Joint UNDP/World Bank Energy Sector Management Assistance Program

Activity Completion Report

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Activity: REPORT ON PETROLEUM PROCUREMENT, REFINING AND DISTRIBUTION

NOVEMBER 1986

ENERGY SECTOR MANAGEMENT ASSISTANCE PROGRAM

The Joint UNDP/World Bank Energy Sector Management Assistance Program (ESMAP), started in April 1983, assists countries in implementing the main investment and policy recommendations of the Energy Sector Assessment Reports produced under another Joint UNDP/World Bank Program. ESMAP provides staff and consultant assistance in formulating and justifying priority pre-investment and investment projects and in providing management, institutional and policy support. The reports produced under this Program provide governments, donors and potential investors with the information needed to speed up project preparation and implementation. ESMAP activities can be classified broadly into three groups:

- Energy Assessment Status Reports: these evaluate achievements in the year following issuance of the original assessment report and point out where urgent action is still needed;

- Project Formulation and Justification: work designed to accelerate the preparation and implementation of investment projects; and

- Institutional and Policy Support: this work also frequently leads to the identification of technical assistance packages.

The Program aims to supplement, advance and strengthen the impact of bilateral and multilateral resources already available for technical assistance in the energy sector.

Funding of the Program

The Program is a major international effort and, while the core finance has been provided by the UNDP and the World Bank, important financial contributions to the Program have also been made by a number of bilateral agencies. Countries which have now made or pledged initial contributions to the programs through the UNDP Energy Account, or through other cost-sharing arrangements with UNDP, are the Netherlands, Sweden, Australia, Switzerland, Finland, United Kingdom, Denmark, Norway, and New Zealand.

Further Information

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JAMAICA

REPORT ON PETROLEUM PROCUREMENT, REFINING AND DISTRIBUTION

NOVEMBER 1986

ABBREVIATIONS AND ACRONYMS

AFRA	Average Freight Rate Assessment published by the London Tanker Brokers Panel
API	American Petroleum Institute
bbl	barrel
b/d	barrels per day
CIF	Cost, Insurance and Freight
CS	Centistrokes per second
DWT	deadweight tonnes
FOB	Freight-on-Board
GOJ	Government of Jamaica
Intascale	International Tanker Nominal Freight Scale
JPSCo	Jamaica Public Service Company
LIFO basis	Last in, First out basis
LPG	Liquified Petroleum Gas
MDWT	thousand deadweight tonnes
MM	million
MMB/D	million barrels per day
MMET	Ministry of Mining, Energy and Tourism
PCJ	Petroleum Corporation of Jamaica
PDVSA	Petroleos de Venezuela S.A.
RIM	Round Island Movement
SSF	Saybolt units per second
USGR	U.S. Gulf Coast Refineries
USGC	U.S. Gulf Coast
USEC	U.S. East Coast

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I. INTRODUCTION

1.1 In April, 1984, at the request of the Government of Jamaica (GOJ), the World Bank carried out an energy sector review in Jamaica under the Joint UNDP/World Bank Energy Sector Assessment Program. Its Assessment Report 1/ outlined the overall place of energy in the Jamaican economy and then reviewed in detail the electric power, petroleum and renewable subsectors, as well as potential energy conservation and institutional issues.

1.2 Subsequent to publication of the Assessment Report, GOJ initiated further discussions on the sections dealing with Jamaica's petroleum procurement, refining and distribution subsector, which it regarded as inaccurate in part. As a result of those discussions, it was agreed that the Bank would undertake a detailed review of this subsector, in the light of the comprehensive data provided by GOJ and Petroleum Corporation of Jamaica (PCJ). In particular, the review would evaluate the economic costs and benefits of Jamaica's current system of crude procurement and domestic refining against the alternative of closing the refinery and directly importing products, as well as the operation of Jamaica's petroleum product price regulatory system. The analysis, conclusions and recommendations in the present report, dealing with issues covered under the petroleum sector, supersede those contained in the Assessment Report of April 1985.

1.3 The findings of this review, 2/ which took place in February 1986 under the joint UNDP/World Bank Energy Sector Mangement Assistance Programme, with the assistance of the Canadian International Development Agency, are set out below.

1/ "Jamaica: Issues and Options in the Energy Sector" Report No. 5466-JM, of April, 1985.

2/ This Report is based on the findings of a Bank mission which visited Jamaica in February, 1986. The mission comprised Mr. I. Hume, Mission Chief; Ms. C. Bernard, Loan Officer; Mr. C. R. Poncia, Energy Planner; Mr. T. S. Nayer, Refinery Engineer and Mr. A. Hunter, Petroleum Consultant. Comments from the Government of Jamaica and the Petroleum Corporation of Jamaica have been included.

II. SUMMARY OF FINDINGS AND RECOMMENDATIONS

Jamaica's Petroleum Product Price Regulatory System

2.1 The Energy Division of the Ministry of Mining, Energy and Tourism, as the Government agency responsible for energy policy, coordination and monitoring, regulates the pricing at each stage of production and distribution of controlled petroleum products (gasoline, domestic kerosene, auto diesel and industrial diesel). The system is designed to ensure that, at the refinery level, prices of petroleum products in Jamaica correspond to the landed cost of the equivalent imported products. At the consumer level, Government controls the final selling prices of certain products by the imposition of taxes and the control of the margins to distribution, marketing and retail sectors. The following changes to improve the efficiency of the regulatory system are recommended:

(a) as directed by the Minister of Mining, Energy and Tourism, the FOB price of products should be based on published sources of supply more reflective of marketing conditions in the U.S. East Coast and Europe;

(b) the Terminal, Rack and the Round Island Movement (RIM) Fees payable to the Refinery operator, Petrojam, should be: (i) audited to provide detailed information as to the cost incurred in providing these services and (ii) established at the levels which would prevail in a competitive situation. Petrojam's efforts to reduce the Esso Throughput Fee by purchasing the Esso tanks or installing new tanks should be continued; and

(c) efforts should be maintained to determine and ensure regular Accord/Subsidy Fund transfers between GOJ and Petrojam.

Refinery Performance

2.2 The refinery's product slate, at its current level of operation of 22,000 b/d, is well matched to domestic demand of about 21,500 b/d in 1983 and 1984, excluding the private sector alumina industry fuel oil requirements which are imported directly.

2.3 Within its technical limitations. the refinery's operating costs should be low, reflecting its integrated process units and low manning. The refinery's fixed operating costs at US$0.70 per barrel (bbl) are indeed low but its variable costs (including terminal and rack costs) of US$1.43-1.71 bbl, in 1983 and 1984 respectively, are 20% to 30% higher than normal for a hydroskimming refinery, partly due to the higher cost of purchased electricity and higher than normal fuel consumption in these years.

2.4 The crude procurement and processing costs incurred by Petrojam in 1983 were lower by a margin of US$0.30/bbl than the costs that it would have incurred if it had directly imported its entire product slate. This differential, i.e., the refinery's operating margin, was negative in 1984, by a margin of US$0.10/bbl, but would have been positive but for repeated interruptions of refinery operations because of lack of crude resulting from foreign exchange constraints.

2.5 Lack of foreign exchange not only restricted Petrojam's ability to acquire the cheapest available crudes but also caused financial losses through disruption of refinery operations, expensive procurement of crude tankers, and payment of demurrage and financing charges amounting in 1983 and 1984 to a loss of US$8.8 million. It is therefore recommended that:

> GOJ should ensure that a specified amount of foreign exchange should be made available promptly to Petrojam to avoid costly interruptions in refinery operation and to facilitate procurement of requisite services on a least cost basis.

Economic Evaluation

2.6 The economic viability of the refinery to Jamaica is evaluated by comparison of the economic costs of procuring and processing spiked crude against the alternative of directly importing equivalent products, on a least cost basis. For this purpose, the economic costs of procuring and refining spiked crude are based on the actual costs incurred by Petrojam in 1983 and 1984, in procuring from Mexico and Venezuela. 3/ The costs of directly importing equivalent products should, however, be determined not on the actual product prices paid by Petrojam (based on average Curacao/Aruba) posted prices, but on the least cost source of supply, i.e., an average of the posted prices of the Venuzuela national oil company, PDVSA, prevailing in 1983 and 1984. 4/ Likewise, Petrojam's actual freight costs in 1983 and 1984 are adjusted to reflect the lower crude and product freight rates which should be available. The economic costs of importing and refining spiked crude are still comparable to the economic costs of direct product imports (about US$0.03 per bbl lower in

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3/ These countries are the best source of crude supply for Jamaica because of Jamaica's nearby location to the regional crude oil exporting countries, and because the exporting countries crude prices are set by reference to the international crude market.

4/ While Caribbean spot product prices in 1983 and 1984 (as published in Platts), were consistently lower than Caribbean posted prices, the Caribbean spot market would be too thin and prices too variable to be the basic source of product supply. Of the Caribbean posted prices in those years, PDVSA prices were close to the U.S. East Coast spot prices, while Aruba/Curacao posted prices were significantly higher.

1983 and US$1.18 higher in 1984 - See Table 5.5). This conclusion is reached without taking into account either the savings which would have accrued if the crude slate had been optimized or the benefits of the San Jose Accords with Mexico and Venezuela, which would improve the viability of domestic refining by increasing the margin, since their future level is in some doubt given current crude price trends and the prevailing Accord interest rates.

2.7 The economic evaluation of Jamaica's petroleum procurement and Refining system should not depend exclusively on relative historic crude and product prices, given their volatility. Further analysis is possible by comparison of the competitive position of the Petrojam refinery against that of the nearest product supplier whose prices are determined in accordance with international market forces, i.e., the U.S. Gulf Coast Refineries (USGR). Products produced by the USGR in excess of their contractual commitments would normally be priced at marginal cost only, an advantage compared to the Petrojam refinery. Offsetting this, the Petrojam refinery location means that its crude transportation costs are lower assuming the same point of crude supply (Mexico, Venezuela or Colombia). Furthermore, supply costs from USGR, but not the Petrojam refinery, would include product transportation costs from the Gulf Coast to Jamaica. On balance (see Table 5.6), the Jamaican refinery and transportation costs remain close to the costs of USGR supply to the Jamaican market across a wide range of crude prices.

