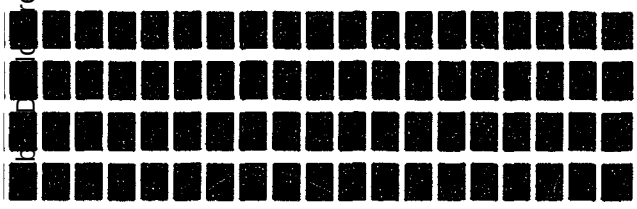


ESMAP

Energy Sector Management Assistance Programme

Jamaica

Energy Sector Strategy and Investment Planning Study
Volume II: Liquid Fuels

Report No. 135B/92

Consultants' Reports

JAMAICA

ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY

VOLUME II

Liquid Fuels

PART A
PETROLEUM SECTOR REVIEW

PART B
EVALUATION OF FUEL GRADE ETHANOL PRODUCTION

CONSULTANTS' REPORTS

August 1992

CONTENTS

FOREWORD v

ABBREVIATIONS AND ACRONYMS vii

CURRENCY EQUIVALENTS viii

ENERGY UNITS AND CONVERSIONS viii

I. INTRODUCTION 1

II. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS 2
- Conclusions 2
- Recommendations 5

III. CURRENT SITUATION 6
- Sector Organization and Institutions 6
  - Legislation 6
  - Sector Organization 6
- Infrastructure 6
- Supply Agreements 7
  - San Jose Accord 7
  - Crude Selection Under SJ Accord 8
  - Nigeria Supply Agreement 9

IV. SECTOR ISSUES 10
- Ex-Refinery Pricing 10
  - Acquisition Differential 12
  - Product Specifications 12
  - Ocean Freight 15
  - Round Island Movement 17
- Petrojam Shipping and Logistics 18
- Performance of Refinery 22
  - Capacity Definition 22
  - Powerformer Capacity 24
  - Foreign Exchange Constraints 24
  - Summary/Conclusion 26

V. PRODUCT DEMAND 27

VI. LEAST COST SUPPLY OPTIONS 28
Methodology 29
Case Selection 30
Process Engineering Analysis 32
Crude and Product Price Forecast 33
LP Model Configuration and Outputs 44
Cash Flow Modeling Results - EIRR and NPV 45
Sensitivity Analysis 47
Export Oriented Options 50
Grass-Roots Refinery 50

VII. FINANCIAL EVALUATION 51
Methodology 52
Case Selection 53
Financial Evaluation Results 55
Sensitivity Analyses 58
Debt/Equity Structure 59

ANNEXES

4.1 Evaluation of Ex-Refinery Petroleum Product Price Structure
4.2 Petrojam Refinery Operating Performance
5.1 Jamaica Petroleum Product Demand Forecast
6.1 Petroleum Subsector Process Engineering Analysis
6.2 Crude and Product Price Forecast
6.3 Cash Flow Model
6.4 Feasibility of Jamaica Grass Roots Refinery
7.1 Corporate and Financial Planning Analysis - Documentation Relating to the Financial Model

FOREWORD

This volume, in two parts, presents the consultants' findings and recommendations concerning the liquid fuels sector in Jamaica as part of the Energy Sector Strategy and Investment Planning Study (ESSIPS). The analysis contained herein is based on conditions and projections made in late-1990/early-1991, at the time of the Persian Gulf War. Mr. William Matthews, Petroleum Economist, was the principal author and lead consultant for both sections of the report.

Part A: Petroleum Sector Review has been prepared on the basis of inputs from the individual consultants, as noted, and comments received on a working draft. A formal draft of the ESSIPS report (including this volume) was discussed with the government of Jamaica in September 1991 and comments were received in January 1992 (vol. I, Annex 2.1). These comments have been reflected in the finalized ESSIPS reports. In view of the need to establish a framework that would promote competition under a liberalized import and pricing regime and that would maintain fiscal receipts, the government of Jamaica has engaged consultants working under supervision of the World Bank to carry out studies and draft legislation for the deregulation of the petroleum subsector as well as to prepare a specific strategy for the privatization of Petrojam. Terms of reference for consultancy are shown in Vol. I, Annex 2.2.

Consultants	Mission
William Matthews, principal consultant	December 1990 January, March 1991
Ubaldo Hurtado, demand and price projections	December 1990
Tom McCann, refinery engineer	January 1991
Tom Steigerwald, product import pricing	April 1991
John Peet, shipping and logistics	April 1991
Kathleen Sambo, financial analyst (Touche, Ross, Ogle; Kingston)	March 1991

Part B: Evaluation of Fuel Grade Ethanol Production was prepared with the assistance of Philmore Ogle and Kathleen Sambo of Touche, Ross, Ogle. The mission also benefited from discussions with Mr. Brian Cross, alcohol distillery engineer and consultant to PCJ.

ABBREVIATIONS AND ACRONYMS

AAC	ambient air concentrations
ADO	automotive diesel oil
ASTM	American Society for Testing and Materials
API	American Petroleum Institute
bbl	barrel (42 U.S. gallons, 159 litres)
BCF	Bolivar Coastal Field, 17° gravity, a Venezuelan grade of crude oil
B-C ratio	benefit-cost ratio
BPCD	barrels per calendar day
BD or BPD	barrels per day (calendar day)
BPSD	barrels per stream day
C_3	propane
C_4	butane
CBI	Caribbean Basin Initiative
CFB	circulating fluidized-bed
C&I	commercial and industrial
CIDA	Canadian International Development Agency
CPE	centrally planned economy
DAF	dissolved air flotation
DERD	Defense Engineering Research and Development (a British standards/specifications body)
DSM	demand side management
EC	European Community
EIA	environmental impact assessment
ENDC	Energy Sector Development Committee
ESDPP	Energy Sector Deregulation and Privatization Project
ESMAP	Energy Sector Management and Assistance Programme
ESSIPS	Energy Sector Strategy and Investment Planning Study
ETBE	ethyltertiarybutylether, a high octane blend stock for gasoline
FCC	fluid catalytic cracker
FCCU	fluid catalytic cracking unit
FGD	flue gas desulfurizing
FS	feedstock
GPM	gallons per minute
GWh	gigawatt hours
HFO	heavy fuel oil
HSFO	high-sulfur fuel oil
HO	heating oil
H_2S	hydrogen sulfide
EIRR or IERR	internal economic rate of return
JPS	Jamaica Public Service Corporation
kBD	thousand barrels per day
LCEP	least cost expansion plan
LDC	less developed country
LPG	liquified petroleum gas
LSFO	low sulfur fuel oil
LV	liquid volume
MBD	thousand barrels per day
MDO	marine diesel oil
MFPP	Ministry of Finance, Planning, and Production
mio	million
MME	Ministry of Mining and Energy
MOF	Jamaican Ministry of Finance
MOGAS	motor gasoline
MTBE	methyltertiarybutylether, a high-octane blend stock for gasoline
MW	megawatt
NAAQS	National Ambient Air Quality Standards
NCS	National Conservation Strategy
NGO	nongovernmental organizations
NO_x	nitrogen oxides
NRCA	National Resources Conservation Authority
NYH	New York Harbor
PV	present value
RON	Research Octane Number
S	sulfur
SFS	Saybolt Furol Seconds
SO_2	sulfur dioxide
SWECO	Swedish Energy Company
T	tonne (metric ton)
TEL	tetraethyl lead, an octane additive for gasoline
USEC	United States East Coast
USGC	United States Gulf Coast
USMW	United States Midwest
WS	worldscale

CURRENCY EQUIVALENTS

The Jamaican dollar is floating. The current exchange rate (July 1992) is J$22/US$. The rate used in preparing this report was J$8.0/US$.

ENERGY UNITS AND CONVERSIONS

	Gross energy (MJ/kg)	Oil equivalent (TOE/MT)
Fuelwood (5% mcwb)	15.0	0.36
Charcoal	30.0	0.72
Crude oil	42.6	1.00
LPG (propane)	50.0	1.17
Gasoline	46.5	1.09
Kerosene	46.4	1.09
Jet Fuel	46.4	1.09
Diesel (ADO)	46.0	1.08

1 kWh = 3.6 MJ = 860 kcal = 3,412 BTU = 0.086 kgoe
1 TOE = 7.3 barrels of oil equialent = 11.63 MWh = 42 GJ =
10 million kcal = 39.68 million BTU

Gasoline : 1,360 liters per MT
Kerosene : 1,260 liters per MT
Diesel : 1,190 liters per MT

JAMAICA

ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY

VOLUME II

Liquid Fuels

PART A

PETROLEUM SECTOR REVIEW

CONSULTANTS' REPORT

I. INTRODUCTION

1.1 The government of Jamaica (GOJ) is concerned that petroleum products should be supplied at least cost with due consideration for reliability of supply, environmental protection, and public safety. In keeping with overall macroeconomic policies, responsibility for petroleum supply operations is to be shifted to the private sector through the divestiture of the refinery and a liberalization of product imports. This report provides a detailed evaluation of the three basic supply options (a) importing all products, (b) continuing to operate the refinery in its present configuration with minor investments, and (c) upgrading the refinery to varying degrees to increase the flexibility of operations and profitability.

1.2 While the analysis of the refining options has been carried out to a pre-feasibility study level, this report does not recommend that the government should invest in any refinery upgrade prior to requesting proposals from private sector firms. Although the analyses indicates that refinery operation in Jamaica and upgrading are expected to be viable over the long term, it should be left to private sector investors to make their own assessments as would be reflected in the prices offered. The circumstances of prospective investors will vary and may not correspond to the assumptions used in this analysis. Nonetheless, this report provides the government with an analytical framework for comparison of the proposals which it can expect to receive.

1.3 It is also assumed that the government would move rapidly to liberalizing product imports in keeping with its overall trade policy. An evaluation has therefore been made concerning the sensitivity of the refinery to the possible reduction in domestic product markets to direct importation. For the purpose of the study, it has been further assumed that the refinery would operate as an independent producer purchasing crude and product on the spot market or under supply agreements linked to the US Gulf Coast (USGC) or Caribbean regional spot markets. Any trade arrangements which the refinery operator might offer which would lower the net costs of crude and/or product supply would clearly be to Jamaica's advantage and would be considered in the evaluation of the refinery purchase proposals.

1.4 Under all supply options it is assumed that the government would seek to minimize petroleum supply costs through open market competition and specifically would not wish to substitute a private monopoly in place of the present public sector monopoly in refining and product importation. The strategy for making the transition from the present situation of virtual public sector monopoly on petroleum supply to a competitive private sector market structure has therefore been examined in Chapter IV.

II. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

2.1 The petroleum subsector in Jamaica at present is managed by a mix of public and private enterprise. PCJ, through its subsidiary Petrojam, has a de facto monopoly on refining and bulk product supply by virtue of existing tariff protection. Wholesale distribution and management of retail networks are dominated by three local affiliates of international majors—ESSO, Shell, and Texaco—while PETCOM, a subsidiary of PCJ/Petrojam, participates to a minor extent in this segment of the industry. Road transportation and operation of retail outlets are in the hands of private Jamaican entrepreneurs.

2.2 Jamaica is party to two supply agreements, the San Jose Accord (SJA) and a bilateral agreement with the government of Nigeria. Under the SJA, Jamaica receives crude oil and finished products from Mexico and Venezuela up to a total limit of 26 KBD on concessionary financing terms. The Nigerian agreement is a government-to-government arrangement under which PCJ can lift up to 20 KBD of Nigerian crude at commercial terms and dispose of as it wishes.

2.3 Petroleum product prices are decontrolled at the wholesale and retail levels, but still controlled at the main bulk supply points, ex-refinery or marine receiving depot. The ex-refinery/depot price structure is based on the principle of import parity for finished products supplied from the U.S. Gulf Coast (USGC) as reference market.

2.4 Chapter III provides detail on the current situation in the sector, while chapter IV discusses the main issues affecting sector efficiency. Chapter V presents an analysis of Jamaican product demand with a forecast to the year 2010 as one of the principal inputs to an analysis of least cost supply options as presented in chapter VI. Chapter VII provides the results and conclusions of a financial evaluation of selected options from the economic analysis of least cost supply. Following is a resume of the main conclusions and recommendations arising from this analysis of sector issues and supply options.

Conclusions

Product Demand

2.5 The total Jamaica product consumption excluding the bauxite demand is projected to increase from 30 kBD at present to 35 KBD by 2000 and 44 KBD by 2010 (para. 5.2). Including the bauxite demand, mostly heavy fuel oil, the consumption figures would be 43 kBD at present, 54 kBD in 2000, and 64 kBD in 2010.

Performance of Refinery

2.6 Petrojam has run its refinery at about half of nominal rated capacity of 35,500 BPCD in recent years, importing roughly half of total product requirements as finished products. The nominal capacity of 35,500 BPCD is, however, overstated. Based on powerformer (gasoline unit), allowance for

planned and unforeseen outages and foreign exchange constraints, true available capacity over the past five years is estimated to be in the 23,000 to 25,000 BPCD range.

Ex-Refinery Pricing

2.7 A total saving to Jamaican consumers on product supply cost of up to US$15 million per year could be achieved through adjustments to the ex-refinery pricing formula through a combination of market efficiency improvements, changes in product specifications, and associated parity reference pricing in advance of market deregulation.

Least Cost Supply Options

2.8 The existing refinery capacity of 35 kBD, without upgrading, and if efficiently operated, is sufficient to meet the projected product supply needs of Jamaica to the year 2010, with a minimum of product imports in later years. This excludes the bauxite/alumina industry demands. This case is termed "business as usual."

