOTAL U.S. (1)	2.65-2.75	98	22	120
TRINIDAD (2)				
AMOCO/STATE	.90	34	18	52
GRACE/FEDCHEM	1.25	50	22	72
FRACE/STATE	.90	35	18	53

(1) SRI: 1984/85 PROGRAM REPORT NO. 1
(2) BLUE, JOHNSON & ASSOCIATES - NITROGEN COSTS

GRS6:33:5

1984
AMMONIA IMPORTS*
(000 METONS)

CANADA	885
MEXICO	340
CARIBBEAN	816
USSR	807
OTHER	100
	2,948

TOTAL AMMONIA DEMAND	18,180
U.S. PRODUCTION	15,300

*SOURCE: BLUE, JOHNSON & ASSOCIATES
(NITROGEN SUPPLY-DEMAND)

U.S. GULF COAST
$/SHORT TON

	1982	1983	1984	1985
MARKET PRICE	125	136	164	163
PRODUCER CASH COST	100	93	110	123
CONTRIBUTION TOWARD INVESTMENT/PROFIT	25	43	44	40
PERCENTAGE%	20	31	26	24

SOURCE: SRI 1984-85 PROGRAM

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AMMONIA
U.S.S.R. EXPORTS
(000'S SHORT TONS)

1980	1981	1982	1983	1984
2874	2806	2086	2474	2900 EST.

TOTAL WORLD EXPORTS
(000'S SHORT TONS)

1980	1981	1982	1983	1984
7936	7495	7490	8270	8300 EST.

* SOURCE: SRI

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