2.8 The evidence does not, therefore, support closure of the Petrojam refinery. It is, however, recommended that in continuing refinery operations, Government should provide sufficient foreign exchange to Petrojam to allow it to:

(a) procure its basic crude requirements under contracts including most favored nation price protection and otherwise based on generally applicable sales terms; and

(b) supplement its basic contract source of crude by periodic intervention on the spot market, when prices are favorable.

Outlook and Options

2.9 The recent decline of crude prices should lead to higher production by existing refineries, discourage investment in new refineries and push spot prices closer to contract prices. The outlook suggests that it will become increasingly difficult for Jamaica to obtain products at marginal cost from the U.S. Gulf Coast Refineries, compared to continued Kingston Refinery operation. The future outlook for the refinery sector, therefore, supports continued Petrojam refinery operation as the least cost method of maintaining reliable product access.

2.10 A number of refinery cost savings measures are being pursued by Petrojam to increase revenues and reduce costs. Petrojam should continue its efforts to:

(a) exchange its relatively high value uncracked fuel oil, which could be exported to the U.S. and Europe, for a lower value cracked fuel oil;

(b) increase production and reduce costs through changes in various product specifications;

(c) evaluate with the private sector alumina industry the feasibility of increasing production to capacity, 35,000 b/d, based on an appropriate blend of heavy unspiked crude, for supply to the industry of its fuel oil requirements;

(d) reduce fuel use and losses, while carefully evaluating individual investments against current fuel oil prices; and

(e) undertake a secondary conversion feasibility study to upgrade its fuel oil production, as soon as the price differential between fuel oil and white products stabilizes.

2.11 The volatility of petroleum marketing conditions makes it essential that Jamaica monitor the evolution of these conditions to verify that the economic costs of the present system continue to be comparable with the alternative of direct product importation. It is recommended that:

GOJ should ensure that adequate resources for this purpose are made available to the Energy Division of the Ministry of Mining, Energy and Tourism.

III. BACKGROUND INFORMATION

Regional Petroleum Market

3.1 Jamaica lies at the center of one of the world's traditional oil markets, the Caribbean. In the late 1970's, the Caribbean was still a major refining and transshipment center with six large export refineries supplying products to the US and Europe and seven small refineries, each serving their respective domestic markets. The region was ringed by the two large Venezuelan export refineries and the domestic refineries in Central America, Mexico and Colombia. The large export refineries were originally designed to meet the large residual fuel oil import requirements of the US East Coast but, as these dropped from 1.3 million barrels per day (MMB/D) in 1978 to 0.5 MMB/D in 1985, the main outlet for the output of these refineries disappeared and rendered them economically vulnerable.

3.2 Today, only three of the original five export refineries are in operation - St. Croix (Hess) in the Virgin Islands, Point a Pierre (Trintoc) in Trinidad and Curacao (now leased by the Venezuelan national oil company, PDVSA) in the Netherlands Antilles. Worldwide excess refining capacity, heightened competition from the new OPEC export refineries and reduced US and European import requirements have forced the surviving refineries to reduce operations. On the mainland, the Venezuelan, Mexican and Colombian refineries have been upgraded, and either are (Venezuela and Mexico) or may become (Colombia) significant product exporters. In contrast, other Caribbean and Central American domestic refineries have not been upgraded and have a considerably reduced throughput.

3.3 While these changes have taken place, transshipment and blending operations have continued active. Crude can be brought into the area for storage and/or transshipment in smaller vessels at four terminals in the Bahamas, Curacao and Bonaire. Products from diverse locations and with different qualities can be brought for blending and shipment to the US or Europe at four other terminals, all located in St. Eustacius. The sharp growth which occurred in the 1970s in this business was due, firstly, to unavailability of US ports able to receive huge crude carriers and, secondly, to the savings possible by transhipping outside US territorial waters in order to avoid using US flag vessels. Because of the continued need for intermediate storage for US imports and the growth in product exports from other Latin American countries, principally Brazil and Argentina, terminal operations have continued, albeit at a reduced level. In recent years, transshipping crude has been less attractive than lightering it at the port(s) of destination in the US. Storage has tended to be used during times of oversupply to "park" crude and product until sale.

3.4 Cheaper refining in the Middle East, and the likelihood (because of declining production) of increased US crude and product

imports suggest that Middle East producers and the new Arabian Gulf export refineries may again become significant users of terminals in the Caribbean Region for transshipping large cargoes into the US. Caribbean export refineries' production may also rise to meet some the increasing US fuel oil import requirements, so long as the fuel oil price remains competitive with other fuels.

The Jamaica Petroleum Product Market

3.5 Petroleum product demand in Jamaica in 1983 and 1984, broken down by product and by marketing company, is shown in Table 3.1.

Table 3.1: PETROLEUM PRODUCT DEMAND
(Barrels/day)

	Esso	Shell	Texaco	Petcom	IGL/ Tropicana	Bauxite Alum	Total
1983							
LPG	119	376	14	-	580	-	1089
Gasoline	1627	1620	1419	-	-	-	4666
Distillates	3361	3033	862	2	-	103	7361
Fuel Oil	4721	5437	100	429	-	13770	24457
Other Prod.	155	292	112	-	-	-	559
Total	9983	10758	2507	431	580	13873	38132
1984							
LPG	111	388	13	-	508	-	1020
Gasoline	1523	1422	1277	-	-	-	4222
Distillates	2940	2482	1002	41	-	110	6575
Fuel Oil	3851	5221	55	517	-	13637	23281
Other Prod.	124	204	23	-	-	-	351
Total	8549	9717	2370	558	508	13747	35449

Source: Ministry of Mining, Energy and Tourism.

3.6 The bulk of the above demand excluding direct fuel oil imports by the alumina refinery companies is usually met by production from the Kingston refinery, which produced 20,319 b/d in 1983. In 1984, however, foreign exchange constraints caused crude oil supply interruptions and the refinery produced only 12,575 b/d. In both cases, refinery production is supplemented by direct product imports. The refinery sales for 1983 and 1984 are shown in Table 3.2.

Table 3.2: REFINERY SALES
(Barrels/day)

1983	Esso	Shell	Texaco	Others	Total
LPGs	121	390	15	564	1089
Gasoline	1575	1664	1135	0	4374
Distillates	2487	2933	708	2	6130
Fuel Oils	4790	4506	24	429	9749
Other Prod.	65	163	0	0	228
Total	9039	9656	1881	995	21571
1984					
LPGs	115	385	12	508	1020
Gasoline	1635	1518	1073	0	4225
Distillates	2502	2584	934	41	6060
Fuel Oils	4003	5410	56	517	9986
Other Prod.	37	90	0	0	127
Total	8292	9986	2075	1065	21418

Source: Petrojam "Statistics" 1983, 1984.

3.7 Regulation of the Jamaica petroleum market, including petroleum product pricing, is the responsibility of the Energy Division of the Ministry of Mining, Energy and Tourism (MMET), as part of its overall responsibility for formulating national energy policy and overseeing its implementation. The Energy Division also monitors energy use and evaluates proposals for energy substitution and conservation.

3.8 Reporting to the MMET, the Petroleum Corporation of Jamaica (PCJ), a parastatal holding company, is responsible for operating the Kingston refinery (through Petrojam Limited), for the provision of engineering consulting services (PCJ Engineering Limited) and for limited marketing of petroleum products (Petroleum Company of Jamaica Limited (Petcom)). As operator of the Kingston refinery, Petrojam arranges for the supply of refinery feedstock (crude, spikes and finished products), its transportation to Jamaica and the re-export of any surpluses.

3.9 Esso, Shell and Texaco have wholly owned marketing companies in Jamaica. Each owns a terminal in the Kingston area and retail outlets throughout the island. However, since operations of the refinery commenced in 1964, these tanks have not been operated as a petroleum product terminal. Esso and Shell also have terminals at Montego Bay to receive gasoline, kerosene and diesel transported from Kingston. The companies are entitled to import finished products to make up any

shortfall that Petrojam has been unable to fill. Since this does not occur frequently, they are basically wholesalers, linking Petrojam to the retail outlets through haulers. In addition, a number of small companies handle directly from the refinery significant volumes of LPG which they market domestically.

3.10 As shown in Table 3.2, Esso, Shell and Texaco marketed over 95% of the total refinery output in 1983 and 1984. With the exception of LPG sales to small marketing companies, the balance of refinery production was purchased by Petcom which supplied Kaiser's bauxite operations and Caribbean Cement Company. In addition, Petcom has a contract to supply fuel oil to the cement company and to refuel cruise ships at Montego Bay from a tender moored offshore, as a temporary measure to evaluate the economics of an onshore tank. Petcom does not own any retail outlets but has applied for a license to operate one.

IV. REGULATORY SYSTEM

Pricing

4.1 This Section deals with the product and crude pricing system in effect since the Kingston refinery was purchased by the Government of Jamaica (GOJ) in October 1982. The system was devised so that the bulk of the importation and refining was handled by one company (Esso before 1983 and PCJ later), while ensuring equal treatment to all three marketing companies. This was achieved by basing the product prices on independent, publicly available sources, namely the prices posted by Esso and Shell for production from their Aruba and Curacao refineries, respectively.

Product Pricing System

4.2 Petroleum products in Jamaica are classified for pricing purposes into two categories -- controlled and uncontrolled. The differentiation depends on whether or not certain margins, added to the price of product at the refinery gate, are regulated by the Energy Division of the Ministry of Mining, Energy and Tourism (MMET).

4.3 The controlled products are LPG, gasoline, domestic kerosene, and auto diesel. Since the refinery began operating in 1964 until Esso's shutdown of Aruba in 1984, the starting point for setting prices was the average of the posting of each product by Esso in Aruba and Shell in Curacao. Since the closing of Aruba, the average of Shell's Curacao postings and Esso's Bahamas postings has been used. 5/ However, on the instructions of the Minister of Mining, Energy and Tourism, Petrojam's pricing has been taken off Aruba/Bahamas postings and is now based on postings from Trintoc, PDVSA, Shell International, Texaco International and Esso Bahamas. The Landed Price is calculated by adding the estimated average cost of freight to Kingston, including the cost of losses and insurance during the voyage. It is then raised in three stages, through a series of margins, to the Retail Price. The wholesale and retail margins on all of the products are fixed by the MMET.