2.9 Based on crude and product price forecasts made in early 1991, refining of available feedstocks to produce finished products in Jamaica at the existing Kingston site with efficient operation of existing facilities would be a more economic supply option than closing the refinery and terminaling imported products at the same site. This conclusion assumes a minimum of refinery upgrading and efficiency investments, and corresponds to a "business-as-usual" case, albeit with more effective management of all sector related operations including foreign exchange management. This conclusion confirms the results of several earlier studies.[1]

2.10 The addition of a catalytic cracker and ancillary facilities to the existing refinery at present crude capacity, an incremental investment over terminaling of some US$130 million would be economically viable, earning an EIRR of 27 percent versus the terminal case and 20 percent versus the "business-as-usual" case. The sensitivities to both lower refinery margin and a decline in market volume indicated that not only was the target EIRR still achieved, but that it was more robust to such contingencies than was the "business-as-usual" case.

2.11 The expansion of the refinery crude capacity to 50 kBD, the limit of the existing site, plus a larger balanced catalytic cracker, an incremental investment over terminaling of some US$ 170 million though economically viable at an EIRR of 25 percent, shows a slight decline in returns versus the existing-capacity case due to incremental dependence on lower-margin export business. The higher investment combined with this reliance on export business for about 25 percent of output makes it a riskier project than the existing capacity case which relies almost exclusively on the domestic market.

---

1. *ESMAP Report on Petroleum Procurement, Refining and Distribution, November 1986. Several Petrojam in-house studies of refinery upgrading and expansion conducted since 1986. Japan Consulting Institute, "Feasibility Study on Fuel Oil Upgrading Project in Jamaica," May 1987. Purvin & Gertz, "Petrojam Refinery Valuation Study," January 1986.*

2.12 The expansion of the refinery to 100 kBD, involving the integration of existing facilities with a new site and with fully upgraded export capability, is not a feasible case at projected refining margins. The low returns on the major export business are insufficient to earn the target return on the large investment of some US$740 million.

2.13 A grass-roots refinery in Jamaica dedicated to the export business would not be economically viable for an independent refiner; direct access to crude or markets might improve the economics sufficiently to justify new capacity at a "green field" location, but in that case Jamaica would merely be leasing the site.

San Jose Accord and Crude Selection

2.14 The gross value of the short-term financing under the San Jose Accord is about US$0.30 per barrel of crude oil at present. There does not appear to be any additional benefit realizable under the more concessionary long-term feature of the Accord.

2.15 Based on extensive linear programming analysis of refinery facilities options, four crude grades, Venezuelan BCF 24, BCF 17, Mexican Isthmus, and Ecuadorean Oriente were found to be about equal in economic value as feedstocks to the refinery. Maya crude from Mexico and Nigerian Forcados were uneconomic grades for the Petrojam refinery.

2.16 Due to short-term benefit of the Accord combined with the economic debit on Maya crude, which must be taken along with the better Isthmus grade, the Venezuelan grades are about US$0.30 per barrel better than the Mexican mix or Oriente from Ecuador.

2.17 The Nigerian crude supply agreement would not provide any benefits as a feedstock in the Kingston refinery. The other crudes as discussed above were found to provide a net advantage of US$3.00 to US$4.00 per barrel compared with the typical Nigerian crudes which could be refined by Petrojam.

Financial Evaluation

2.18 The net foreign exchange cost of Jamaica's total product supply would be some US$1.40 per barrel lower for refining of crude oil to finished products than for 100 per cent terminaling of imported products.

2.19 The upgraded cracking refinery is lower cost than the "business-as-usual" facility as well as being more robust and flexible in the face of possible uncertainties such as loss of local market in a deregulated environment.

2.20 Both the refining versus terminaling and cracking versus "business-as-usual" conclusions are robust to sensitivities to lower markets, lower margins, and different capital structures for the refining

company. With an assumption of loss of local market combined with lower international refining margins, the cracking case is still lower cost than "business-as-usual" and both refining cases are lower cost than terminaling. (para. 7.11).

Recommendations

Least Cost Supply and Financial Evaluation

2.21 The government should proceed with plans to attract qualified private foreign partners to participate in the ownership and operation of the Petrojam refinery. A detailed Request for Proposal document should be prepared with specialist assistance to be provided under the Private Sector Energy Development technical assistance package. Further financial analysis should be carried out to determine the optimum strategy concerning seeking private participation before or after investing in the refinery upgrade.

2.22 The government should not participate in any major export refinery project, either through significant expansion of the existing facility or a "grass-roots" plant on a new site.

2.23 Any proposal for a major transhipment terminal should be subject to the most careful scrutiny, particularly with regard to the environmental risk, and the government should not invest or accept any risk in a project.

San Jose Accord and Crude Selection

2.24 In order to realize minimum net benefits under the San Jose Accord, the government should approach the government of Mexico with a view to relaxing the requirement that Jamaica must take a minimum of 30 per cent Maya crude in mix with lighter grades of Mexican, such as Isthmus.

Deregulation and Liberalization

2.25 A two-phase approach to improving efficiency of the sector through increased competition is recommended:

(a) Short-term. Continuance of price control with an improved import parity structure administered by the Price Commission. Creation of a Hydrocarbon Directorate in MPUTE to act as technical secretariat and overall task manager and coordinator for government activities in the subsector.

(b) Medium-term. Following the establishment of a government subsector management capability, including price and profitability monitoring and common carrier regulation mechanisms, complete price deregulation and import liberalization.

III. CURRENT SITUATION

Sector Organization and Institutions

Legislation

3.1 The present institutional structure was established through the Petroleum Act of 1979 whereby the Petroleum Corporation (PCJ) was created to manage the entire sector under the supervision of the Ministry of Mining and Energy. PCJ was empowered to engage in petroleum exploration, refining, crude and product importation. It was also free, with the approval of the Minister, to form subsidiaries to carry out any activities permitted under the Act and has done so notably in setting up Petrojam as the refining subsidiary. Petrojam itself has subsidiaries engaged in ethanol production in Jamaica and in Belize.

3.2 The Act permits PCJ to engage in a wide range of activities including marketing and transportation. Although not specified in the Act, PCJ/Petrojam has a virtual monopoly on petroleum product importing by virtue of the precedent established in 1963, when the refinery was built, to ensure profitability and maximum utilization. PCJ/Petrojam can import crude and products free of duties and taxes. Other importers are required to pay 10-30 percent customs duties, and an additional stamp duty of 40 percent. All operators, Petrojam included, pay common consumption duty on ex-depot or ex-refinery prices.

Sector Organization

3.3 Major petroleum companies active in Jamaica as product marketers include Esso, Shell, and Texaco. In addition, Petrojam operates a subsidiary Petcom which operates one service station and distributes LPG. Following deregulation of retail prices of most products in September 1990 increased competition is evident. A new distributing organization of independent service stations has been formed and new investment in service station facilities is occurring. Many of the structural issues noted in the 1985 Energy Assessment report will be resolved as a result of deregulation; however, it is too early yet to draw firm conclusions.

Infrastructure

3.4 As described in more detail below, Petrojam owns and operates a simple hydroskimming refinery in Kingston with a nominal crude capacity of 35,500 barrels per calendar day. Its port facilities are able to accommodate tankers of up to 50,000 deadweight tonnes (DWT). The refinery has total crude oil and product tankage of some 2.2 million barrels. This includes about 300 thousand barrels of tankage used for marketing and loading rack sales. The refinery supplies product to the three marketers in Kingston, for their Kingston area sales and other bulk consumers, through a refinery-owned loading rack.

3.5 ESSO, Shell, and Texaco each maintain product storage terminals in Kingston, through which, prior to the construction of the refinery, they imported finished product. These terminals still have an import capability, although they each have their particular limiting characteristics as regards tanker size/draft, product capacities, and product segregations. The marketers also share a joint aviation depot at Norman Manley airport, Kingston. In Montego Bay, Shell and ESSO own and operate separate terminals for product receiving, storage, and onward sales. Total marketing company storage capacity in both Kingston and Montego Bay is about 1 million barrels.

3.6 The two main transportation fuels, gasoline and diesel, are sold through a network of some 250 retail outlets, which are about equally divided among the 3 multinational marketers. These retail networks are supplied by road tanker from loading racks in Kingston and Montego Bay. The marketing company outlets are about 60 percent company-owned and leased to independent dealers, with the remainder dealer-owned and operated. There are only two outlets in Jamaica which are both owned and operated directly by salaried company staff. The road transportation between loading rack and the outlets is provided by a group of independent road haulage contractors.

Supply Agreements

San Jose Accord

3.7 Jamaica is party to two supply agreements, the San Jose Accord and a bilateral agreement with the government of Nigeria. The San Jose Accord was originally established in August 1980 by the supplying countries of Venezuela and Mexico and was renewed for the eleventh time in August 1990 on the following terms:

(a) The supplying countries would continue to provide jointly up to 130 kBPD, depending on requirements of beneficiaries and availability of supplies.

(b) Supplies are controlled by the policies and commercial practices of the state oil companies of Mexico and Venezuela with regard to letter of credit requirements and pricing; although originally designed as a crude oil supply agreement, these practices have permitted the import of products under special arrangements with the individual state companies.

(c) Credits will be granted through official financing entities for 20 percent of the invoiced value of a cargo; the general, commercial exchange of goods and services will be financed under the short-term credit, and economic development projects will be financed under the longer term, more concessionary arrangement.

(d) Short-term credits for general financing purposes are granted in US dollars at 8 percent per annum interest for up to 5 years, while long-term credits for development projects are granted up to 12 years at 6 percent per annum interest.

3.8 Under an informal arrangement, Jamaica presently could lift up to 13 KBPD from each of Mexico and Venezuela (the formal agreement sets the quantity at 11 KBPD). Volumes lifted in the most recent fiscal year (1990-91) did not exceed about 10.2 KBPD from each of the two Accord sources, on a total crude run of 20.4 KBPD. During the previous four years, total crude runs were even lower, averaging some 15 KBPD over the period. The lifting rule on sourcing of crudes at the refinery has been to force in equal volumes of Venezuelan and Mexican up to the Accord limits, and then beyond this as necessary, to source the most economic crude based on the available feedstock slate and the short-run optimization performed with the help of the refinery's linear programming (LP) models. It is clear, however, that these limits have never been reached, and therefore, lifting procedures beyond this not tested. The free crude selection within the LP model, for volumes beyond Accord limits, would include an evaluation of the economics of running non-Accord crudes such as Oriente from Ecuador, as well as traditional Accord grades such as BCF 17 and BCF 24 from Venezuela (including spike components as options), and the Isthmus/Maya mix from Mexico.

3.9 In 1991 the gross value of the short-term financing under the Accord was about US$0.30 per barrel at marginal government borrowing rates of 12 percent and an average crude cost of US$16.00 per barrel. The terms of the Accord and attendant benefits have been reduced significantly over the years by Venezuela and Mexico. At inception in 1980 the short-term credit was for 30 percent of the invoiced value at an interest rate of 4 percent for 5 years. At $16.00 per barrel crude and the same marginal borrowing rate of 12 percent this was worth $0.90 per barrel, three times the current benefit. Because of complications in converting the short-term credit to the more concessionary long-term financing, there is no additional benefit from this aspect of the Accord. These complications relate to the difficult process of getting Venezuelan or Mexican approval for qualifying development projects under the second "tranche," and in restrictions placed by the Venezuelans and Mexicans on sourcing of project equipment and services. These latter restrictions diminish, if not render negative, the value of the long-term credit, even if a development project were approved.

Crude Selection Under SJ Accord

3.10 The experience of the ESSIP study team in running the refinery LP to select feedstocks and optimize the operations, using relative crude pricing based on the value of the different grades in main markets, indicates that the two Venezuelan grades, Mexican Isthmus and Oriente from Ecuador are all roughly equal in economic attractiveness to the refinery. One or another of these crudes has each come into the solution, at times, as the most economic crude for a given demand pattern while the others of

these four excluded from the particular solution never have a shadow value[2] exceeding about US$0.10 to 0.20 per barrel. It is concluded, therefore, from an analysis of some 100 LP cases including business-as-usual and the full range of upgrade/expansion runs, that these four crudes are all in the same range of economic appeal to the refinery.

3.11 Other crudes tested were Mayan from Mexico and Nigerian Forcados. The heavy Mayan grade is not favored by the refinery; it was not selected to be run in any of the LP cases, and its shadow value was generally in the US$0.70 to US$1.00 per barrel range. Nigerian Forcados is even further from consideration; it was never selected and its shadow value was in the US$3.00 to US$4.00 per barrel range. The fact that the Mexicans force its customers, including Petrojam, Jamaica, to take a minimum of 30 percent Maya along with the more attractive Isthmus grade, would make the Isthmus/Maya mix about US$0.20 to US$0.30 per barrel less attractive than the Venezuelan and Oriente grades. The effect of the Accord credit, therefore, is to put the Venezuelan grade at an advantage over Mexican mix or Oriente, equivalent to the amount of this credit. The government should press the Mexicans to relax their requirement for minimum liftings of the Maya grade, since its inclusion at 30 percent along with Isthmus nullifies any Accord benefits.

Nigeria Supply Agreement

3.12 Under this Agreement, Jamaica through PCJ can lift up to 20 KBPD and trade or use the oil as it chooses. Based on current and projected crude and shipping prices, it is more profitable to trade the Nigerian crude rather than transport it to Jamaica for refining. Crude oil trading is handled by Vitol, a commercial trading firm on contract to PCJ and acting on instructions from PCJ to lift. Vitol looks after the sale and gives PCJ a guaranteed margin.

3.13 The refinery linear programming model consistently selects crudes other than Nigerian as providing the least cost solution, as a result, the Nigerian Supply Agreement can be considered primarily as a trading agreement but which in a case of supply shortages could be used to supply the Petrojam refinery.

---

2. *Shadow value of a crude oil or other factor input, which did not get selected in a linear programming solution, is the amount by which its price would have to be reduced in order to make it economically equivalent to the inputs actually selected in the solution; i.e. to have it come into the solution; it is only valid over a limited range.*

IV. SECTOR ISSUES

Ex-Refinery Pricing

4.1 The most important issues in the petroleum subsector relate to the encouragement of efficiency in bulk crude oil and product supply operations. In principle, marketing companies and final consumers are free to import products. In practice, however, the duties and taxes levied on such operators under the Petroleum Act make such importation uneconomic compared with supply from Petrojam, which is exonerated from duty on both crude and products (para. 3.2).

4.2 This chapter discusses the nature and extent of subsector inefficiencies and appropriate remedies under the headings: Ex-Refinery Pricing, Petrojam Shipping and Logistics, Deregulation and Liberalization, and Performance of the Refinery.

4.3 Although petroleum product prices were deregulated at the retail level in September 1990, they continue to be fixed ex-refinery as determined by an import parity pricing formula. The imputed parity price for all products whether produced by the refinery or imported as finished products is adjusted weekly on the basis of parity prices derived from US Gulf Coast spot market prices for comparable products plus cost adjustments to yield ex-refinery prices.

4.4 The refinery billing price includes the duties and taxes which were also revised in September 1990 and which are applied to the ex-refinery price to yield the price paid by marketing companies. To retain the buoyancy in the tax system in the event of significant movements in international prices above a set level, an ad-valorem consumption duty is levied in addition to the consumption tax.

4.5 The ex-refinery pricing formula was established in 1963 and last revised in November 1988. The components of the formula are as follows:

(a) Reference Price defined as the mean of US Gulf Coast water-borne spot prices with some adjustments related to specific products such as leaded gasoline for which a reference price is no longer available.

(b) An Acquisition Differential specific to each product based on the differences between Jamaica's requirements or capabilities and US Gulf Coast norms in the areas of cargo size, credit terms and product quality.

(c) Ocean Freight based on prevailing market rates from the US Gulf Coast for appropriate vessel size and load port combinations applicable to the specific product.

(d) Cargo Insurance, 0.07 percent of C & F price.

(e) Ocean Loss as percent of CIF price; 0.5 percent for LPG, Gasoline, Kero/Turbo; 0.4 percent for ADO and MDO; .25 percent for HFO and asphalt.

(f) Terminal Fee based on the actual operating costs and charges on depreciated replacement cost and inventory of operating a terminal at the refinery site.

(g) Round Island Movement (RIM) fee represents the cost of shipping controlled products by ocean tanker from Kingston around to Montego Bay and is rolled into the price of controlled products sold out of both terminal racks. RIM is to be reviewed and adjusted from time to time if there is any appreciable change in the freight market.

(h) Rack Fee represents the recovery of costs of running the product truck loading operations.

(i) The latest official Exchange Rate is applied to the sum of the above factors which are all denominated in US$, to arrive at a total Ex - Refinery price in J$/IG.

4.6 Such a notional import parity pricing formula attempts to derive prices that would correspond to the least cost alternative based on the importation of all products. While seeking to reflect factors which a private sector operator would consider in price setting, the formula does not capture the dynamics of the market and has been found to have inherent biases which raise the cost of products to consumers as well as to the country. In addition, international conditions are constantly changing, so that it is necessary to carry out a periodic review of the pricing formula and the allowances that are provided which determine the ultimate price paid by the consumers. Each of the components in the pricing formula was therefore reviewed with respect to its rationale, impact on the ex-refinery price, and the cost to consumers. It was concluded that a total saving of a minimum US$9 million and up to US$15 million per year could be achieved by adjustments to the ex-refinery pricing formula. Annex 4.1 provides a summary of the assumptions and results of this analysis. Some of these adjustments (i.e., savings) could be achieved by improvements in system efficiency if the market were deregulated and others by changes in the product specification and reference price. About one third of the US$17 million saving would be in direct foreign exchange cost to the country related to changes in product specifications, financing, insurance, and RIM costs. The remainder represents excess charges to consumers in local currency for costs which are attributed but would nominally be absorbed by the supplier in the case of deregulation. Each aspect is discussed below.

Acquisition Differential

4.7 The acquisition differential depends primarily on the product specifications for the Jamaica market compared with the quoted products in the USGC.

Product Specifications

4.8 Product specifications are presently established by the refinery in consultation with the marketing companies and major consumers such as JPS. Only in the case of unleaded gasoline has the specification been established with the involvement of Jamaica Bureau of Standards. Unnecessary or excessive costs of petroleum products arise from specifying a higher quality product than is required to meet end use needs in the Jamaican market.

4.9 The review of product specifications carried out by the consultants found that the present specifications result in an increase in supply costs of about US$5 million per annum, as compared with the cost of supplying products largely suited to overall market requirements in Jamaica. In the case of heavy fuel oil the acquisition differential is based on a low-viscosity fuel oil produced used primarily by JPS rather than on the basis of a lower quality (and lower priced) cracked, higher-viscosity fuel oil as used by the bauxite companies.

4.10 The contribution that each of the quality changes discussed below could make to the yearly supply cost to Jamaica are estimated as follows:

		US$/million
(a)	motor gasolines	1.9
(b)	jet fuel/kerosene	0.4
(c)	automotive diesel oil (ADO)	0.4
(d)	marine diesel oil (MDO)	0 to 0.3
(e)	heavy fuel oil (HFO)	2.7
	Total	5.4 to 5.7

4.11 Gasoline Consultants to Petrojam are currently analyzing the octane requirements of the vehicle fleet based on a data obtained from vehicle registrations and by all evidence the octane rating and cost could be lowered. Petrojam produces a 95 Research Octane Number (RON) gasoline, required by only a small percentage of cars, rather than a more suitable level of 92 RON octane.[3] Coincidentally

---

3. *Gasoline is blended from Petrojam's own produced blending components and purchased blending agents plus additives including tetraethyl lead as an octane booster; 92 RON corresponds roughly to regular gasoline with 87 octane as computed by the (RON + MON)/2 method.*

and unintentionally, this over-specification served in the past to compensate for the reduction of octane that frequently occurred because of the widespread adulteration of gasoline with kerosene causing engine knocking and poor performance. Such adulteration has been virtually eliminated through tighter controls on the distribution of subsidized domestic kerosene.

4.12 It should not, however, be the role of the refinery to compensate for unscrupulous commercial practices at the higher cost of increasing the gasoline octane specification. Quality control by an independent regulatory body would assure consumers that the gasoline produced by the refinery meets the specification while periodic testing of fuel from service station would be a further means of consumer protection. Stiff penalties under the Fuel Products Quality Act should be applied for infractions. A fuel testing laboratory including an octane testing engine is available at the refinery. This laboratory could be used to carry out all quality control testing provided that procedures could be established to insure its independence and the integrity of its work.

4.13 Midgrade unleaded gasoline is now being used as the basis for ex-refinery billing. With the lowering of the octane requirement to 92 RON corresponding to this specification about $1.00/bbl or US$1.9 million p.a. could be saved by Jamaican end consumers. Surveys in the USA have found that high octane fuels as promoted by marketing companies do not provide significant additional benefits to a large percentage of motorists.[4]

Automotive diesel oil

4.14 With regard to the cetane specification for automotive diesel oil (ADO also known as Number 2 fuel oil), the present specification is 45 cetane index rather than 40 cetane index which is the Colonial Pipeline specification for fully fungible fuel as supplied in the USGC region. Petrojam is concerned that 45 cetane index fuel is needed to satisfy Jamaican fleet requirements with a high proportion of Japanese and European trucks. Given the potential cost savings and the possiblity of using fully fungible fuel, every effort should be made to lower the specification.

4.15 The cetane index is of no consequence to JPS which uses 20-40 percent of total consumption of ADO in gas turbine power plants representing 20-40 percent of its total Jamaica demand. A saving to consumers of about US$0.4 million could be realized by reducing the cetane index to 40 from 45, thereby reducing the acquisition differential. No significant reduction in Petrojam's cost would result, however, with the present refinery configuration. Savings would be realized only if and when a catalytic cracker unit were added.

Jet fuel/kerosene

---

4. *Consumer Research Reports, "Do you Need High Octane?" March 1991. Also American Automobile Association, December 1990. These reports revealed that only about 10% of vehicles needed higher than regular grade gasoline.*

4.16 Since all kerosene and jet fuel in Jamaica is supplied as one product - dual purpose kerosene, the customer with the highest quality requirement establishes the specification and attendant supply cost of the complete requirement. At present one international airline requires the stringent DERD specification. It has subsequently been learned that all fuel supplied at Miami International Airport is ASTM specification. This includes fuel to British Airways, which previously required DERD specification. In 1991 this grade cost about US$0.30 per barrel more than standard ASTM USA grade commercial jet fuel and this premium is reflected in the Jamaican price structure for kerosene and jet fuel. *It is recommended that the standard ASTM grade be adopted as the Jamaican specification.* Any airline which demands DERD specification would be free to import its requirements in bond at its own costs as this is an international bunker sale. The estimated supply cost saving at present volumes is US$0.38 million per year.

Marine Diesel Oil (MDO)

4.17 The present price structure is based on a reference price in the USGC based on 85 percent ADO price and 15 percent HFO price. This blended value reflects the price of regular MDO which contains some cracked components and is generally a dirty product, containing small amounts of residual. Such a product is generally quite acceptable as a fuel for heavy and medium-speed diesel engines providing there is proper filtration and handling. Petrojam's main customer in Jamaica is the cement company. This consumer and others at present specify a clean, premium-quality MDO. Petrojam supplies this as clean, straight-run heavy atmospheric gasoil from the crude unit. In order to acquire the same product ex USGC, a quality differential of $0.75 per barrel above regular quality MDO is built into the present import parity price structure. While it is felt that, given a choice supported by technical advice on fuel utilization, most consumers would choose the cheaper, regular grade, an evaluation would have to be done to confirm this. A range of savings from zero to $0.34 million per year would be realized at present sales volumes, depending on the success in converting users.

Heavy fuel oil

4.18 The major users of Number 6 or heavy fuel oil (HFO) are the bauxite companies and JPS. The bauxite companies are able to use low quality high viscosity cracked HFO, which they can import at lower cost than straight run HFO produced by Petrojam. JPS on the other hand has not been consistently successful in using the lower quality, less expensive cracked HFO. The official acquisition differential in the price structure for HFO quality is now $0.75 per barrel. This is based on the estimated differential in price between a standard USGC HFO of 6 to 9 API gravity, 250/300 SSF at 122F and the higher quality Jamaican grade now specified at 11.5 API min. and 200 SSF at 122 maximum. The product specification should be changed to standard Bunker C with 3 percent sulfur and 250 viscosity without a quality premium in the acquisition price. The saving to Jamaican consumers would be some $1.9 million per year at present volumes.

4.19 JPS will likely require consultant assistance and fuel supply modifications to adjust to a lower quality fuel. As the bauxite companies have been successful using such fuel, there appears no

insurmountable obstacle for JPS to do likewise. Terms of Reference have been prepared for a study to develop a program for fuel supply modification. (See Vol. III, Power Sector Report, Annex G.) This study should be undertaken in conjunction with the JPS plant performance audit being carried out as part of the rehabilitation program.

Other Acquisition Differentials

4.20 For all products Petrojam receives a credit adjustment to reflect 30 days instead of 15 days with an interest rate of less than 8 percent. Any extra payment in the standard product reference price for extra credit should be balanced out by the additional interest earned on the funds which are retained in Petrojam's account for that period, assuming interest rates are roughly equal. This should be the case since the effective interest rate which Petrojam is paying with this premium is less than 8 percent. It is recommended that any payment for extra credit terms such as this 6 to 11 US cents per barrel be eliminated from the price structure.

4.21 The acquisition formula includes a parcel size adjustment for HFO and LPG in the acquisition cost. Liberalization of imports and use of lower quality fuel by JBS would encourage the joint importation with the bauxite companies in larger vessels thereby avoiding a small-ship premium.

4.22 For marine insurance, a base rate in excess of US$0.07 per US$100 valuation appears in the pricing formula whereas a current rate of US$0.03 to 0.04 per US$100 valuation is more typical of current rates for small parcel trading companies operating in the Caribbean. It is possible that future rates will escalate to levels approximating the current rate of US$.07 per $100 valuation, due to increased claim costs caused by environmental problems, spills clean-up and attendant litigations. It is recommended that the current rate be left in the structure but a saving under deregulation could range up to 50 percent of this.

Ocean Freight

4.23 In accordance with the wording of the official price structure promulgated in November 1988 "to the extent practicable freight rates published in Platt's Oilgram for appropriate tankers and voyage shall be used." In addition it was indicated in the same document that "freight rates to be verified and confirmed on a monthly basis." The regular adjustment of ocean freight in accordance with a reference for market freight such as *Platt's* is a normal, recommended feature of an import parity pricing formula. It appears, however, that the same freight rates have been used since the inception of the pricing formula. These are $12.25 per long ton for clean products and $7.15 per long ton for dirty products. These rates are equivalent to some 390 percent of WORLDSCALE (WS) for clean and 230 percent WS for dirty, using a 1991 WS rate of $3.10 per MT for USAC to Kingston for one-port loading.