5/ Shell has recently sold its Curacao Refinery to Government of the Netherlands Antilles, which has leased it to the Venezuelan national oil company, Petroleo de Venezuela S.A. (PDVSA). Shell now manages the Refinery under a management contract and still lists a Curacao posted price. As indicated in Section VI, this is not, however, regarded as a realistic market indicator. It is recommended that Petrojam should use a more accurate marker, such as PDVSA posted prices.

4.4 In the first pricing stage, four charges are levied:

(a) a Terminal Fee, which represents Petrojam's charge for operating the refinery as a product terminal, including a fee for carrying product inventory;

(b) an Esso Throughput Fee for the lease of certain product tanks owned by Esso Marketing and associated with the rack system;

(c) a Rack Fee for the use of the industry rack where products are collected; and

(d) a Round Island Movement (RIM) fee, which is the ocean freight, insurance and loss paid for moving gasoline, domestic kerosene and diesel to the Montego Bay terminal, equalized over the total volume of each of those products sold by the refinery.

The total of the Landed Cost and these four charges results in the Ex-Refinery Price. As shown in Table 4.1, these charges amount to approximately US$2.00/bbl for controlled products and a little less for uncontrolled products, a substantial part of the overall markup. The charges are not audited against the actual cost of services provided, but are subject to monitoring by MMET and, with the exception of the Esso Throughput Fee, subject to periodic review. The Esso Throughput Fee is renegotiated annually. In the Bank's view (a) audit procedures should be introduced to provide detailed information as to the cost incurred by Petrojam in providing these services and (b) the charges should be established at levels which would prevail in a competitive situation. In addition, Petrojam's efforts to reduce the Throughput Fee by purchasing Esso's tanks or installing new tanks should be continued.

4.5 In the second pricing stage, excise and consumption taxes are levied on gasoline and diesel; LPG and kerosene receive a subsidy. A factor 6/ is added to or subtracted from the Ex-Refinery Price plus taxes, after conversion to Jamaican dollars. The Ex-Refinery Price plus the taxes and Accord/Subsidy Factor add up to the Refinery Billing Price, the amount the marketing companies pay when they collect product at the rack for distribution to the retail level. In 1983-1984 prompt settlement of amounts due between Petrojam and the Accord/Subsidy Fund did not occur, reflecting foreign exchange difficulties. It is

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6/ The purpose of this factor is (a) to maintain the retail price at a fixed level, irrespective of fluctuations in the Landed Cost in Jamaica Dollars; and (b) to permit administration of the subsidy program. Surplus/deficits arising from the scheme are payable by or to Petrojam into/from a special fund designated as the Accord/Subsidy Fund and administered by MMET. The administration of the Fund is not, however, reviewed as it falls outside the scope of this report.

understood that procedures have since been introduced to determine, and ensure regular transfer of, amounts due between GOJ and Petrojam.

4.6 In the third pricing stage, three further margins are imposed - a Marketing Margin for the wholesalers, a Transportation Fee for the haulers, and a Retailers Margin. Each of these three margins are separately and continually negotiated by MMET and the wholesalers, haulers' union and retailers' representatives. The total of the margins added to the Refinery Billing Price is the Retail Price.

4.7 The uncontrolled products are turbo (jet) fuel, marine diesel, fuel oil and asphalt. The Ex-Refinery Price of each is calculated in a manner similar to that for controlled products, with a Terminal Fee for all, an Esso Throughput Fee for all but asphalt, and a Rack Fee for turbo fuel and asphalt. The total is the Ex-Refinery Price. An excise tax is then added only to marine diesel to obtain its Refinery Billing Price. Turbo fuel is not subject to tax. Except for a one month period (May 1985) when a small difference was corrected, it has been sold at one price to all consumers. Unlike controlled products, the Refinery Billing Price for these products is the final selling price. Since there is no Accord/Subsidy Factor, it reflects fluctuations in the exchange rate.

4.8 Finished lubes are not subject to controls. Lube oil basestocks imported by Esso and Shell are blended; Esso exports some of the output. Texaco imports only finished lubes. Finished lubes are taxed at 40% of the import cost while basestock rate is 16%.

4.9 An example of how the prices are broken down is presented in Tables 4.1-4.3, where each table represents a pricing stage.

Table 4.1: JAMAICAN PETROLEUM PRODUCT PRICING FIRST PRICING STAGE
(Based on the Caribbean postings on 1st December, 1984)
(In US$/bbl)

	Controlled Product				
	Premium Gasoline	Regular Gasoline	Kerosene	Diesel Retail	Diesel Bulk
Average FOB	32.760	31.500	33.705	33.180	33.180
Freight	1.049	1.043	1.133	1.187	1.187
Insurance	0.024	0.023	0.024	0.024	0.024
Ocean Loss	0.169	0.163	0.174	0.138	0.138
Landed Cost	34.002	32.729	35.036	34.529	34.529
Terminal Fee	1.138	1.138	1.138	1.138	1.138
Esso Throughput Fee	0.076	0.076	0.076	0.076	0.076
Rack Fee	0.440	0.440	0.440	0.440	0.440
Rim	0.301	0.544	0.362	0.489	0.489
Ex-Refinery Price	35.957	34.927	37.052	36.672	36.672
and in J$/bbl	177.987	172.888	183.407	181.526	181.526
in J$/IG	5.0893	4.9435	5.2443	5.1904	5.1904

Table 4.1: JAMAICAN PETROLEUM PRODUCT PRICING FIRST PRICING STAGE
(Based on the Caribbean postings on 1st December, 1984)
(In US$/bbl) (con't)

	Uncontrolled Product					
	Turbo Fuel	Marine Diesel	Fuel JPSCP	Oil Other	Asphalt	LPG
Average FOB	33.705	31.939	26.975	26.976	26.100	25.440
Freight	1.133	1.216	0.670	0.670	4.250	9.600
Insurance	0.024	0.023	0.019	0.019	0.021	0.025
Ocean Loss	0.174	0.133	0.069	0.069	0.076	0.176
Landed Cost	35.036	33.311	27.733	27.734	30.447	35.241
Terminal Fee	1.138	1.138	1.138	1.138	1.138	-
Esso Throughput Fee	0.076	0.053	0.125	0.125	-	-
Rack Fee	0.440	-	-	-	0.540	-
Rim	-	-	-	-	-	-
Ex-Refinery Price	36.690	34.502	28.996	28.997	32.125	35.241
and in J$/bbl	181.615	170.784	143.530	143.535	159.018	174.443

a/ Exchange rate is J$4.95/US$.
b/ 1 barrel is 34.[illegible]26 imperial gallons.
c/ FOB and freight alues shown are average ex. Aruba and Curacao.

Source: Petrojam.

Table 4.2: JAMAICA PETROLEUM PRODUCT PRICING
SECOND PRICING STAGE
Based on Caribbean postings on 1st December, 1984
(In J$/IG)

	Premium Gasoline	Regular Gasoline	Domestic Kerosene	Diesel Retail	Diesel Bulk
Ex-Refinery Price	5.0893	4.9435	5.2443	5.1904	5.1904
Excise Duty	2.4100	2.4100	-	0.3000	0.3000
Tax/(Subsidy)	1.4910	1.4810	(1.1500)	1.0810	1.0910
Accord Factor	(0.8655)	(0.9898)	(0.824)	(1.2755)	(0.9978)
Refinery Billing Price	8.1248	7.8447	3.2700	5.2959	5.5836

Notes: 1. Accord/Subsidy factor for each product described in the text is the combination of Tax/(Subsidy) and Accord Factor shown above.
2. Except for an excise duty of J$0.30/IG on Marine Diesel, the above taxes were not levied on uncontrolled products.

Source: Petrojam.

Table 4.3: JAMAICAN PETROLEUM PRODUCT PRICING
THIRD PRICING STAGE
Based on Caribbean postings on 1st December, 1984
(In J$/IG)

	Premium Gasoline	Regular Gasoline	Domestic Kerosene	Diesel Retail	Diesel Bulk
Refinery Billing Price	8.1248	7.8447	3.2700	5.2959	5.5836
Marketing Margin	0.3343	0.2899	0.1060	0.2234	0.2235
Transportation	0.1008	0.2003	-	0.1256	0.0929
Retailer's Margin	0.4301	0.4151	a) 0.1940 b) 0.2640	0.3451	-
Final Selling Price	8.9900	8.7500	a) 3.5700 b) 3.6400	5.9900	5.9000

Notes: 1 (a) Urban
(b) Rural

Source: Petrojam.

4.10 The retail prices in Jamaica, being built over the imported prices, are above international prices except for kerosene and LPG which are the only products that are sold with Government subsidy. At a retail price of JS$3.57 per imperial gallon, the kerosene price as at December 1, 1984, was about 80% of the US East Coast harbour price at that time of JS$4.6 per imperial gallon equivalent (US$32.5/bbl). However, the pattern of consumption of kerosene and diesel in 1983 and 1984 did not indicate any major migration of kerosene into diesel on account of the kerosene subsidy.

4.11 Table 4.4, which is derived from the Jamaica petroleum product demand breakdown shown in Table 3.2 and the price mark up structure shown in Tables 4.1-4.3, sets out the derived allocation of marketing fees and margins in 1983 and 1984. Marketing and distribution margins for the uncontrolled products are not included.

Table 4.4: ALLOCATION OF CONTROLLED FEES AND MARGINS

	1983		1984	
	MMUS$/yr	US$/bbl	MMUS$/yr	US$/bbl
Landed Cost		31.6		31.4
Terminal and Rack Fee	10.24	1.3	10.18	1.3
Esso Throughput Fee	0.72	0.1	0.73	0.1
GOJ a/	32.80	4.2	31.55	4.0
Marketers Margin	5.88	0.7	5.69	0.7
Haulers Margin	3.29	0.4	3.15	0.4
Retailers Margin	6.55	0.8	6.40	0.8
Retail Price		39.1		38.7

a/ Excise duty, Accord/Subsidy factor.

Source: Tables 3.2, 4.1-4.3.

Table 4.4 shows that the Government received about 55% of the mark up between the Landed Cost and the Retail Price, the marketing and distribution system 25%, and the refinery and terminal together 20%.

Recommendations

4.12 It is recommended that the subsidy on LPG and kerosene should be reviewed periodically. If major migration of kerosene into higher value products occurs, the subsidy should be reduced or withdrawn. This also applies to LPG if its consumption increases significantly by replacing other non subsidized fuel such as gasoline.

4.13 The regulatory system is intended to set product prices at levels which reflect the costs of those products if directly imported and to ensure that the fees, taxes, and margins described above are set in accordance with Government policies. To assist MMET to achieve this objective, it is recommended that:

(a) as directed by the Minister of Mining, Energy and Tourism, the FOB price of products should be based on published sources of supply more reflective of marketing conditions in the US East Coast and Europe;

(b) the Terminal, Rack and the Round Island Movement (RIM) fees payable to Petrojam should be: (i) audited to provide detailed information as to the cost incurred in providing these services, and (ii) established at the levels which would prevail in a competitive situation. Petrojam's efforts to reduce the Esso Throughput Fee by purchasing the Esso tanks or installing new tanks should be continued; and

(c) efforts should be maintained to determine and ensure regular Accord/Subsidy Fund transfers between GOJ and Petrojam.

V. REFINERY PERFORMANCE

Refinery History

5.1 The Kingston refinery was built by Arthur McKee & Co. for Esso in 1964, on reclaimed land in Kingston harbor. Esso sold it to GOJ in 1982 and Petrojam has operated it since. Prior to the refinery, each of the three marketing companies had imported its own product requirements. Esso designed the refinery to meet most of Jamaica's requirements, and agreed with the other marketers, Shell and Texaco, to supply them products at competitive prices.

5.2 When operations began in 1964, Esso, as refinery operator, was granted certain incentives such as tax exemption for several years and a guaranteed market for products. The product pricing system was intended to equate refinery product prices with the price of equivalent product imports. Each refinery product was sold at the mean of its Aruba and Curacao posted price plus freight rate, originally based on AFRA/Intascale. This basis applied independently of the refinery's actual crude feedstock costs.

5.3 The formula allowed the refinery to recover its costs until the mid 1970's. Esso then obtained permission from GOJ to levy a $2.15/bbl (small refinery differential) on each barrel of throughput to help cover additional refining costs. This fee quickly became the subject of continuous negotiations between Esso and GOJ because of disagreements over costs. Some retroactive claims by Esso were granted, and in 1981 the fee was raised to $2.50/bbl.

5.4 The eventual sale of the refinery to the GOJ was negotiated between the GOJ and Esso in 1982. The GOJ paid US$15 million, on which Esso paid capital gains tax of US$6.5 million. The GOJ also purchased the existing oil stocks at their book value on a LIFO basis at US$26 million, or US$18 million below their actual market value of US$44 million.

Refinery Description

5.5 The refinery is a hydroskimming operation with a simple distillation unit, an Esso catalytic reformer ("Powerformer") and three Esso hydrotreaters ("Hydrofiners") for naphtha, kerosene and diesel. A small vacuum unit provides feed for the asphalt plant. Table 5.1 shows the capacities of the principal units. There are over 2.5 million barrels of storage in about 40 tanks in the refinery and rack tankage.

Table 5.1: KINGSTON REFINERY - REFINERY UNIT CAPACITIES

Unit	Design Capacity Bbls/Stream day	Current Capacity Bbls/Calendar day
Atmosphere Pipestill	26,394	35,500
Gasoil Hydrofiner	5,650	7,200
Kerosene Hydrofiner	5,232	6,000
Naphtha Hydrofiner	5,229	6,400
Powerformer	2,800	3,540
Vacuum Pipestill	1,500	1,350

Source: Petrojam.

The refinery burns refinery fuel gas and fuel oil to balance. Water and air cooling are both used. Electric power is supplied by the Jamaica Public Service Company (JPSCo).

5.6 The composition of crude imports in 1983-4 is presented in Table 5.2.

Table 5.2: CRUDE IMPORTS, 1983-84

		1983		1984	
Source	Type	Bbls/day	Percent	Bbls/day	Percent
Crudes:					
Mexico	Maya	1412	6.9	233	1.9
Mexico	Isthmus	3315	16.3	1079	8.6
Venezuela	BCF 17	7655	37.7	0	0
Venezuela	BCF 24	0	0	4572	36.4
Iran	Light	1639	8.1	1464	11.6
Ecuador	Oriente	0	0	2214	17.6
Spikes:					
Venezuela	Butane	147	0.7	55	0.4
Venezuela	Naphtha	2511	12.4	1152	9.2
Venezuela	Kerosene	2654	13.1	1365	10.9
Venezuela	Gasoil	986	4.9	441	3.5
Total		20319	100.0	12575	100.0

Source: Petrojam "Statistics" 1983, 1984.

5.7 Because the refinery has no means of adjusting the relative yields of the white products and of the residual fuel oil, the quality of the feedstock is tailored by adding some finished products or "spikes" at the loading port. This brings the refinery product slate into line with

the pattern of national demand (excluding fuel oil directly imported by the alumina industry) (Table 5.3), and avoids the over- or underproduction of product requiring direct product export or import. Before 1982, Esso often obtained spiked crude from its refinery at Amuay, Venezuela and the practice was continued with Petroleos de Venezuela (PDVSA) because the proximity of its large refinery and crude production/loading areas permits the blending of crude and product conveniently and cheaply.

Analysis of Refinery Characteristics

5.8 Although its processing ability is limited, the refinery has a number of important positive aspects:

(a) there is no intermediate tankage, so loss of heat is minimized: such simplification is attractive on construction because the capital cost is minimized, but it becomes more difficult to maintain if the number of downstream units increases and the operation becomes more complex;

(b) cut points on the fuel oil are good up to 35,000 barrels per stream day. At this capacity, overhead and sidedraw column capacities are ample, meaning that the products can be withdrawn without meeting a limitation in the system; and

(c) the refinery employs only 102 people, a low manning level by international standards.

The negative aspects include:

(a) reformer capacity is well below both domestic demand for gasoline and the availability of virgin naphtha cuts in many crudes at or above 24 API; and

(b) the wharf can take only up to 50,000 tonnes deadweight (DWT) tankers: this is adequate for product imports/exports at current throughput levels, but greatly reduces the competitiveness of distant sources of crude from areas such as the North Sea, Nigeria or even the Middle East should there be the opportunity to purchase large cargoes at attractive FOB prices. Although crude can be lightered from bigger ships to 50,000 DWT tankers, significant increases in offloading capacity above 80,000 DWT would be expensive because the crude storage capacity is about 850,000 bbls and is limited at this point: for example, assuming the tankage were 20% full on arrival of the vessel and was filled to 90% of capacity, it could only accommodate up to 600,000 bbls or the contents of a 80,000 DWT tanker.

5.9 With the refinery's integrated process units, purchased electricity and low manning, per barrel costs for fuel and labor appear to be competitive with other refineries of similar configuration and size, although fuel consumption in 1983 and 1984 was 20-30% higher than normal at 3.1% and 3.0%, respectively, of the crude unit feed. Fuel losses of 0.28% were low during the period of normal operation in 1983, but rose to 1.25% in 1984 because of the inefficiency inherent in intermittent operation. The refinery's fixed costs are lower by international standards than expected at US$0.70 per barrel, but variable costs of US$1.43-1.71 per barrel are higher, partly due to the high cost of purchased electricity and higher than normal fuel consumption in these years. Total costs are still in line with a US Gulf Coast cracking refinery.

Financial Assessment of the Refinery Operation

5.10 Because finished products are imported on a regular basis to supplement refinery production in each year, the average landed cost of all products is known at the end of that year. Thus, the derived cost of importing the entire refinery product slate can be compared accurately with the actual cost of producing that slate from imported feedstocks (crudes and spikes).

5.11 Table 5.3 shows the refinery's contribution by product to total demand in 1983 and 1984. Supplies of fuel to industry that did not pass through the refinery are excluded.

Table 5.3: PETROLEUM SUPPLY AND DEMAND BALANCE
(Barrels/day)

1983	Domestic Demand	Exports	Imports	Inventory a/	Losses	Refinery Production
LPGs	1089	0	532	-10	-	566
Gasolines	4374	0	761	205	-	3409
Distillates	6130	192	295	-17	-	6043
Fuel Oils	9749	1180	1014	517	-	9398
Other	228	0	0	17	-692	903
Total	21571	1372	2603	712	-692	20319
1984						
LPGs	1020	0	735	7	-	278
Gasolines	4225	0	2122	107	-	1997
Distillates	6060	402	2307	171	-	3984
Fuel Oils	9986	397	4734	-36	-	5685
Other	127	6	48	-13	-533	631
Total	21418	805	9945	236	-533	12575

a/ Negative figures indicate increases in inventory/losses.

Source: Petrojam "Statistics" 1983, 1984.