4.24 An analysis of average dirty vessel market rates during 1989 and 1990 is summarized in Table 4.1. As indicated the average SPOT rate for 30,000 DWT size was 220 WS over the period. Even if we assume no component of longer-term charters, which are lower as shown and add a clean

vessel premium of 30 WS points, a maximum clean vessel rate of 250 WS would have applied over the period. In the case of dirty vessels it is considered reasonable to assume a combination of slightly larger vessels than 30,000 DWT, plus the effect of term chartering. On this basis a dirty vessel rate of 200 WS would have been derived on average over the period.

4.25 The savings identified in the spreadsheet summary amounting to some $0.50 to $0.60 per bbl on clean products and $0.14 per bbl on HFO coincides with the lower freight which would have applied, had a monthly formula been applied over the 1989-1990 period in conformance with the intent of the pricing formula. A forecast of average SPOT charter rates for 30,000 DWT dirty vessels prepared in late 1990 by Petroleum Economics London, U.K. indicates 255 WS for 1991 and 225 WS for 1992. This outlook reinforces the need for a monthly adjustment since these forecast average rates would derive significantly lower freight elements than now incorporated in the formula.

4.26 Even if the agreed formula, specifying 30,000 DWT vessels, is followed this is considered generous in the context of a proper import parity basis. This should be based on the hypothetical situation of the larger-scale importation of all Jamaica's needs in the form of finished products. Based on present volumes such an import operation would require a clean 30,000 DWT vessel every 13 days. Larger vessel sizes would obviously be utilized in such a full product import situation, with attendant lower freight basis than the agreed formula.

Table 4.1: AVERAGE OF CARIBBEAN-USGC/USAC CHARTER RATES IN TERMS OF 1991 WORLDSCALE

I. 30,000 DWT DIRTY

	SPOT	1 YEAR	5 YEAR	AVERAGE
1989	195	175	185	185
1990	245	185	195	208
AVERAGE	220	180	190	197

II. 50,000 DWT DIRTY

	SPOT
1989	195
1990	185
AVERAGE	190

Source: Petroleum Economics Limited, London, U.K.

4.27 Ocean losses: Ocean loss in the price structure is now calculated based on 0.5 percent of the CIF price for LPG, MOGAS and Turbo; 0.4 percent for ADO and MDO; and 0.25 percent for HFO and asphalt. Although 0.5 percent is used in general practice as the maximum allowable loss in voyage charter party contracts, it does not necessarily represent the acceptable average technical losses in well-run shipping operations. Analysis of operations by multinationals confirm lower rates on a well-run fleet activity. Recommended revised rates which should be achievable are 0.4 percent for MOGAS and Turbo; 0.3 percent for ADO and MDO and 0.1 percent for LPG. With this latter non-viscous pressurized product there should be none of the usual technical losses from clingage and evaporation. HFO and asphalt losses are assumed to be the same at 0.25 percent. This represents an average reduction of about $0.04 per barrel on clean products.

Combined Terminal and Rack Fee

4.28 A marine product receiving terminal for storage and onward shipping normally includes a truck loading rack as an integral component of its operation. The total charge in the present price structure for the terminal/rack combination is US$1.12 comprising US$0.95 for terminal and US$0.17 for rack Transhipment terminal operators typically charge in the range of US$0.35 to US$0.50 per barrel for throughputting including a month allowable storage time. The much smaller ESSO and Shell operation in Montego Bay charge US$1.00 to US$1.05 per barrel for total terminal and rack fees (excluding inventory carrying costs). It is reasonable to expect a Kingston operation of 30,000 barrels per day (representative of Jamaica's product demand) to be commercially viable at a lower cost per barrel than these smaller terminals of 5,000 barrels per day throughput or less. A revised fee of US$0.71 per barrel (or 63 percent of $1.12) for total terminal and rack, was derived through examination of the cost build-up used for the present fees. As this fee would not include inventory (30 days), insurance, and losses, a provision of US$0.35/bbl would be an additional charge, bringing the total cost to US$1.06 at most.

Round Island Movement

4.29 The Round Island Movement (RIM) charge should be removed entirely from all products in a fully deregulated market as the intent of the pricing formula is to establish an ex-refinery price rather than provide a cross-subsidization mechanism for transportation to Montego Bay. Direct imports into Montego Bay may be the lowest cost supply option; however, the present pricing formula and monopoly on imports by the refinery precludes this option. It is estimated that roughly half of the total RIM charges could be saved in foreign exchange through such direct imports.

4.30 The total incentive for a direct supply option versus transhipment through Kingston is quite high. Although at present smaller vessels would have to be used and possibly demurrage charges incurred because of present port draft limits and congestion, the countervailing incentive is the total Kingston terminal cost plus the RIM charge. This amounts to some $2.00 per barrel based on present price structure levels or $1.70 per barrel based on a recommended lower charge for the Kingston terminal.

4.31 In a liberalized market such an incentive could, among other things, result in the private companies resolving the port congestion and draft problems. Two previous oil port projects were identified and sufficient design work performed to develop budget estimates:

- In 1968 the Montego Bay port authority in conjunction with an overall port project, including dry cargo, cruise ship and petroleum berths studied the construction of a dolphin mooring with 2 berths for reception of 30,000 DWT product tankers. Although the dry cargo and cruise ship berths were built, the oil port was never undertaken and oil reception is combined with the dry cargo berthing at present. The cost of the oil port as specified then, is estimated to cost about US$3.5 million in 1991 dollars.

- In 1974 the three oil companies investigated the construction of a sea-buoy terminal for aviation fuel off the coast, adjacent to the Montego Bay airport. The 1974 cost was estimated at US$2 million.

Petrojam Shipping and Logistics

4.32 Petrojam presently covers most of their marine transportation requirements with an owned tanker and barge as well as chartered tankers on both time and bare boat arrangements. They balance their fleet through spot coverage when short, and through out-chartering when long. Under a liberalized sector the Petrojam fleet would be divested from public sector ownership. It could be offered separately from the refinery facilities with the timing of bid calls such that a refinery bidder would have the option of also bidding on all or a part of these marine transportation facilities.

Deregulation and Liberalization

4.33 One of the strategies enunciated by the government for the energy sector is to further deregulate the petroleum sub sector.

Present Situation

4.34 Product Pricing. In the first phase of price deregulation wholesale and retail petroleum product prices were decontrolled in September 1990. The ex-refinery prices, however, are still controlled. The marketing companies pick the product up at the refinery rack, paying the controlled, formula-based price and they are free to set their own prices at the wholesale level. The retail dealers acquire the product at the companies' wholesale tankwagon prices and are free to set the pump prices.

4.35 The ex-refinery prices are adjusted weekly based on USGC Spot price changes and the new prices are published weekly in the press. The MME (now MPUTE) performs a price monitoring function by gathering data on the prices at two levels: ex-refinery and retail. This data gathering function

is performed weekly through contact with the following information sources: Petrojam, marketing companies, selected service stations (survey of 25 outlets) and selected LPG distribution outlets. The data is organized in a weekly "Petroleum Products Price Structure," published by MPUTE, which provides, for each product, ex-refinery prices with and without consumption duty, retail price and derived total (wholesale plus retail) marketing margin. The ministry officials have been unsuccessful in obtaining complete information from all marketers on wholesale prices and, therefore, have been unable to derive a split between wholesale and retail margins.

4.36 Bulk Supply/Importation of Products. PCJ/Petrojam has an effective monopoly on the bulk supply/importation of petroleum products. The Petroleum Act authorizes PCJ and its subsidiaries to import petroleum and petroleum products either alone or in association with contractors, exempt from import duties. Importation by other companies has to be approved under the Customs Act and is subject to customs duty of 24.44296 Jc per imperial gallon and a stamp duty of 40 percent CIF value.

4.37 The petroleum supply/refining/distribution industry by its nature and characteristics of high fixed, low variable costs and significant economies of scale in infrastructure capital and operating costs, specialized equipment, handling of hazardous, environmentally risky products, tends towards rationalization and concentration in order to achieve cost efficiencies while at the same time maintaining all health, safety, environmental and product quality standards. Where markets are large and supply options diverse, there is scope for scale efficiencies to be realized while at the same time sustaining a significant number of players competing in the industry. In smaller, more physically contained markets there is some risk that the number of players, and hence competition, is restricted by these inherent industry characteristics. In a free market this in turn may lead to pricing "coordination" among the players such that there is a capture of monopoly/oligopoly rents. There are two broad remedies that are employed to alleviate such practices or the effects thereof:

(a) explicit price control at ceiling levels that are judged by the controllers to represent economic supply costs.

(b) a combination of measures, including some regulation in other areas, to foster a more efficient and competitive market, without resorting to explicit price regulation, or import controls. Such measures include regularized, standardized, monitoring of prices and industry profitability with attendant publication and dissemination of the results. It would also include the provision of open access by responsible operators to large, specialized facilities in the infrastructure owned by others, such as port/depot combinations through assignment of common carrier status. Such a liberalized price and import environment must be accompanied by strong and effective regulation of standards of health, safety, environment, weights and measures and product quality.

4.38 The following elaborates on the essential underpinnings to maintenance of competition in a liberalized petroleum refining and marketing sector:

Monitoring and Publicity

4.39 An effective, centralized petroleum monitoring function is recognized as an important element in the otherwise minimal government administration of the industry in most liberalized economies. The dissemination of clear, standardized monitoring results can, of itself, be a mechanism which encourages market efficiency. The monitoring is normally done in two broad areas - price and profitability.

4.40 Price monitoring, usually takes the form of verifying the magnitude of wholesale and/or retail price movements relative to the movements in international/external reference markets. An import parity price structure is an effective analytical framework for monitoring of these movements. It is also useful to monitor the relative movements in prices in one region or jurisdiction versus others. In Canada, for example, the federal government, on a monthly basis, monitors the relative retail price components and movements therein for major centers in all provincial jurisdictions, producing a weighted Canada average. These are also regularly checked against U.S. prices, corrected for differences in product taxation as well as against ex-tax prices in other industrialized countries.

Open Access

4.41 In order to reduce monopoly control of elements of the oil and gas industry, through ownership control of key transport and storage systems, the government authorities in several countries, notably the U.S. and Canada, regulate these facilities as common carriers. The regulatory function involves two principal elements:

(a) Approval and publishing of tariffs for the facility.

(b) Approval and administration of a system of capacity allocation.

4.42 Such regulation is particularly designed to allow a smaller "independent" operator the use of a transport or storage system owned by others, a duplicate of which he could not justify building on his own, due to his small scale. It effectively reduces the entry fee for prospective operators in the sector and, in principle, increases competition.

4.43 The degree of regulation of open access may vary. In major inter-state (U.S.) or inter-provincial (Canada) facilities both the tariff and method of apportionment of capacity are explicitly and directly controlled by a central regulatory authority. In the case of certain smaller intra-state/provincial facilities a more "laissez-faire" approach is taken whereby the shippers/users are left to make their own arrangements for access with the owner/operator of the facility. State or provincial regulators would only intervene in the event of a complaint from a shipper who has been denied access or charged an excessive tariff.

4.44 It is recommended that the government proceed to full price deregulation and liberalization of product imports in two phases:

Phase 1: Continuance of price control with an improved import parity price formula maintained and administered by the Prices Commission. Creation of a Hydrocarbons Directorate in MPUTE with responsibility as technical secretariat to all government petroleum regulation, monitoring and sector management activities. The functions that such a Directorate would support would include the regulatory and monitoring functions of the Prices Commission, including import parity price formula and common carrier tariff and capacity allocation, as well as those of other bodies charged with the establishment and regulation of industry standards of health, safety, environment, weights and measures and product quality. The Directorate would play the lead role as government coordinator and program/project director in the establishment of industry standards and monitoring systems to be utilized by the appropriate bodies with legislative or judiciary authority. Because of the important role envisaged for this body, the key staff would have to be well-seasoned professionals with expertise in all aspects of international crude oil and product pricing, supply, affreightment and marketing as well as end-use product quality and utilization. The joint experience of the Directorate and the Prices Commission with revision and administration of the import parity price formula in this phase, would serve as the foundation of the subsequent price monitoring function.

Phase 2: Full price deregulation and import liberalization. The Price Commission would maintain an industry price and profitability monitoring function as well as regulating terminal common carrier tariff and capacity allocation.

4.45 Under either system, the supply cost of product to Jamaica should be reduced. The total reduction in landed cost through the implementation of reductions discussed in paras 4.3 to 4.26 is estimated by the Consultants to be on the order of US$15 million per annum. The details of this cost reduction calculation is included as Annex 4.1.

Performance of Refinery

4.46 In recent years, Petrojam has run its refining facilities (refer to process schematic diagram Annex 6.1, Figure 1) at well below the officially quoted capacity of 35,500 barrels per calendar day (BPCD), importing as finished products a major portion of Jamaica's product requirements. Table 4.1 provides a summary of the product imports, crude runs and attendant refinery capacity utilization over the past five years. More details of total refinery production and imports by individual products for the same five years are provided in Annex 4.2. As indicated, crude throughput has averaged about half of official rated capacity, with imports of finished products by Petrojam averaging almost half of total product supplied.

TABLE 4.1: JAMAICA - PETROJAM REFINERY OPERATING PERFORMANCE

	86-87	87-88	88-89	89-90	90-91	AVERAGE 5 YEARS
CRUDE RUN BPD	15,642	13,454	14,668	17,502	20,415	16,336
AS % OFFICIAL CAPACITY	44%	38%	41%	49%	58%	46%
TOTAL PRODUCT SUPPLY	26,587	24,789	27,160	29,526	30,211	27,709
PRODUCT IMPORTS	12,292	12,077	13,268	12,879	10,674	12,238
AS % SUPPLY	46%	49%	49%	44%	35%	44%

4.47 An analysis of this low utilization record was conducted; while not purporting to approach a performance audit in degree of detail, this brief study indicated that the low throughput was attributable to a complex mix of physical, economic and financial constraints. Among these discussed below are:

(a) Overstatement of rated capacity due mainly to an unrealistically low assumption for planned and unforeseen plant outages.