Table 5.4: REFINERY OPERATING MARGIN

			1983 Production Import/ b/d	1983 CIF Cost	1984 Production Import/ b/d	1984 CIF Cost
I. Importing Products	1.	Prod. Costs $/bbl a/				
		LPGs	566	36.12	278	25.32-31.02
		Gasolines	3409	26.43-35.12	1997	33.79-35.06
		Distillates	6043	34.17-36.39	3984	34.94-35.59
		Fuel Oils	9398	25.83-32.51	5685	27.82-33.55
		Ashphalt	211	28.84	98	31.45
		Ref.Fuel/Loss b/	692	-	533	-
		Bbls imported	20319		12575	
		Wgtd.Av.Cst. $/bbl		29.95		30.36
		Sub-Total MM $		222.15		139.37
	2.	Handling Costs $M				
		Pur. Utilities		0.70		0.64
		Salaries c/		0.40		0.23
		Maintenance		1.35		0.77
				2.45		1.63
	3.	Total, (1+2) $M		224.60		141.00
II. Domestic Refining	4.	Crude Costs $/bbl				
		Maya	1412	24.37	233	26.11
		Isthmus	3316	29.86	1079	30.98
		BCF 17	7655	24.64	0	26.21
		BCF 24	0	27.83	4572	27.75
		Iran Light	1639	31.01	1464	29.70
		Oriente	0	-	2214	29.11
		Butane	147	26.04	55	23.74
		Naphtha	2511	33.69	1152	31.44
		Kerosene	2654	33.76	1365	33.59
		Gasoil	986	33.71	441	32.66
			20319		12575	
		Wgtd.Av.Cst. $/bbl		28.75		29.66
		Subtotal MM$		213.20		136.17
	5.	Ref. Opg. Costs $M				
		Fixed				
		Salaries		2.01		1.13
		Maintenance		2.47		1.44
		Supplies		0.61		0.30
				5.09 ($0.69/bbl)		2.87 ($0.63/bbl)
		Variable				
		Pur. Utilities		2.12		1.45
		TEL (Lead)		1.95		0.97
				4.07 ($0.55/bbl) d/		2.42 ($0.53/bbl) d/
		Sub-Total		9.16 ($1.24/bbl)		3.29 ($1.16/bbl)
	6.	Total, (4+5), $M		222.36		141.46
III. Refinery Operating Margin		Margin, (3-6) $M		2.24		-0.46 e/
		US$ per bbl		0.3		-0.1

a/ For 1983 average exchange rates of J$1.93/US$ and for 1984 J$3.94 were used.
b/ The cost of imported products is based on the volume of crude imports less refinery fuel and losses.
c/ Terminal salaries taken as 20% of refinery salaries.
d/ If refinery fuel and losses of US$6.52 million (1983) and US$5.46 million (1984) are added, variable costs rise to US$1.43/bbl (1983) and $1.71/bbl (1984).
e/ 1984 losses of US$-0.46 MM and US$-0.1/bbl were due to low capacity utilization and intermittent operations.

Source: Petrojam.

5.12 The refinery operated in 1983 for 326 days at an 89% operating factor and in 1984 for 220 days at 60%. The decline was due to foreign exchange constraints which made it difficult for Petrojam to procure crude or products. In order to meet the demand, the local marketing companies imported the product shortfall under special financing arrangements.

5.13 The refinery operating margin in 1983 and 1984 is shown in Table 5.4, which compares the costs of operating the Kingston refinery against the alternative of closing down the refinery units, and using the refinery and terminal systems for finished products imported at prevailing Aruba/Curacao posted prices. The Table indicates the refinery's profitability, measured against the standard pricing system used for products based on Aruba/Curacao postings.

5.14 Table 5.4 shows that in 1983 Petrojam's actual feedstock and refinery operating costs were US$2.24 million (or $0.30 bbl) less than the derived costs of imported products, plus terminal costs, although in 1984 the refinery operators margin was negative at $-0.46 ($-0.1/bbl), because of refinery closures due to lack of feedstock. If, however, the 1984 feed and product costs are prorated to the 1983 production level and the 1983 refinery and terminal costs are used, the 1984 refinery loss of $0.46 MM becomes a small gain of US$0.1 MM (US$0.01/bbl). This improvement highlights the extent of the losses both from inefficiencies when operating the refinery at low rates and from increased crude costs due to foreign exchange limitations. In other words the refinery operates at a positive operating margin, providing production is uninterrupted.

5.15 Foreign currency constraints, particularly in 1984, also caused increased demurrage costs, when tankers would not berth until documents were processed, and increased letter of credit costs of up to 4% compared to the usual 0.5%. Petrojam estimates that demurrage costs directly attributable to foreign exchange transfer delays amounted to US$0.24 MM in 1983 and US$0.38 MM in 1984, and additional letter of credit costs to US$3.4 MM in 1983 and US$4.86 MM in 1984, an aggregate of US$8.8 MM.

5.16 Indirect losses also arose during 1983/84 because the uncertainty surrounding foreign exchange transfers restricted Petrojam taking advantages of opportunities to purchase spot cargoes on favorable terms. As indicated in Annex 3, foreign exchange constraints meant that Petrojam was unable to take advantage of favorable spot freight rates, at an estimated cost of about US$1 million p.a.

Recommendation

5.17 It is therefore recommended that foreign exchange should be made available promptly to Petrojam within a pre-approved budgeted amount to permit continuous refinery operation and to enable it to make full use of occasional profitable spot cargoes available either in the Caribbean or in the US Gulf Coast.

VI. ECONOMIC EVALUATION

Least Cost Comparison

6.1 This section compares the way in which Jamaica meets its product demand through domestic refining of crude imports against the alternative of direct product imports. In Part V, the actual costs incurred by Petrojam in procuring and refining crude in 1983 and 1984 were examined against its direct product import costs, and a positive refinery operating margin was established for both years, assuming uninterrupted refinery operations. Each of the cost components in this comparison is now examined, adjusting as necessary to a least cost basis.

6.2 As regards the landed cost of imported products, the refinery operating margin calculation (Table 5.4) was based on Petrojam's actual product import costs in 1983 and 1984, using Aruba and Curacao posted prices. Annex 1 examines Aruba/Curacao posted prices against Caribbean spot and other posted prices. While Caribbean spot prices in 1983 and 1984 were significantly lower then Caribbean posted prices (except for leaded gasoline), the Caribbean spot market is too variable and thin to be the basic source of Jamaica basic supplies. As regards other Caribbean posted prices, PDVSA posted prices were consistently lower then Aruba/Curacao prices, over the same period. Weighting the various product prices to reflect the Kingston Refinery product slate, PDVSA "Realizations" were US$0.30 less per barrel in 1983 and US$1.20 per barrel less in 1984 than Aruba/Curacao Realizations. To arrive at a least cost comparison, the refinery operating margin in favor of domestic refining should therefore be reduced by the PDVSA product price advantage.

6.3 As regards the FOB cost of crude imports, the refinery operating margin calculation in Table 5.4 is based on actual prices paid by Petrojam in 1983 and 1984 for crude procured mainly from Mexico and Venezuela. Since these sources are the closest crude supply point for Jamaica and priced by reference to the international crude market, Petrojam's actual costs have been used for the least cost comparison. However, it should be noted that during the period under review the crude slate used in the refining was not optimized due to foreign exchange constraints. Similarly, no account is taken of the concessional finance available to Jamaica from Mexico and Venezuela under the San Jose Accords, which is examined in detail in Annex 2. Since the future level of benefits from these Accords is in some doubt, given crude price trends and the prevailing Accord interest rates, no adjustment to the refinery operating margin is made.

6.4 As regards crude and product transportation costs, Annex 3 indicates available freight rates for both. The transportation cost to Kingston based on Worldscale cost of January 1984 in suitable sized tankers, which is representative of transportation costs over 1983 and 1984, shows that although there are no savings on the dirty cargoes,

there is a potential saving of US$0.45/bbl for clean products. Since clean products represented 46% in 1983 and 50% in 1984 of the total products consumed, these figures have to be adjusted to US$0.21/bbl and US$0.23/bbl respectively. Furthermore, since products are obtained on 15 day credit vis-a-vis 30 days for crude oil, there is a US$0.09/bbl financing advantage in the purchase of crude. Finally, no adjustment is made for refinery operating costs, since these are comparable to US Gulf Refinery costs (para 5.9), even though refinery efficiency might be further enhanced by energy conservation investments now under consideration.

6.5 Table 6.1 sets out the comparison:

Table 6.1: ADJUSTMENT OF REFINERY OPERATING MARGIN TO LEAST COST BASIS

		1983 (US$/bbl)	1984 a/ (US$/bbl)
1.	Refinery Operating Margin US$ bbl	0.30	0.01
2.	Less		
	(a) adjustment to reflect lower posted product prices (PDVSA v. Aruba/ Curacao)	0.30	1.20
	(b) adjustment to reflect potential product transportation savings	0.21	0.23 b/
3.	Add savings from fuel oil switch (see para. 7.7)	0.15	0.15
4.	Add financing advantage	0.09	0.09
5.	Net saving (losses) in domestic refining compared to direct product imports	(+0.03)	(-1.18)

a/ Derived figures on the assumption of continuous production.
b/ See Table A.3.1. and A.3.2. and para. 3 of Annex 3.

6.6 Although an economic cost differential in favor of direct product imports of US$1.18/bbl for 1984 is significant, too much weight should not be attached to these figures, given the fact that a suboptimal

crude slate was used in that year and reflected in the evaluation and also given the volatility of the petroleum market generally, and the vulnerable position of Jamaica as a residual product market. In order, therefore, to test the conclusion based on these figures, the competitive position of the Kingston Refinery as supplier to Jamaica's domestic market should be compared against that of the next best alternative. Because of their location and key role in the international product market, these are the US Gulf Refineries (USGR).

6.7 Using 1983 cost figures (when the refinery was operating steadily) its total operating costs were US$2.12/bbl, made up of US$0.69/bbl fixed costs and US$1.43/bbl variable costs (Table 5.4). These costs are higher than US Gulf refinery prices for "marginal" product barrels, i.e., production over and above their contract commitments, which is then offered for sale on the spot market. These marginal product barrels are generally priced to recover the variable portion only of the total cost, the fixed portion being covered by the contract barrels, or in the range $1.20-1.50/bbl depending on the refining complexity and type of crude.

6.8 Because the US is a net importer of crude, the USGR supplying PCJ with spot product will, like Petrojam, be processing imported crude oil, possibly from the same source. Comparing the two alternatives of processing in Kingston or buying on the spot market, it is assumed that the USGR and Petrojam acquire the crude from the same Caribbean supplier (for example, Mexico (Mayan) or Venezuela (Tia Juana Medium)). The saving achieved by purchasing spot barrels from USGR and avoiding the Petrojam refinery's fixed cost element has to be balanced against the lower cost of crude freight from Mexico or Venezuela to Jamaica and the need to ship spot product from the USGR to Jamaica. Table 6.2 shows that, treating feedstock prices as equal, the Kingston refinery's higher operating costs are substantially compensated for by the lower crude and avoided transportation costs.