(b) The physical and economic constraints imposed on the entire plant by lower than required powerformer capacity; these constraints should further de-rate the plant's official capacity.

(c) Crude run cutbacks, run-outs, and alternate product purchases due to lack of timely provision of foreign exchange for crude purchases.

Capacity Definition

4.48 The Petrojam refinery has a rated design capacity of some 38,000 barrels per stream day (BPSD). This level has been verified by test runs and represents the maximum amount of design (medium gravity) feedstock that the refinery can process through the atmospheric pipestill on a short-term uninterrupted run without encountering constraints in any of the downstream processing equipment, with

the exception of the powerformer (discussed below). After allowing for total plant downtime per year of 24 days for planned maintenance and unforeseen outages, the refinery currently rates its longer-term average processing capacity at 35,500 barrels per calendar day (BPCD).

4.49 Based on required regularly scheduled maintenance shutdowns, combined with a realistic estimate of unforeseen outages, this total plant downtime is considered unrealistic; the calendar day capacity of the plant is, therefore, overstated at 35,500. Annex 4.2, Table A4.2 provides documentation of the refinery outages over the past five years. All the information on each outage is classified by year, month, duration of the outage in days, and reason for the shutdown. This was assembled in database format and data extracts by each reason for outage were performed. Table 4.2 presents a summary of this detailed database analysis.

TABLE 4.2: PETROJAM REFINERY SUMMARY/ANALYSIS OF PLANT OUTAGES FOR 5 YEAR PERIOD 1986-90

DURATION IN DAYS

	ENTIRE DATABASE	PLANNED	UNPLANNED (MECH)	POWER CUT	CRUDE RUNOUT
TOTAL NUMBER OF OUTAGES 5 YEARS (NO)	37	9	14	8	6
TOTAL DURATION OF OUTAGES 5 YEARS (DAYS)	409	261	70	8	70
AVERAGE NUMBER OF OUTAGES PER YEAR (NO)	7.4	1.8	2.8	1.6	1.2
AVERAGE DURATION PER OUTAGE (DAYS)	11.1	29.0	5.0	1.0	11.7
AVERAGE TOTAL OUTAGE TIME PER YEAR (DAYS)	81.8	52.2	14.0	1.6	14.0
AVERAGE SERVICE FACTOR	77.6%				

4.50 Over the past five years there were a total of 409 days of downtime, in 37 separate shutdowns. This represents an average downtime of 82 days per year, or an overall service factor of some 78 percent. Planned shutdowns averaged almost 2 per year for a total of 52 days per year. This confirms actual refinery practice of planning one major maintenance turnaround per year for complete plant overhaul, including powerformer catalyst regeneration, and a second maintenance turnaround of shorter duration roughly 6 months later, for powerformer catalyst regeneration alone. It is not possible, because of a lack of hydrogen for distillate treating, and no intermediate product tankage, to run an effective refining operation during the second powerformer shutdown; too much unfinished product would have to be slopped and rerun later. It has been the practice, therefore, to shut down the entire plant during this regeneration, and program other maintenance tasks to be performed at the same time. With the present (1991) status of the powerformer, it is therefore assumed that there is a planned shutdown of the entire plant every 6 months. A realistic duration for these shutdowns would be 30 days for the main turnaround and 15 for the second, or a total of 45 days per year allocated for planned outages. A realistic assumption for unforeseen mechanical outages would be 10 days per year. The total realistic "efficient" downtime would, therefore be 55 days per year, or a service factor of 85 percent. This would result in a physical capacity limit on the plant of 32,300 BPCD.

Powerformer Capacity

4.51 The actual stream day capacity of the powerformer is some 3,500 barrels per day. Based on a linear programming analysis of unconstrained capacity used by the powerformer at different crude runs for a typical product slate and feedstock, it is estimated that this constrains the pipestill and refinery overall capacity to some 29,000 barrels per stream day. The results of this analysis are summarized in Table 4.3. It should be pointed out that this is a combination of an economic and a physical constraint. It would be possible to force a bit more crude through the pipestill and still meet product requirements, but at a higher cost; the actual physical limit beyond which naphtha would have to be bypassed around the powerformer to direct sale would occur at approximately 3,000 BPSD above this average economic limit, or about 32,000 BPSD. If it is assumed, therefore, that the refinery is constrained to the economic limit of 29,000 BPSD for a total of 310 run days per year, the effective economic capacity is 24,600 BPCD.

TABLE 4.3: PETROJAM -LINEAR PROGRAMMING ANALYSIS OF RELATIONSHIP BETWEEN CRUDE RUNS AND ECONOMICALLY OPTIMUM POWERFORMER CAPACITY

VARIOUS "BUSINESS AS USUAL" REFINING CASES WITH UNCONSTRAINED POWERFORMER CAPACITY FOR FORECAST DEMANDS AND PRICES 1991-97

	CRUDE RUN kBD	POWERFORMER CAPACITY USED, kBD
	28.97	3.69
	29.43	3.90
	31.06	3.61
	31.70	3.53
	32.12	3.56
	28.50	3.87
	28.50	3.88
	31.42	3.75
	32.27	3.55
	32.59	3.73
AVERAGE	30.66	3.71
	BASED ON THESE AVERAGES CRUDE RUN CONSTRAINED TO ACTUAL POWERFORMER CAPACITY	
	28.94	3.50

Foreign Exchange Constraints

4.52 In addition to the above-documented physical and economic constraints on Petrojam crude running capacity there has been an experience of low crude running, crude run-outs and "emergency" product importation to cover low inventory, due to the lack of timely opening of letters-of-credit for crude purchases. Petrojam has documented the nature and impact of numerous incidents of L/C delays over the

past few years. These delays occur in spite of advice to the Bank of Jamaica on a yearly basis of Petrojam's estimated foreign exchange requirements and timing of proposed crude purchases as well as precise amount and timing information 3 to 4 weeks prior to lifting.

4.53 A typical scenario involves the scheduling of purchase of a crude cargo for a given month from Venezuela, to be lifted about the 10th. About the 15th of the month before lifting, the BOJ is requested to open a letter-of-credit for this cargo. In the ensuing few days Petrojam Logistics is involved in communications back and forth with BOJ and the crude supplier to finalize quantity, quality and window of availability. Petrojam must, during this same period, arrange for the affreightment of the crude in accordance with the available loading window.

4.54 Despite the best efforts on notice and communications with BOJ, a delay often occurs in opening of the L/C. There is usually little advance notice of the delay before the loading date. The cause of delay is generally that the credit limits provided by the finance organizations involved (e.g. Austin Blades, BCCI) are exceeded. Delays as long as 20 days are experienced, leading to cutbacks in crude runs by Petrojam, arrangements for importation of small cargo lots of finished product to cover inventory, and payment of demurrage charges on crude vessels waiting in load port. If the delay in L/C is severe, the reduction in crude runs may be insufficient to avoid a crude run-out and the refinery shuts down. As indicated by Table 4.2 there were 6 run-outs caused by L/C delays over the past five years for a total average downtime of 14 days per year. What this outage record does not account for, however, is the lost capacity due to reduced crude running while awaiting the L/C. This further loss would probably be equivalent to at least half of the lost capacity due to actual run-outs for a total of 21 days per year of effective capacity lost due to L/C problems.

4.55 Indirect evidence of the extent of this L/C delay problem may be derived from the figures on demurrage charges incurred on crude oil shipping over the 1988-90 period. There is a close relationship between L/C delays and demurrage charges. Table 4.4 provides a summary of this information.

TABLE 4.4: PETROJAM - DEMURRAGE CHARGES ON CRUDE SHIPPING

	1988	1989	1990
TOTAL 000s US$	149	390	655
NUMBER OF INCIDENTS	5	7	10
ESTIMATED DELAY DAYS*	12	33	55

*Estimated by mission using an average US$12,000 per day.

Summary/Conclusion

4.56 The total effective capacity of Petrojam as it is presently configured, with allowance planned and unforeseen mechanical outages, constrained powerformer, and persistent L/C problems would be some 23,000 BPCD, as shown in Table 4.5. On the basis of these revised capacities, the 5 year performance record would indicate an average 71 percent utilization of economic capacity over the period and a utilization of 89 percent in the latest fiscal year.

TABLE 4.5: PETROJAM REFINING CAPACITY

	ECONOMIC	PHYSICAL
STREAM DAY LIMIT DUE TO POWERFORMER	29,000	32,000 BPD
PLANNED AND UNFORESEEN MECH. OUTAGES	55 DAYS	
ALLOWANCE FOR L/C DELAYS	21 DAYS	
TOTAL RUN TIME PER YEAR	289 DAYS	
CALENDAR DAY LIMIT	23,000	25,300 BPD

V. PRODUCT DEMAND

5.1 A major input to the analysis of sector issues in general, and in particular to the screening study of least cost supply options, is a forecast of Jamaica's future product demands. Annex 5.1 incorporates the base assumptions and forecast summary of such a projection to the year 2010 based on expectations as of late 1990/early 1991.. As indicated the approach was to break each main product category to the extent possible into sub-categories by end-use, define a forecast rationale for each of these, and then sum these individual lines into product totals by product class. An over-all economic (GDP) growth rate of 3 percent per annum was assumed, consistent with the latest World Bank projections for Jamaica. Table 5.1 provides a summary by product class and key forecast years.

TABLE 5.1 JAMAICA PETROLEUM PRODUCT DEMAND FORECAST

Thousands Barrels

	ACTUALS	<----------FORECAST---------->				
	1989	1991	1995	2000	2005	2010
LPG	473	521	634	809	1,084	1,317
AVGAS	14	15	17	19	23	26
MOTOR GASOLINE	1,949	2,068	2,328	2,698	3,222	3,626
KERO/TURBO	1,571	1,675	1,906	2,248	2,752	3,157
AUTO DIESEL	1,789	1,513	1,856	1,862	2,471	2,838
MARINE DIESEL	503	496	569	619	694	754
HFO LOCAL	3,782	4,554	5,098	3,996	3,273	3,910
HFO BAUXITE	5,242	7,143	7,057	7,057	7,057	7,057
TOTAL FUEL PRODUCTS	15,322	17,985	19,464	19,309	20,576	22,685
LUBES	83	92	112	143	191	233
ASPHALT	97	109	138	185	262	331
TOTAL ALL PRODUCTS	15,503	18,186	19,714	19,637	21,030	23,249
EQUIVALENT KBD						
TOTAL ALL PRODUCTS	42.5	49.8	54.0	53.8	57.6	63.7
EXCLUDING BAUXITE	28.1	30.3	34.7	34.5	38.3	44.4

5.2 As indicated, actual consumption of some 15.5 million barrels in 1989 is projected to increase to increase to 19.6 million by the year 2000 and 23.2 million by 2010. The corresponding figures in kBD are 42.5, 53.8 and 63.7 respectively. These figures include a significant demand, primarily heavy fuel oil, by the bauxite/alumina industry. As discussed in Annex 5.1 this industry is not required to source its fuel requirements from the Petrojam refinery and may engage in direct importation, or local sourcing as it chooses. The bauxite companies generally put their fuel requirements up for competitive bidding on a yearly basis. Due to a combination of price uncompetitiveness and quality, Petrojam is generally excluded from supplying HFO to the bauxite industry. As illustrated, total Jamaica consumption excluding this major HFO requirement was 28.1 kBD in 1989, projected to increase to 34.5 KBD by 2000 and 44.4 kBD by 2010.

5.3 Table 5.2 illustrates Jamaica's actual and forecast product mix, based on the two (bauxite HFO, non-bauxite HFO) cases. As illustrated the Jamaican demand mix with bauxite included is a relatively heavy one, with HFO accounting for more than half total requirements on a volumetric basis. This HFO proportion drops to the 35 to 40 percent range without bauxite considered in the total mix.

TABLE 5.2 JAMAICA PRODUCT DEMAND MIX
(Volumetric basis, Fuel Products Only)

	WITH BAUXITE			W/O BAUXITE		
	1989	1995	2000	1989	1995	2000
LPG	3.1%	3.3%	4.2%	4.7%	5.1%	6.6%
AVGAS	0.1%	0.1%	0.1%	0.1%	0.1%	0.2%
MOTOR GASOLINE	12.7%	12.0%	14.0%	19.3%	18.8%	22.0%
KERO/TURBO	10.3%	9.8%	11.6%	15.6%	15.4%	18.3%
AUTO DIESEL	11.7%	9.5%	9.6%	17.7%	15.0%	15.2%
MARINE DIESEL	3.3%	2.9%	3.2%	5.0%	4.6%	5.1%
HFO	58.9%	62.4%	57.2%	37.5%	41.1%	32.6%
TOTAL FUEL PRODUCTS	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

VI. LEAST COST SUPPLY OPTIONS

6.1 There are several options for future supply of petroleum products to Jamaica which vary in respect to both supply infrastructure and institutional/regulatory framework. The principal infrastructure variations involve terminaling of imported finished products versus refining in Jamaica of imported crude oil to finished products. Within the Jamaica refining option, there are different feedstock selection, equipment configuration and capacity variations possible for crude processing to meet Jamaica's demand alone. In addition to refining to meet national demands, there are incremental export refining possibilities, which if profitable, could serve to reduce the net cost of Jamaica's supply needs. The institutional/regulatory variations involve different ownership structures for the supply facilities as well as aspects of project financing and regulation of price and trading.

6.2 In view of the complexity of analyzing simultaneously all the infrastructure and institutional/regulatory options a two-phase approach was used for the over-all analysis of the least cost supply options:

(a) An economic screening study of a number of discrete supply facilities cases.

(b) A detailed financial evaluation of the most economically attractive of the facilities cases.

6.3 This chapter summarizes the economic screening study of various alternative petroleum product supply/refining investment cases. Chapter VII presents the financial evaluation of selected cases.

Methodology

6.4 The following presents the methodology of the study:

(a) A limited number of reasonable, discrete petroleum product supply/refining investment cases were selected and defined for analysis.

(b) A detailed process engineering analysis of each investment case was executed; this included the required equipment configuration, capacities, and attendant capital and operating costs associated with each case. This analysis, the results of which are included as Annex 6.1, also incorporates environmental and product quality considerations related to each case.

(c) An integrated international/regional crude oil and product price forecast was prepared. Annex 6.2 comprises this crude and product price forecast spreadsheet, with accompanying documentation.

(d) A Petrojam refinery linear programming (LP) model was modified and adapted to the needs of the study; some 100 LP cases were prepared and run in order to define the refinery crude selection, material balance, and equipment configuration for selected future years for the different refinery investment cases. The optimization objective was to satisfy at minimum cost, the Jamaican petroleum product demands as outlined in Chapter V.

(e) A detailed economic cash flow model (using Lotus 1-2-3 software) was prepared which integrates all the LP outputs, i.e. refinery production, import and export balances, with crude and product prices, Jamaica demand volumes, investments and operating costs for the different investment cases; Economic Internal Rate of Return (EIRR) and Net Present Value (NPV) were calculated for each of the refining cases, incremental to a base all-product-import case.

(f) The economic analysis framework with illustration of all data flows and linkages is outlined in the flowsheet, Figure 6.1.

(g) The EIRR and NPV results were analyzed for sensitivity to lower Jamaican demand on the refinery and to lower refining margins than in the base product/crude price relationship.

Case Selection

6.5 The alternative cases were selected and defined through the process of reviewing earlier studies on investment and expansion options, and extensive discussions with Petrojam refinery technical staff. The earlier studies included:

(a) ESMAP Report on Petroleum Procurement, Refining and Distribution, November 1986.

(b) Several Petrojam in-house studies of refinery upgrading and expansion conducted since 1986.

(c) Japan Consulting Institute, "Feasibility Study on Fuel Oil Upgrading Project in Jamaica," May, 1987.

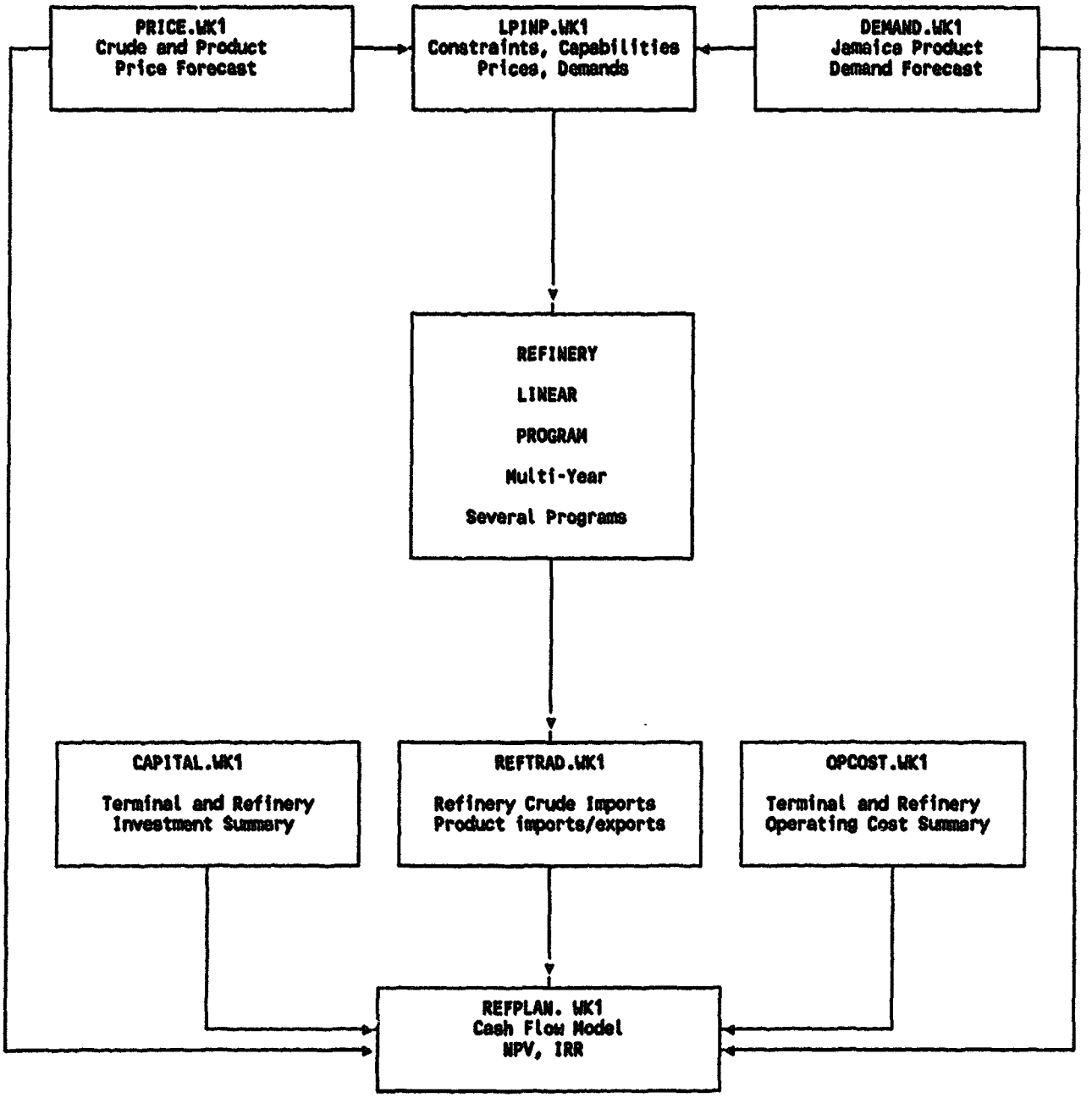
(d) Purvin & Gertz, "Petrojam Refinery Valuation Study," January, 1986.

6.6 Five petroleum product supply cases were defined as follows:

(a) **Base (terminaling)** - Shut down the refinery process units and import all products using the existing port facilities, transfer lines, tankage and other refinery offsites as required for the terminaling operation. It was anticipated that some minor investments would be required in tankage modification/conversion, product line tie-ins and cross-overs and environmental control facilities.

(b) **Alternate (refining) I** - "business-as-usual," minimum investment in the existing refinery in order to carry on business, but with enhanced efficiency and capability of meeting all anticipated product specifications and environmental standards. This case was projected to involve a reformer upgrade, an light naphtha isomerizer for 100 percent unleaded gasoline production capability, some tankage, and immediate pollution abatement. The refinery would remain a hydroskimmer with the same rated pipestill capacity as at present, 35,500 BPD. There would be no cracking/conversion or atmospheric pipestill debottlenecking investment.

FIGURE 6.1: JAMAICA ESSIP STUDY - SCHEMATIC OF PETROLEUM SECTOR ECONOMIC MODELING SYSTEM



(c) **Alternate (refining) II** - intermediate investment in a catalytic cracker with capacity balanced to the existing pipestill capacity, primarily for reduction in the cost of product spikes or lighter whole crude feedstock to meet the given domestic product demand. There would be no atmospheric pipestill debottlenecking investment, capacity remaining at 35,500 barrels/day, but all the necessary product quality and pollution abatement investments would be included as in Case I.

(d) **Alternate (refining) III** - maximum investment at existing site in a larger catalytic cracker plus a major debottlenecking/expansion of crude running to the highest practical level at this refinery site, with the existing pipestill. The expanded crude capacity would be 50,000 bbl/day and the cat cracker capacity would be increased to the balanced level. The incremental investment above Case II is primarily devoted to an export refining capability.

(e) **Alternate (refining) IV** - site and facilities expansion This case would incorporate all investments as in (d) plus a new pipestill and processing unit. Because of space limitations at the existing site, some existing tanks would have to be relocated, and additional storage tanks built on a separate site, identified as land to be reclaimed near Portmore Causeway. The total capacity of the expanded refinery is assumed to be 100,000 bbl/day. It would be a major export refining case.

Process Engineering Analysis

6.7 The base terminaling case and the refining cases I, II and III defined above were analyzed by RTM Engineering Ltd., Calgary, Alberta, Canada, at the prefeasibility level of definition to arrive at required process configurations and capacities and attendant capital and operating costs. The major export refining Case IV was defined in terms of preliminary concepts only, with resultant order-of-magnitude capital and operating costs defined. The results of this study are contained in Annex 6.1, "Jamaica Energy Strategy and Investment Planning Study, Petroleum Subsector, Process Engineering Analysis." The main outputs from this study were used as inputs to the economic cash flow analysis and financial evaluation, as summarized in Table 6.1.

6.8 The main objective of the analysis was to define the technical and economic parameters of the selected cases so that the cash flow screening analysis and financial evaluation could be performed with confidence. Optimization decisions such as the sizing of selected upgrade facilities and amount of pre-investment to include in procurement of major equipment are properly left to a commercial operator to make in the process design phase.

TABLE 6.1: SUMMARY OF OUTPUTS FROM PROCESS ENGINEERING ANALYSIS

	BASE TERMINAL	REFINING ALTERNATES I	II	III	IV
PROCESS UNIT CAPACITIES, KBCD					
CRUDE PIPESTILL(S)	NA	35.5	35.5	50.0	100.0
POWERFORMER(S)	NA	5.0	5.0	5.0	12.0
CATALYTIC CRACKER	NA	NA	11.5	17.5	18.5
LVN ISOMERIZER	NA	2.0	2.0	2.0	6.0
HYDROCRACKER	NA	NA	NA	NA	15.0
VISBREAKER	NA	NA	NA	NA	18.5
ALKYLATION	NA	NA	NA	NA	2.3
CAPITAL US$ MILLION 1991					
PROJECT	2.6	15.5	130.5	175.7	737.0
SUSTAINING, YEARLY	0.4	2.5	3.3	3.7	5.0
OPERATING COSTS					
FIXED US$ MILLION/YR	5.7	11.0	15.2	17.9	31.1
VARIABLE US$/BbL	0.06	0.22	0.32	0.38	0.36

6.9 As indicated, the main process unit capacities and capital and operating costs for each case are compared. The project capital investment, ranging from US$ 15.5 million in refining alternate I, to US$ 737 million in case IV, is all spent over a three to four year period at inception. The sustaining capital investment is an estimate of the regular yearly extent of renewal and rehabilitation expenditure required to maintain the operating capability of an ageing plant.

6.10 The capital investment for each case includes provisions for pollution abatement facilities such that the refinery would conform to present average North American standards in all cases. These investments include a sour water stripper, impermeation of tankage dyked areas, improved oily water collection, additional new oily water separators combined with downstream dissolved air flotation, and, in the FCC cases, recovery of sulfur from off-gases.

Crude and Product Price Forecast

6.11 An essential input to this product supply/refining investment analysis is an integrated crude oil and product price forecast. Annex 6.2 comprises a description of the basis for this projection and summarizes the actual year-by-year prices in spreadsheet form. Since the product-crude relationship implicitly embodies a gross refinery margin assumption, it is probably the single most important body of input data relevant to the determination of the economics of refining compared with direct product importation. This forecast is based on the assumption of a return to pre-crisis crude supply/demand balances and price levels after the Iraq/Gulf conflict. It conforms to the World Bank Scenario "rapid return to normalcy" prepared in the fall of 1990 by the International Commodity Markets Division. The Bank forecast of crude price was shown in terms of the "OPEC average" crude price only. From the base forecast of "OPEC average" price, the prices of OPEC and non-OPEC crudes, including common

reference grades, were derived using historical price differentials. Table 6.2 provides a summary of the resultant crude price forecast for key forecast years.

TABLE 6.2: CRUDE PRICE FORECAST BASED ON DIFFERENTIALS FROM WORLD BANK FORECAST OF OPEC AVERAGE

	US$/BARREL (1990 CONSTANT PRICES) ALL FOB SOURCE, EXCEPT ANS				
	1991	1995	2000	2005	2010
"OPEC AVERAGE"	22.49	17.76	22.84	22.49	22.49
WTI	24.60	19.52	24.98	24.60	24.60
ANS CIF USGC	22.74	17.95	23.10	22.74	22.74
BRENT	23.52	18.44	23.90	23.52	23.52
ARAB LT.	21.03	16.61	21.36	21.03	21.03
LAGOTRECO 31	21.84	17.24	22.18	21.84	21.84
FURRIAL	21.14	16.78	21.54	21.11	21.23
BCF 24	19.74	15.70	20.22	19.67	19.95
BCF 17	16.94	13.62	17.54	16.74	17.33
ISTHMUS	22.78	17.99	23.14	22.78	22.78
MAYA	18.94	15.11	19.45	18.83	19.20
FORCADOS	23.85	18.77	24.23	23.85	23.85
ORIENTE	21.41	16.50	21.77	21.41	21.41

6.12 The absolute level of these crude prices is only relevant to a refining project analysis in that it sets a general price and supply/demand environment for products in relation to crude. This forecast represents a relatively low crude price forecast compared with the "conventional wisdom" of one or two years ago. On the basis of low real price of petroleum compared with other cost factors, a stimulation of product demand is expected. The anticipated strong growth in product demand will fully utilize a much-reduced international/regional refining capacity. Extreme measures were taken in the early 1980s to rationalize refining as a reaction to the collapse in petroleum demand. This action resulted in refinery shutdowns, decommissioning and outright scrapping of plant on a massive scale worldwide. Total world refining capacity declined by about 10 million barrels per day or 20 percent of pre-rationalization levels.