Table 6.2: RELATIVE COST OF REFINING AND PURCHASING AT CURRENT PRODUCTION LEVELS (US$/bbl)

	1983-84 Prices		"$12/bbl Case"	
	USGR	Jamaica	USGR	Jamaica
Cost of Crude, F.O.B.,	------same----		-----same-----	
Freight to refinery a/	0.67	0.53	0.67	0.53
US duty	0.05	-	0.05	-
Processing Cost b/	1.30	2.12	0.79	1.64
Product Freight to Jamaica a/	0.90	-	0.90	-
Comparative Costs	2.92	2.65	2.41	2.17
Jamaica Refinery Cost Saving		0.27		0.24

a/ Worldscale, January 1984.
b/ Including refinery fuel and losses - see Annex 3, Tables A.3.1 and A.3.2.

6.9 The analysis demonstrates that the economic costs of the system of crude procurement, transportation and refining are slightly lower than direct product procurement from the least cost alternative source of supply, at 1983-84 price levels. Table 6.2 also indicates the effect on Kingston refinery economics if the price were to fall, say to $12/bbl. Petrojam's cost would still be about US$0.24/bbl less for a barrel of product if it were to process it rather than purchase it on the USGR spot market.

Recommendations

6.10 There is therefore no evidence to support closure of the Petrojam refinery. In operating the refinery, Jamaica should:

(a) procure its basic crude requirements under contracts including most favored nation price protection and otherwise based on generally applicable sales terms; and

(b) supplement its basic contract source of crude by periodic intervention on the spot market, when prices are favorable.

VII. OUTLOOK AND OPTIONS

Petroleum Price Outlook

7.1 The short term outlook is uncertain. Prices have recently fallen dramatically. Given the recent events, the current state of uncertainty is likely to continue for some time.

7.2 Whatever the uncertainties of the short term outlook, the trend in the 1990's is for significantly higher levels of crude and product imports into the US through the Caribbean region.

Impact on Refinery Sector

7.3 The sharp decline in crude and product prices since December 1985 affects refining prospects in several ways. First, it reduces variable costs (fuel and losses) relative to the fixed costs, strengthening the competitive position of those refiners whose fixed costs are low. Second, the lower price encourages greater oil consumption and increased refinery throughputs, particularly in the light and middle distillate product range. (By May 1986, US refinery utilization rates, for example, had reached 83% from a low in 1982 of 70%). Third, it reduces the fuel element in freight costs, making product purchases from distant refineries a little more attractive. Put together, the lower level of crude prices will lead to higher capacity utilization in existing refineries, discourage investment in new refineries by independent refiners and push spot prices closer to contract prices as refinery utilization rises.

Outlook and Options for the Petrojam Refinery

7.4 As indicated in the previous section, Kingston refinery's proximity to crude oil export centers, its operating cost levels and the potential match between its product slate and Jamaica's domestic market all contribute its competitive position across a wide range of crude oil prices. The rise in US refinery capacity utilization rates and the trend for spot prices to move closer to contract prices will make it increasingly difficult for Jamaica to obtain products at marginal cost from export refineries in the region and will thus reinforce the Kingston refinery's position as the least cost reliable source of product supply the Jamaica market.

7.5 Various short term measures are available to Petrojam to improve its technical and financial performance at zero or low capital cost. Of these, certain technical specification changes and exchanges of uncracked fuel oil are currently being implemented. In addition, major savings are possible from increasing throughput and shifting to unspiked heavy crude, so long as the additional fuel oil produced can be marketed to the private sector alumina industry. Certain longer term measures are also potentially justified. Petrojam is already developing various

energy conservation projects, and should continue, while carefully evaluating their economic viability in the light of lower fuel oil prices. Secondary conversion investment may also be justified but, since the return on such investment depends entirely on the differential between crude and product prices, further evaluation of this option should be deferred until price and market conditions become less volatile. These options are now considered in more detail.

Short Term Options

7.6 Fuel Oil Switch: The refinery is producing a large amount of straight run fuel which is used either for combustion at Jamaica Public Service Co., the cement companies, the public sector bauxite/alumina companies, or for bunkering purposes. For these uses, a cracked fuel is sufficient. Markets in the US and Europe place a higher value on uncracked, straight-run material because it can be used as a refinery cracking unit feedstock to make the more valuable white products. The premium on straight-run material fluctuates with the relative strength of gasoline and fuel oil and has reached as high as $26/ton or $4/bbl at the USGC.

7.7 Exchanging 5000 b/d uncracked fuel oil out of the Kingston refinery for the same amount of cracked fuel oil out of Corpus Christi would require a tanker every 5-6 weeks. Assuming 320 operating days a year and dirty freight to Corpus Christi in the range of $0.69-0.42/bbl, the switch would save $0.5-0.9 MM per year for the first $1/bbl premium and $1.6 MM per year for each additional $1/bbl premium. Such an exchange could give rise to potential savings in the order of $0.15 per barrel of crude.

7.8 Modified Refinery Operations - Change in Product Specifications: Petrojam's current specifications were set some years ago and, in some respects, are out of line with those in the US and Europe. The changes referred to below will reduce processing costs. In particular:

(a) Petrojam should increase gasoline production by raising the gasoline 90% point and endpoint. The D-439 ASTM specification allows these to be in the ranges 365-374 F and 437 F respectively;

(b) the diesel flash point should be reduced from 150 F to 140 F to save refinery energy by not having to distill out the extra light ends, without any safety risk to the consumer. The ASTM specification is 125 F for diesel (D975), 100 F for No. 2 heating oil (D396) and 140 F for No. 6 heavy burner fuel (D396). A typical range used in sales internationally for diesel is 140-150 F;

(c) Petrojam's proposal to raise the diesel sulfur level above 0.5% would add to pollution as well as to corrosion, the main

objection of the marketing companies, and would be a retrograde step;

(d) fuel oil viscosity could be raised from 200 SSF to 220 SSF to recover more heavy diesel. Although Petrojam's fuel oil viscosity already exceeds the typical 380 CS at 122°F, the raise could be supported provided consumers are willing to adjust their burners and heating facilities to accommodate the change; and

(e) reformer capacity is below that needed to match the availability of naphtha from most crudes and below market demand for gasoline. The octane of the unreformed naphtha is boosted to the required levels by adding tetraethyl lead which is imported. To minimize octane addition, Petrojam should:

(i) reduce gasoline octane level from 95 RON down to 91 RON, to increase gasoline production; and

(ii) avoid crudes which have virgin naphthas with a low clear octane on the reformed portion.

7.9 Increasing throughput to capacity, using unspiked heavy crude: Petrojam currently operates the Kingston refinery at the level required to meet domestic product demand of about 21,500 b/d, excluding the fuel oil requirements of the private sector alumina producers of about 13,500 b/d (see Table 5.3 and para. 5.7). In order to match its production slate to this demand, Petrojam is required to import more expensive "spiked" crude (i.e., crude mixed with products).

7.10 The refinery production slate and the domestic demand could, however, be balanced while eliminating the use of spiked crude, if refinery throughput was increased to its maximum potential of about 35,000 b/d and the resulting increased fuel oil output of about 13,500 b/d sold to the alumina producers. Table 7.1 indicates the positive margin of US$0.62/bbl available to Petrojam from this option at current prices.

Table 7.1: RELATIVE COST OF REFINING AND PURCHASING AT INCREASED PRODUCTION LEVELS
Based on Unspiked Heavy Crude

Product	Price a/ US$/bbl	Mexican Crude (17500 b/d) Realiz. Price US$/bbl	Realiz. %	Output bbl	Total Output bbl	Venezuelan Crude (17500 b/d) Output bbl	Realiz. %	Realiz. Price US$/bbl
Gasoline	19.60	2.94	15	2625	3850	1225	7	1.37
Fuel Oil	9.83	5.80	59	10325	22925	12600	72	7.08
Gas Oil	16.60	3.82	23	4025	7175	3150	18	2.99
Total Prod.					33950			
Total Realiz. Price		12.56 b/						11.44 b/
Crude Import Costs, CIF c/		11.16						9.60
Gross Margin		1.40						1.84
Refinery Operating Costs d/		1.00						1.00
Net Margin		0.40						0.84
Average Net Margin $/bbl					0.62			

a/ Early May, 1986 US Gulf Coast refinery spot prices adjusted for lower freight cost to Jamaica.
b/ Refinery fuel and losses are excluded.
c/ Early May, 1986 spot prices for Mexican Maya and Venezuelan Bachaquero crude respectively.
d/ Table 5.4, adjusted for increased production and excluding refinery fuels and losses.

7.11 Table 7.1 shows the volume of production from the refinery operating at 35,000 b/d per day capacity, processing, by way of example, equal volumes of Mexican Maya and Venezuelan Bachaquero crude. Comparison with Table 5.3, indicates that production of gasoline and distillates remains comparable to current Petrojam production levels, while fuel oil production is increased by approximately the amount of the alumina industry fuel oil requirement. The Petrojam refinery is, therefore, able to meet almost the entire Jamaica product demand.

7.12 Table 7.1 indicates that the Petrojam refinery can supply the Jamaica domestic market at an ex-refinery cost of US$0.62/bbl less than direct product import at prevailing crude and product prices, a significant improvement on the position at the current level of production, based on spiked crudes (Table 6.2). Table 7.1 is, however, indicative only, and further analysis is recommended to complete the

evaluation of this option, in particular in the following three areas: firstly, current product prices are volatile both in relation to crude prices and in absolute terms, and further price and sensitivity analysis is advisable: secondly, the Petrojam fuel oil price to the alumina industry must be lower than the price paid by the industry for their current direct fuel oil imports (i.e. Petrojam's terminal and distribution costs would have to come within the net margin): and, thirdly, due consideration should be given to the fuel oil specifications (and associated cost implications) required for alumina refinery use (compared to boiler use where specifications are not critical).

Longer Term Options

7.13 Energy Efficiency: With the assistance of PetroCanada International Assistance Corporation, Petrojam has been developing projects that could save energy and therefore reduce fuel use, losses and operating costs. These were originally defined in an energy audit conducted by Exxon in October 1981 when a potential maximum saving of 184 fuel oil equivalent barrels/day were identified. This represents a 26% reduction in the refinery fuel loss (Table 5.4) a significant reduction in the variable cost portion of total refinery costs.