6.13 Consistent with this "stimulated demand" scenario it is expected that refining margins will be healthier in the future in order to support the necessary capacity expansion and upgrading investments. There are, in fact, concerns that not enough new capacity is under construction or on the drawing boards at the moment. Just prior to the Iraq crisis in summer 1990, the refinery utilization rates in the US peaked at just over 90 percent. With the combined effect of higher oil prices and the economic recession, rates declined to the 85 percent range recently but are expected to rebound strongly with economic recovery and the stimulus of lower oil prices. Many of the major oil companies in the US, with complex upgraded facilities, ran their plants close to flat-out during the peak summer 1990 gasoline-making period. The industry's stock of upgrading facilities - the cat crackers and cokers to convert heavy residuals to gasoline - is running at close to full capacity. Although West European utilization rates in the 75 percent range indicate spare distillation capacity, much of this under-utilized capacity consists of older, simple, inefficient plant which is not necessarily well-placed logistically with present trading and traffic patterns.

The so-called entrepôt refineries in the Mediterranean, built as export refineries to serve Western Europe, are examples of this type of facility. The entrepôt refineries in the Caribbean were also built for a similar supply role for the US market. Although still performing a useful balancing function, such facilities will need substantial investment if they are to meet the growing demand for light products without flooding the market with an excess of fuel oil.

6.14 Inherent in the base product price forecast of this study are gross refining margins that are slightly higher than the average experienced in the US Gulf Coast during 1988 through mid-1990. As illustrated in Annex 6.2, the US Gulf Coast Cracking refinery gross margin for BCF 17 crude inherent in the present base product price forecast is $4.58/barrel. This margin compares with an estimated average of $4.21/barrel for actual USGC cracking margins over the three years, 1988-90 and $3.48 per barrel over the longer 1986-90 period. The base forecast represents a real increase on average of 9 percent over the 20 year period compared with the 1988-90 average and 32 percent compared with the 1986-90 period. Even the change from 1986-90 only represents a yearly average real compound growth of 2.3 percent from 1988 to 2000, the mid-points of each period. The historical growth and forecast trend in margins are illustrated in graphical form Figures 6.2 and 6.3.

6.15 Margins can reasonably be expected, if anything, to increase to levels well beyond the $4.58 per barrel assumed as an average over the 20 year forecast period. To put this assumption in perspective, a gross margin of roughly $7.00/barrel would have to be earned in order to amortize the capital and pay operating costs on a new cracking refinery, assuming a USGC location and 1991 cost levels. With the projected continuous expansion and upgrading required, in addition to capital replacement, it is expected that gross USGC margins will reach this level in 1991 dollars by the year 2010 at the latest, the end of the forecast period/project life for this study.

6.16 The "Jamaica Grass-Roots Refining" paper, Annex 6.4, reached a similar conclusion that new grass-roots refining will be required in the region at about 2010. Even before then, during the mid to late 1990s, considerable simple topping capacity available in the region will have to be upgraded to cracking and coking at costs per daily barrel (of distillation capacity) that will range 60 to 75 percent of that of new, grass-roots facilities. Such investment will require USGC equivalent gross margins in the $4.50 to $5.50 (1991 real) per barrel range in order to be justified. Assuming a compound growth trend line from $4.00 per barrel margin in 1990 to $7.00 in 2010, the equivalent levelled margin over the period would be $5.37 per barrel. This is 17 percent above the base level assumed for the study. Figure 6.4 illustrates the trend line forecast of margins. The 1995-2000 period of this trend line indicates margins in the US$4.50 to US$5.50 range, which is consistent with the minimum level of margin required to support the upgrading of regional spare capacity.

6.17 When refining margin levels are specified in a planning study, it is understood that they are on the basis of a trend line of two or three year rolling averages. Because of short-term supply/demand imbalances in individual product markets, inventory effects and the medium-term effects of the capital cycle in refinery construction, there will be significant fluctuation around the longer-term moving average. Such volatility in margins is illustrated by the graph figure 6.5, which shows the yearly

moving average USGC cracking margin 1986-90, by quarter as a percentage of the 1986-90 total period average margin. As indicated, yearly margins have ranged from as low as 60 percent to as high as 140 percent of the trend line. The effect of such volatility on the year-by-year cash/financing situation will be examined as a sensitivity in the financial evaluation by assuming a fluctuation profile similar to that in evidence during 1986-90, with the low margin assumed in the early project years.

6.18 There are several world export refining centers and important trading centers with major spot product market activity such as the US Gulf Coast, New York Harbor, Rotterdam, and Singapore. Of these the USGC was chosen as the regional product market most relevant to the pricing and direct product supply to and from Jamaica. The "Caribbean Spot" market, though quoted in Platts, is presently too "thin" to serve as a reliable price reference; its quoted values are largely derived as netbacks from NY Harbour Spot prices and it is seldom used, for example, as reference basis in regional product supply contracts. USGC Spot, on the other hand is a common marker for products in the region.