7.14 About twenty projects were identified by the Exxon audit. The largest, installation of a gas turbine generator (US$4.24 MM), has progressed the farthest, with placing of the purchase order for the turbine; the remaining projects are being restudied to determine the effect of lower oil prices, and new engineering design packages, suitable for accurate cost estimating, are expected to be ready shortly.

7.15 Petrojam should continue to develop the scope of each of the potential conservation investment, while carefully evaluating its economic viability in the light of lower fuel oil prices.

7.16 Secondary Conversion: If Petrojam is not able to increase its production level to capacity and market the additional fuel oil to Jamaica's domestic alumina industry, Petrojam should evaluate the alternative of increasing production to capacity and installing secondary conversion or upgrading facilities to reprocess fuel oil production into white products, which can then be exported.

7.17 The Petrojam hydroskimming refinery is a simple distillation unit, refining crude into various petroleum products through a primary conversion process. The installation of secondary conversion facilities would permit Petrojam to upgrade some of its fuel oil production into white products. The return on the requisite capital investment depends, of course, on the spread between fuel oil and white product market prices. In 1979 this spread was over $10 per/bbl, which made secondary investment extremely attractive. In 1984 this spread had almost disappeared. In early May, 1986 the spread was around $9/bbl.

7.18 Secondary conversion facilities capable of processing Petrojam's fuel oil production cover a wide range in cost and, proportionally, in the percentage of white products which can be produced from that fuel oil. By way of illustration, a hydrocracker (including related services and facilities) might cost in the order of $80 million and convert 45% of throughput into white products. At the other end of the scale, a visbreaker (again including related services and facilities) might cost in the order of $20 million and convert 10% of throughput into white products. Many other types of facility including (in cost order) fluid catalytic crackers, delayed coking, thermal cracking and mild hydrocracking facilities fall in between this range.

7.19 The justification of substantial secondary conversion investment depends on the continuance of an appropriate spread between fuel oil and white product prices, which cannot be assured in today's volatile market. It is recommended, therefore, that Jamaica should defer undertaking the secondary conversion feasibility study to evaluate the various conversion alternatives against marketing possibilities, until a higher degree of reliance can be placed on the fuel oil/product price spread. In the meantime, Petrojam may have the opportunity to substantially strengthen its financial and economic viability, at zero or low capital cost, by increasing production to capacity and selling the additional fuel oil to its domestic alumina industry.

Recommendations

7.20 In summary, it is recommended that Petrojam should continue its efforts to:

(a) exchange its relatively high value uncracked fuel oil, exporting it to the U.S. and Europe, for a lower value cracked fuel oil, which would still be suitable for domestic use;

(b) increase production and reduce costs by changing various product specifications;

(c) evaluate with the private sector alumina industry the feasibility of increasing production to capacity, 35,000 b/d, based on an appropriate blend of heavy unspiked crude, for supply to the industry of its fuel oil requirements;

(d) reduce fuel use and losses, while carefully evaluating individual investments against current fuel oil prices; and

(e) undertake a secondary conversion feasibility study to upgrade its fuel oil production, as soon as the price differential between fuel oil and white products stabilizes.

7.21 The conclusions reached in this section of the Report are based on prevailing conditions as they affect Jamaica's petroleum procurement, refining and distribution subsector. Close monitoring by GOJ of the

future evolution of these conditions is required to ensure the effective exploitation of cost savings opportunities as they arise, and to verify that the economic costs of the domestic refining continue to remain comparable with the alternative of direct product importation. It is therefore also recommended that:

> GOJ should undertake this monitoring through MMET, and should ensure that adequate resources are made available to the Energy Division of MMET for this purpose.

COMPARISON OF POSTED AND SPOT PRICES IN THE CARIBBEAN REGION

1. Spot prices are barometers but not accurate measures of the state of the underlying market. They indicate the strength of demand for product that is being sold outside the volume sold under contract arrangements. The market focus for products supplied into the US East Coast is New York Harbor and Platt's Price Report publishes daily its best estimate of the high and low prices of spot transactions that have occurred there. No volumes are shown, although there is a discussion of this in the text. Platt's also lists high/low prices for spot sales in the Caribbean, an uncertain area from which to obtain accurate data because of the smaller number of transactions and limited capacity of locations.

2. Spot product prices in the US East Coast and the Caribbean are shown for periods in 1983-85 in Table A.1. Also shown in the table is the Realization for each period for a product barrel which is equivalent to PCJ's refinery yield. This is a useful way of comparing the prices, so that they are combined in a manner appropriate to Jamaica.

Table A.1 DIFFERENCE BETWEEN USEC AND CARIBBEAN PRICES - SPOT AND POSTED (US$/bbl)

	Leaded Gasoline	Jet/ Kerosene	Diesel Oil	2.2% Sulphur Fuel Oil	2.8% Sulphur Fuel Oil	Realization
9/1983 - 12/1983						
USEC Spot	33.1	-	33.8	27.0	26.6	29.8
Caribbean Spot	32.8	33.6	32.2	26.3	25.6	28.8
1983						
PDVSA Posted	32.7	33.9	33.4	25.3	24.8	28.7
Aruba/Curacao Posted	35.3	35.2	33.0	-	24.8	29.0
1984						
USEC Spot	31.0	-	33.0	27.8	27.4	29.7
Caribbean Spot	31.0	32.3	31.2	26.8	26.2	28.5
PDVSA Posted	30.2	33.2	32.4	27.2	26.8	29.1
Aruba/Curacao Posted	34.0	34.5	33.9	-	27.0	30.3
1985						
USEC Spot	31.8	-	32.1	24.0	23.6	27.5
Caribbean Spot	31.0	31.5	30.3	22.7	22.3	26.2
PDVSA Posted	30.4	32.9	32.3	24.2	23.8	27.5
Aruba/Curacao Posted	-	-	-	-	-	-

Note: 1. Realization based on 17% gasoline, 30% distillate and 53% fuel oil, to approximate Kingston refinery.
2. There is no Caribbean spot for Leaded Gasoline, so Naphtha prices plus US 5¢/gal are used.

Source: Platt's; PDVSA.

3. The USEC realization in the last quarter of 1983 was $1.0/bbl (29.8-28.8) higher than in the Caribbean, US$1.2/bbl (29.7-28.5) in 1984 and US$1.3/bbl (27.5-26.2) in 1985. USEC prices on individual products were higher than those in the Caribbean to allow for the transportation cost to the US.

4. Except for leaded gasoline, the Caribbean spot prices in 1983 and 1984 are lower than Caribbean posted prices, so Jamaica could have benefited substantially from purchasing spot cargoes -- if the product had been available in the correct quantities and qualities and at the time they were needed. This is unlikely because, as pointed out below, the market in the Caribbean is thin.

5. PDVSA posted prices in the Caribbean, while consistently above Caribbean spot prices, bear a closer relationship to the US East Coast spot than other Caribbean posted prices. In 1984, PdVSA prices were slightly less than USEC spot by about the value of the freight and in 1985 were about equal. Posted prices at Aruba/Curacao, however, moved significantly higher than the PDVSA prices after 1983, when Exxon lost its netback crude contract, then shut down Aruba, and when Shell's problems in Curacao began to mount. In 1984 the difference was $1.2/bbl (30.3-29.1), up from $0.30/bbl (29.0-28.7) in 1983.

6. Before 1980 and the worldwide perception of a weak oil market, posted prices at refinery centers were widely used as a sign of availability. They were generally accepted as a basis for negotiations rather than as true indicators of the real product prices. A discount (or a premium) would be applied to each product in a separate, confidential agreement between buyer and seller. Since 1980, the decline in the price of oil because of oversupply has meant that every extra barrel sold over the actual level of today's demand has had to find a home at a reduced price in order for a buyer to take and keep it for use tomorrow. Spot has consistently been at a discount to posted.

7. This situation lasted long enough for a wide range of buyers to make a break with the old practice of contracting for the bulk of their supply at some formula tied to the posted price. Instead, they have chosen to rely in varying degrees on the spot market (the degree depending on the reliability of the particular market), causing the swing to spot purchasing described earlier, and have tried to get contract suppliers to use spot prices. Sellers, of course, have resisted and many have tried based on posted prices. This minimizes revenue loss because posted prices lag behind spot prices in a falling market. In order to move the product, however, the seller has had to eventually include discounts in the formula.

8. For the moment, posted prices play a less prominent role in the market than spot but they still endure- and could return as the buyer's preference if spot prices became stronger than posted.

9. While public display of the seller's price may not be appropriate, contractual agreements between buyer and seller to buy according to an agreed formula, linked to posted or possibly to spot prices, may well be negotiable.

10. Contract purchases should be part of Jamaica's supply package. They are universally used for several reasons. First, they represent a transparent, arms length transaction with a guaranteed delivery at a price fixed by formula. Second, given the commitments of large marketing companies or national economies, making frequent spot purchases for 100% of requirements is unlikely to be practical over the long run. Spot cargoes are not always available at attractive prices when they are needed and are likely to vary in consistency, making it difficult to arrange the correct quality mix. As a result, certain stable relations and purchase agreements with reliable suppliers eventually emerge. A guaranteed supply for a significant portion of feedstock is worth a premium. The extent of that contractual supply and the size of the premium are both the subject of constant negotiation, depending on the state of the oil market.

11. In summary, the Caribbean spot market is too variable and too thin to be the source of Jamaica's basic supply. Having baseloaded the system on contract material, spot purchases from the Caribbean can then play an important part in PCJ's strategy. PCJ can predict quite accurately the demand for petroleum, and incidentally foreign exchange demand, on a month-by-month basis. It is, therefore, in a position to negotiate for a mix of both short- and long-term contracts and to supplement this as appropriate by spot purchases locally.

Annex 2

SAN JOSE ACCORDS

1. The San Jose Accord between countries in the Caribbean area and the Accord's co-sponsors, Mexico and Venezuela, provide for the latter to supply each country with a certain quota of crude, under preferential terms. The Accords began in 1976 when Venezuela alone agreed to supply crude to the region under easy terms, under which half of the crude purchased was entitled to a 30% refund which was then repaid in ten equal installments over a period of five years.

2. The first Accords to which both Venezuela and Mexico were party began in August 1980 for one year and have been renewed each year since. Under these Accords, a total of 160,000 b/d was to be supplied, half from each of the signatories, with 30% of the cost of each shipment converted (by way of refund) to a loan at 4% for 5 years. The loans were applied on a shipment by shipment basis. Each recipient could convert that short term loan into a loan at 2% for 20 years, provided the money was used in energy projects approved by the two suppliers. The Accord also stipulated that the crude be transported in ships belonging to Naviera Multinacional del Caribe, owned by Mexico, Venezuela and others. Unless the conversion to a long term loan occurred, the repayment of the refund on each shipment began six months after delivery and lasted for ten installments of interest plus principal.

3. The Accord was renewed in 1981 and 1982 under the same terms, but in 1983 the short term rate was increased to 8%, the long term to 6% and the portion to which it applied was reduced to 20%. In 1984, the ceiling was reduced to 130,000 b/d. The details of the payment terms were different for each supplier in 1983-84. The Accord was extended for a sixth year in August 1985.

4. The Accord has been very helpful in enabling Jamaica to meet critical payments for oil by deferring 20-30% of the costs to the future. When the interest rate on US dollars basis was 14% in 1983 and Jamaica had to borrow to pay for its oil imports, the benefit of paying an interest rate of 8% on the declining balance over 5 years was about 4% of the total cost (using loan amortization tables as an approximation) or about US$1.2/bbl on each US$30 barrel imported. Although interest rates have fallen to nearly 8%, the 20% refund has continued to have a high opportunity value because loans have been difficult to obtain.

5. However, the increased debt burden of the Accord beneficiaries, and of Mexico and Venezuela themselves, have caused strains in the administration of the Accords in the last few years. By March, 1986, Jamaica had accumulated short-term loans under the Accords of US$150 MM, but had not been able to convert those loans into long-term debt for approved energy projects. Further, short-term loans refunds have been delayed. The benefits under the Accords are not, therefore, included in the analysis.

FREIGHT RATES FOR "DIRTY" AND "CLEAN" CRUDE AND PRODUCT CARGOES IN THE CARIBBEAN REGION

1. Estimated freight rates from a number of sources to Kingston in January 1984 for crude and fuel oils ("dirty" cargoes) and for white products ("clean" cargoes) are presented in Tables A.3.1 and A.3.2. These have been prepared from the Worldscale 100 values for the period January 1, 1984 - June 30, 1984 and the information on the actual January levels of Worldscale published in Platt's at that time. Thus a 50,000 DWT vessel taking crude from Amuay to Kingston could be chartered at 130 Worldscale for the voyage and the landed cost, according to these sources, would have been $0.53/bbl. Tanker brokers active in the Caribbean have confirmed that these calculated rates could have been expected in practice for spot fixtures.

2. Petrojam's landed freight costs for 1983 and 1984 averaged about US$1.10/bbl and US$0.70/bbl for clean and dirty cargoes respectively, excluding LPG. A review of the Worldscale values and actual chartering rates suggest that Petrojam's costs in these years were significantly higher than the calculated landed freight costs of US$0.65/bbl from the Caribbean sources for clean cargoes in 30,000 DWT vessels (Table A.3.2) and about US$0.53/bbl (Table A.3.1) for dirty cargoes in 50,000 DWT vessels.

3. As regards clean cargoes, Petrojam's actual cost of US$1.10/bbl was higher than the calculated cost of US$0.65/bbl because of the smaller size cargoes received due to tankage limitation at the terminal. This limitation on tankage, however, would not be applicable when considering the case of shutting down and using the refinery as a terminal only. In this case, potential savings for clean cargoes would therefore be about US$0.45/bbl. Another reason for these higher costs on the clean cargoes was that Petrojam had to arrange for ships to move committed cargo but frequently found itself without the foreign exchange to do so until the last minute. Arrangements made under these conditions generally result in the excessive rates. Also, Petrojam sometimes hired vessels and was then forced to underload them with a smaller cargo in order to fit the allotment of currency.

4. As regards the calculated freight rate for dirty cargoes, the figure of US$0.53/bbl has in actual practice to be increased for two port loading since the refinery uses crude and to take account of the Venezuela bar toll. According to Petrojam calculations these total about US$0.25/bbl thereby removing any significant difference between the actual and calculated freight rates.

Table A.3.1: FREIGHT RATES FOR DIRTY CARGOES - SOURCES TO KINGSTON

	Amuay	Bonny	Coatzo-coalcas	Covenas	Sullom Voe
Worldscale 100	2.37	12.8	3.62	3.56	11.31
Miles	526	5025	1164	1180	4500
Cargo	BCF 24	Bonny	Isthmus	Colombian Export	Brent
API	24	41	33	28	39
Bbls/Long ton	7.04	7.81	7.44	7.22	7.71
FOB Cost, $/bbl	27	30	30	30	30
$/bbl @ WS 100	0.34	1.64	0.49	0.33	1.47
Ship, MDWT	50	50	50	50	50
Speed, Kn/Hr	10.5	10.5	10.5	10.5	10.5
Days-Transit + Port	6	21	8	6	20
less, credit	30	30	30	30	30
Insurance, %	0.07	0.07	0.07	0.07	0.07
Losses, %	0.25	0.25	0.25	0.25	0.25
Freight, $/bbl	0.44	1.31	0.63	0.43	1.17
Insurance, $/bbl	0.02	0.02	0.02	0.02	0.02
Lightering, $/bbl	0.00	0.00	0.00	0.00	0.00
CIF cost, $/bbl	0.46	1.53	0.65	0.45	1.40
Losses, $/bbl	0.07	0.08	0.08	0.08	0.08
Landed Cost, $/bbl	0.53	1.61	0.73	0.53	1.48

Notes: 1. Worldscale values from January 1984 edition. Tanker rates from Platt's Spot Tanker Rate Report, January 1984.
2. All units prices are in U.S. Dollars.

Table A.3.2: FREIGHT RATES FOR CLEAN CARGOES - SOURCES TO KINGSTON ($/bbl)

	To Kingston		CIF to	
	CIF	Landed	Corpus	Phila
Amuay	0.47	0.65	1.00	1.03
Aruba	0.44	0.62		
Coatzocoalcas	0.71	0.89	0.50	1.05
Corpus Christi	0.77	0.90		
Curacao	0.48	0.66		
Philadelphia	0.86	1.04		
Trinidad	0.62	0.80	1.16	1.05

Note: For 30 DMWT.

Source: As for Table A.3.1.

5. The comparison of freight costs from sources to Kingston and costs to other markets (Table A.3.2) shows that PCJ is well situated to get attractive terms on Colombian, Mexican and Venezuelan crudes because Jamaica is geographically very much closer to the supplying countries than the target markets, like the USGC and USEC, which set the level of crude prices in these three countries. Although its harbor limitation allows it to use only small ships, most of the vessels between these suppliers and the U.S. are also small ships of 30-50 MDWT. PCJ can surrender some of this saving to negotiate for contracts based on "spot-plus" a premium or "posted-minus" a discount.

ENERGY SECTOR MANAGEMENT ASSISTANCE PROGRAM

Activities Completed

Energy Assessment Status Report	Date Completed
Papua New Guinea	July, 1983
Mauritius	October, 1983
Sri Lanka	January, 1984
Malawi	January, 1984
Burundi	February, 1984
Bangladesh	April, 1984
Kenya	May, 1984
Rwanda	May, 1984
Zimbabwe	August, 1984
Uganda	August, 1984
Indonesia	September, 1984
Senegal	October, 1984
Sudan	November, 1984
Nepal	January, 1985
Zambia	August, 1985
Peru	August, 1985
Haiti	August, 1985
Paraguay	September, 1985
Morocco	January, 1986
Niger	February, 1986

Project Formulation and Justification		
Panama	Power Loss Reduction Study	June, 1983
Zimbabwe	Power Loss Reduction Study	June, 1983
Sri Lanka	Power Loss Reduction Study	July, 1983
Malawi	Technical Assistance to Improve the Efficiency of Fuelwood Use in Tobacco Industry	November, 1983
Kenya	Power Loss Reduction Study	March, 1984
Sudan	Power Loss Reduction Study	June, 1984
Seychelles	Power Loss Reduction Study	August, 1984
The Gambia	Solar Water Heating Retrofit Project	February, 1985
Bangladesh	Power System Efficiency Study	February, 1985
The Gambia	Solar Photovoltaic Applications	March, 1985
Senegal	Industrial Energy Conservation	June, 1985
Burundi	Improved Charcoal Cookstove Strategy	September, 1985
Thailand	Rural Energy Issues and Options	September, 1985
Ethiopia	Power Sector Efficiency Study	October, 1985
Burundi	Peat Utilization Project	November, 1985
Botswana	Pump Electrification Prefeasibility Study	January, 1986
Uganda	Energy Efficiency in Tobacco Curing Industry	February, 1986
Indonesia	Power Generation Efficiency Study	February, 1986
Uganda	Fuelwood/Forestry Feasibility Study	March, 1986

		Date Completed
Project Formulation and Justification (cont.)		
Sri Lanka	Industrial Energy Conservation-Feasibility Study	March, 1986
Togo	Wood Recovery in the Nangbeto Lake	April, 1986
Rwanda	Improved Charcoal Cookstove Strategy	August, 1986
Institutional and Policy Support		
Sudan	Management Assistance to the Ministry of Energy & Mining	May, 1983
Burundi	Petroleum Supply Management Study	December, 1983
Papua New Guinea	Proposals for Strengthening the Department of Minerals and Energy	October, 1984
Papua New Guinea	Power Tariff Study	October, 1984
Costa Rica	Recommended Tech. Asst. Projects	November, 1984
Uganda	Institutional Strengthening in the Energy Sector	January, 1985
Guinea-Bissau	Recommended Technical Assistance Projects	April, 1985
Zimbabwe	Power Sector Management	April, 1985
The Gambia	Petroleum Supply Management Assistance	April, 1985
Burundi	Presentation of Energy Projects for the Fourth Five Year Plan	May, 1985
Liberia	Recommended Technical Assistance Proj.	June, 1985
Burkina	Technical Assistance Program	March, 1986
Senegal	Assistance Given for Preparation of Documents for Energy Sector Donors' Meeting	April, 1986
Zambia	Energy Sector Institutional Review	November, 1986