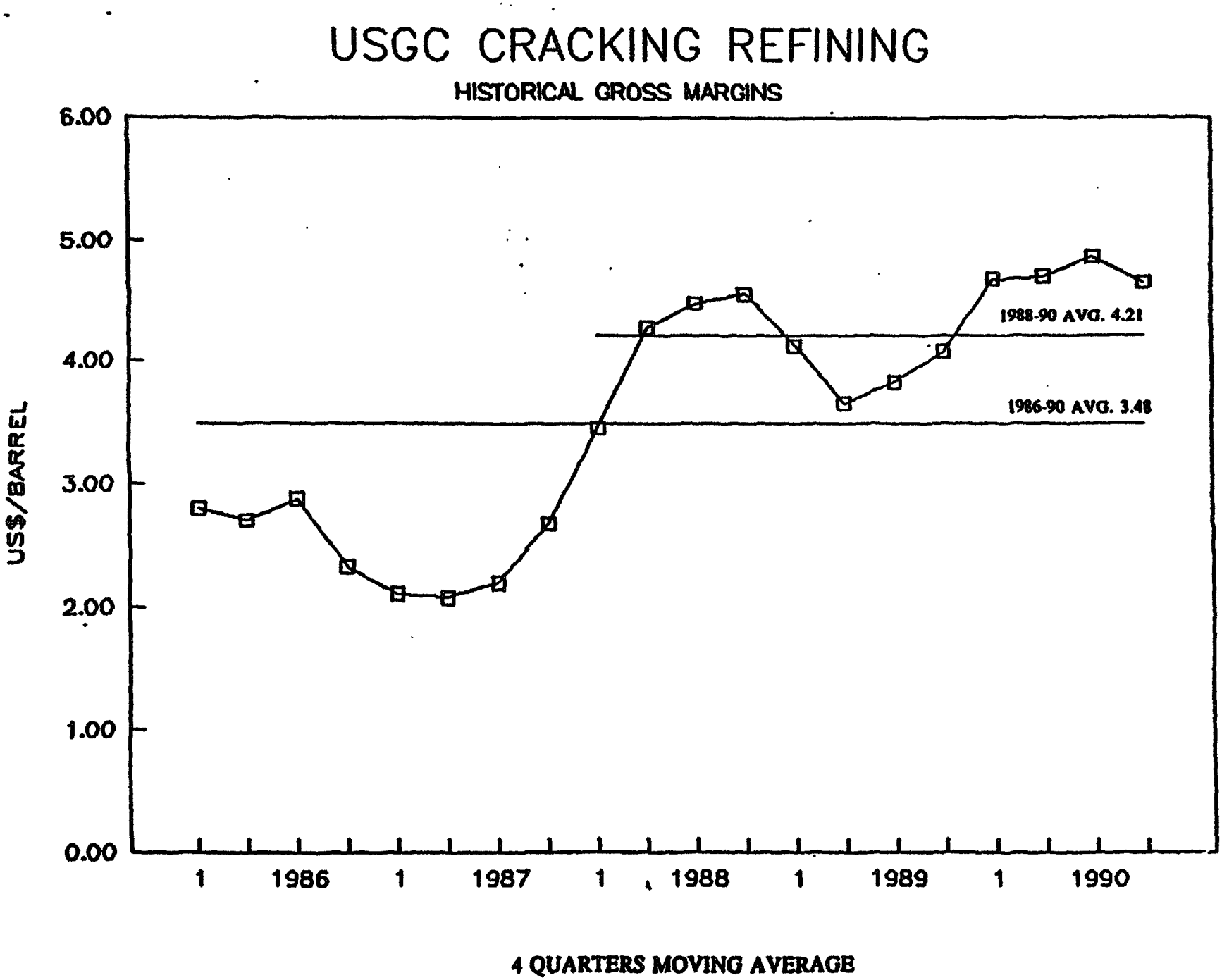


FIGURE 6.2: USGC CRACKING REFINING HISTORICAL GROSS MARGINS

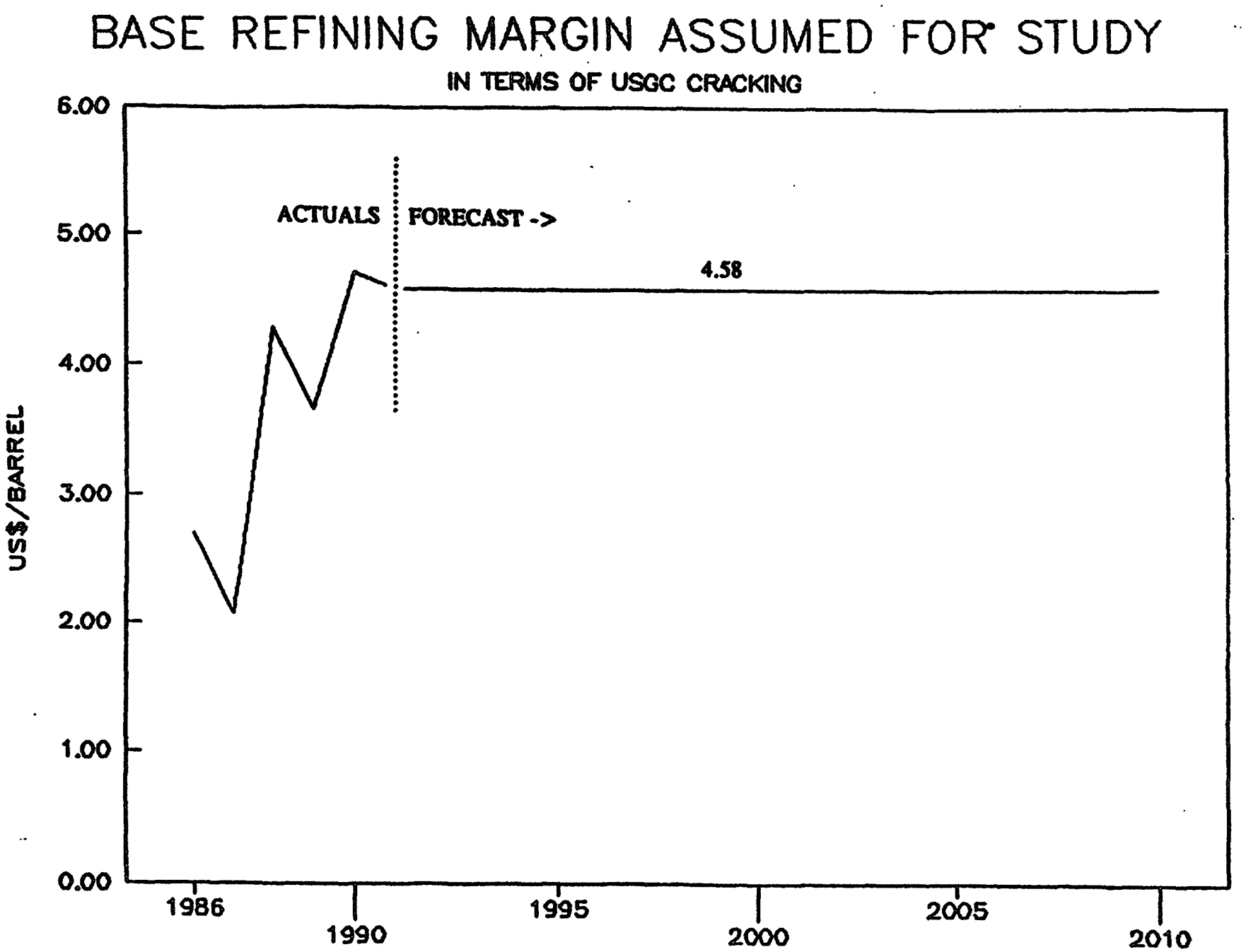


FIGURE 6.3: BASE USGC CRACKING REFINING MARGIN ASSUMED FOR STUDY

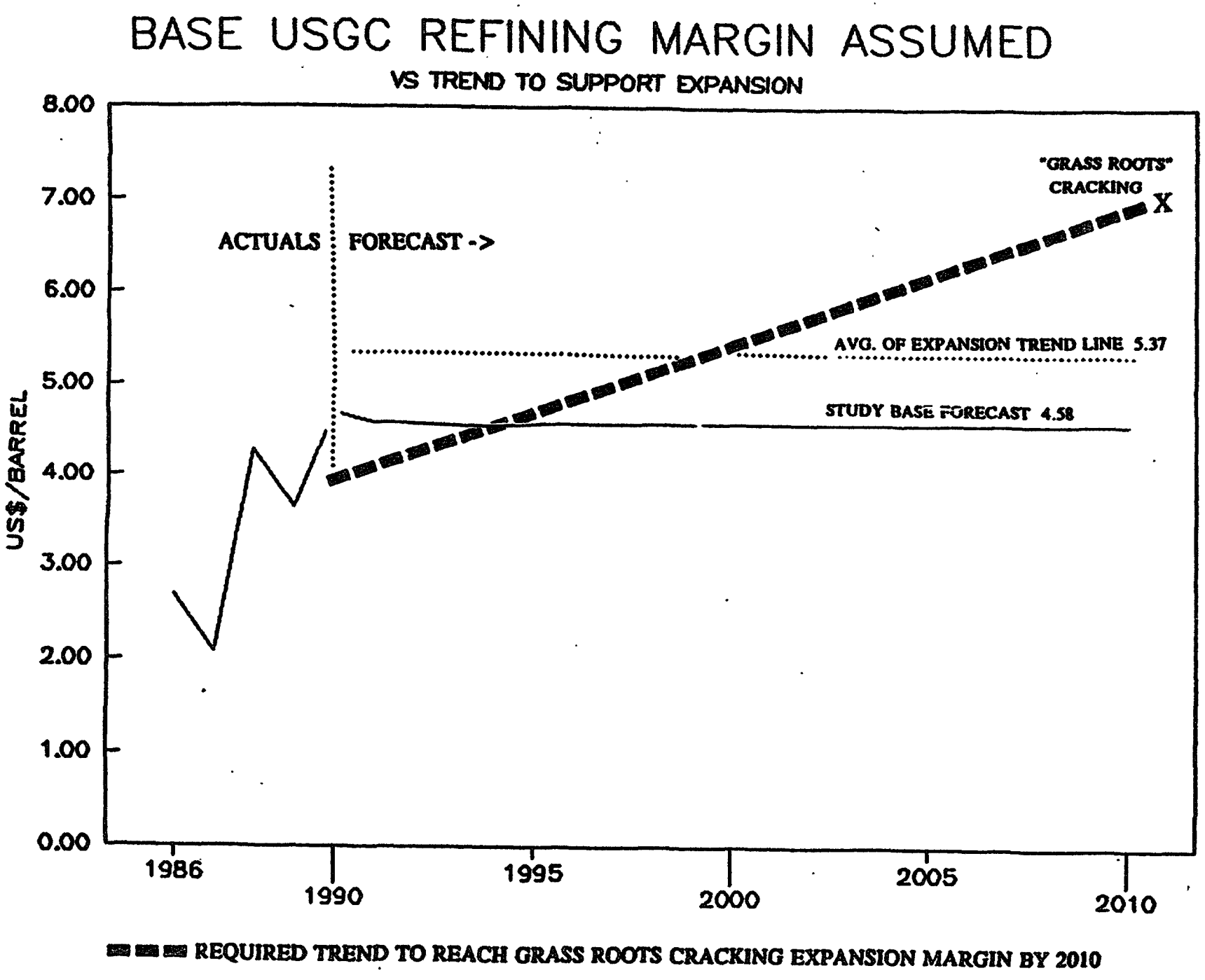


FIGURE 6.4: BASE USGC MARGIN ASSUMED FOR STUDY COMPARED WITH THE TREND IN MARGIN REQUIRED FOR FUTURE EXPANSION

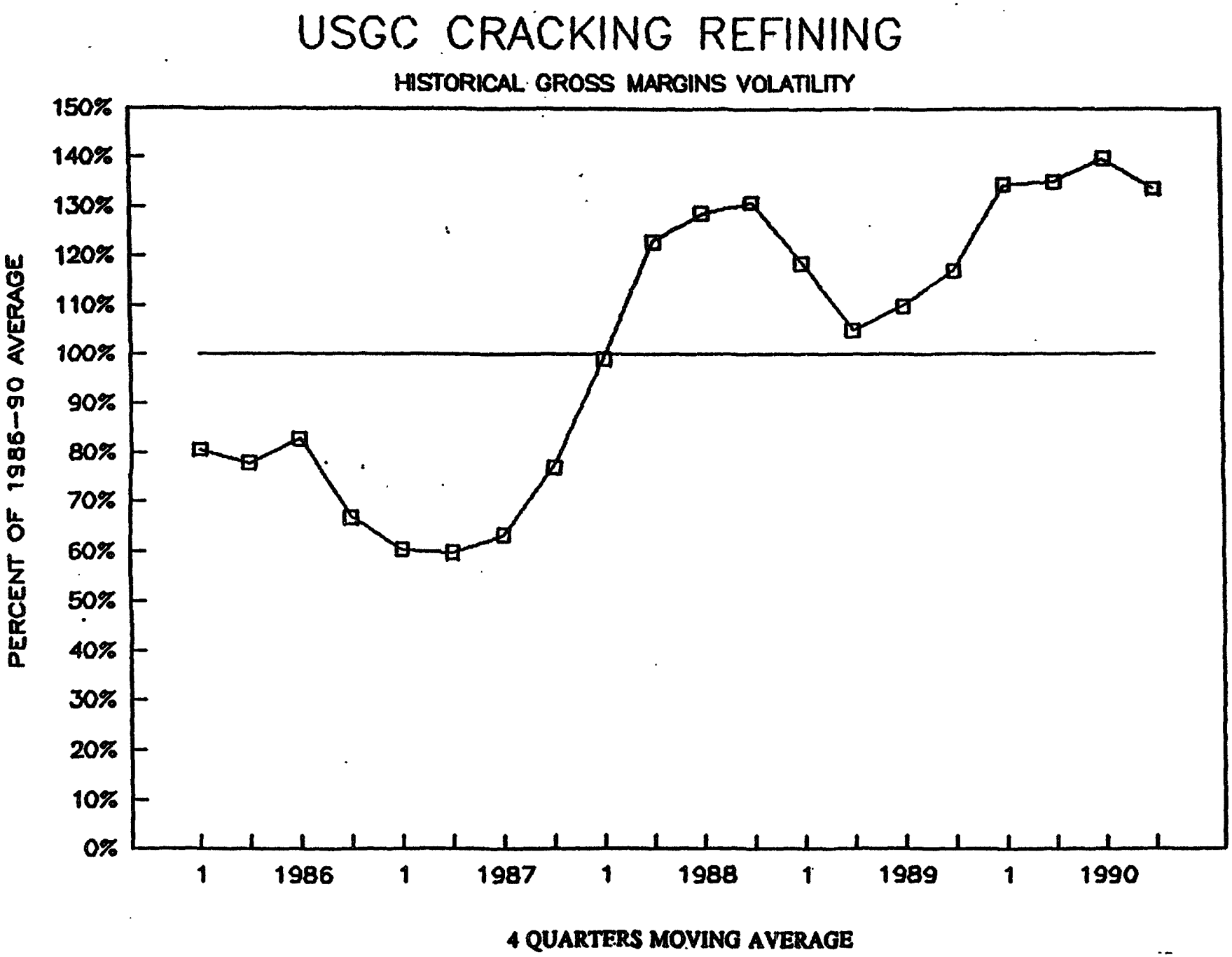


FIGURE 6.5: USGC CRACKING REFINING MARGINS - HISTORICAL VOLATILITY

6.19 A base USGC Spot product price forecast was developed in relation to the crude forecast by using the gross cracking refinery margin of $4.58 per barrel for BCF 17 crude combined with typical product yields and inter-product price relationships. A summary of the projected prices for main products for key forecast years is provided as Table 6.3. The average of product prices over the forecast period was also compared with the price of the principal regional marker crude, West Texas Intermediate (WTI). These product to crude price relationships are illustrated in Table 6.4

TABLE 6.3: FORECAST OF USGC SPOT PRODUCT PRICES

US$/BARREL (1990 CONSTANT PRICES)

	1991	1995	2000	2005	2010
PROPANE	16.01	12.88	16.58	15.82	16.38
BUTANE	19.92	16.02	20.63	19.69	20.38
ULR MOGAS	31.43	25.28	32.56	31.07	32.17
JET/KERO	31.63	25.44	32.77	31.26	32.37
NO.2 GASOIL	30.00	24.13	31.07	29.65	30.70
MDO	29.00	23.33	30.04	28.67	29.68
HSFO	15.60	12.55	16.16	15.42	15.96

TABLE 6.4: RELATIONSHIP OF AVERAGE OF FORECAST USGC SPOT PRODUCT PRICES TO WEST TEXAS INT. (WTI) MARKER CRUDE PRICE

	$/BARREL	PERCENTAGE OF CRUDE
WTI CRUDE	23.12	100%
PROPANE	15.14	65%
BUTANE	18.84	81%
ULR MOGAS	29.73	129%
JET/KERO	29.92	129%
NO. 2 GASOIL	28.37	123%
MDO	27.43	119%
HSFO	14.75	64%

6.20 Venezuela has traditionally supplied product "spikes" in whole crude grades, primarily to small simple refineries in the Caribbean area which were designed by the multinationals as satellites to their large crude supply/refining complexes in Venezuela. These spikes are semi-finished products added at the Venezuelan refinery to whole crude grades such as BCF 24. The Venezuelans price these products based on their opportunity values in alternate dispositions. Table 6.5 provides a summary of the forecast prices for spikes CIF Kingston. The basis for this forecast was established in discussions with Lagoven officials.

TABLE 6.5: FORECAST OF PRICES OF VENEZUELAN SPIKES

US$/ BARREL (1990 CONSTANT PRICES)

	1991	1995	2000	2005	2010
BUTANE	20.72	16.82	21.43	20.49	21.18
NAPHTHA	26.40	21.23	27.34	26.09	27.01
KEROSENE	32.63	26.44	33.77	32.26	33.37
GASOIL	29.00	23.13	30.07	28.65	29.70

6.21 The base 1991 marine freight rate assumptions and assumptions on freight escalation over the forecast period, for delivery of crude to Kingston and/or product to and from Kingston are as follows:

1991 BASE

(a) Venezuelan and Mexican crudes 170 percent Worldscale (WS)
(b) Nigerian or Brent 150 percent WS
(c) Arab light 55 percent WS to Caribbean plus transhipment cost
(d) Oriente from Ecuador US$1.40 per barrel.
(e) Dirty product in the Caribbean 200 percent WS
(f) Clean product in the Caribbean 250 percent WS

ESCALATION

(g) 3 percent real increase per annum to the year 1997; no increase thereafter

6.22 The USGC Spot product prices combined with freight assumptions and minor quality adjustments to the current Jamaican standards were used to derive import parity prices for each Jamaican product. In all cases except gasoline it was assumed that the parity basis would be a USGC sourcing plus freight from there. In the case of gasoline it was assumed that there would be major gasoline sourcing possibilities in the southern Caribbean (Venezuela), which on a full terminaling operation would allow for the acquisition of medium range (MR) cargoes from there. On this basis the gasoline parity was established at USGC flat.

6.23 Export parity prices were derived using the same base USGC Spot and freight data. For most of the products, however, it was assumed that significant export markets would be found at locations outside the USGC, such as the southern US east coast. On this basis all clean products were assumed, on the average, to earn an export netback of USGC Spot less one-half the freight Kingston-USGC. In the case of HFO two export parity bases were defined:

(a) Hydroskimming refinery case, straight-run fuel sold either in the USGC as cracker feed or to the local bauxite industry with a debit for heating value; Export parity equal to USGC HFO less one-half the Kingston-USGC freight. This also assumes that the cracker feed option is only available one-half of the time.

(b) Cracking refinery case, low-API, high heat value fuel sold to the bauxite industry earning USGC HFO plus one-half the freight.

6.24 Because of the diminishing and uncertain nature of the San Jose Accord benefits (para 3.11) the pricing of crude and product imports for the study did not explicitly incorporate Accord benefit parameters. The current level of Accord benefit is, however, well within the limits of price sensitivity analyses performed around the Base Case.

LP Model Configuration and Outputs

6.25 An essential analytical tool in both the short-run scheduling of present-day refineries and in the longer-term facilities planning function is the linear programming (LP) model of the particular refinery facility. In the case of Petrojam, their existing LP model was adapted and modified to suit the needs of this study. The principal modifications related to the establishment of a capability for running consecutive multi-year runs, adaptation to running on a personal computer, as well as organization of output reports for ease of inputting to the economic and financial cash flow analysis. No major modifications were made to the matrix equations and coefficients developed by Petrojam.

6.26 Three multi-year series of LP runs were performed with the objective of defining, for each forecast year, the refinery operating balances, crude imports, spike imports, product imports and product exports for the three refining alternates I, II and III defined above. In the cracking cases it was also possible to examine the optimum FCC capacity for the series of runs.

6.27 The required inputs to each case were:

(a) Process unit capacity constraints and marginal running costs of each unit.
(b) Costs per barrel for refinery feedstocks - crude oils and spikes.
(c) Costs per barrel for product imports.
(d) Revenues per barrel for product exports.

6.28 The LP objective is set to select the combination of refinery feedstocks, product imports, refinery operations and product exports which results in the lowest net cost of supplying Jamaica domestic demand. A selection of six crudes and four product spikes (in the Venezuelan crudes) were permitted as potential feedstocks in the modeling:

CRUDES

BCF 17 from Venezuela
BCF 24 from Venezuela
Isthmus from Mexico
Maya from Mexico
Oriente from Ecuador
Forcados from Nigeria

SPIKES (in the Venezuelan crudes)

butane
naphtha
kerosene
gasoil

6.29 Although there was variation in the feedstock mix from run to run the preferred feedstocks were generally BCF 24, BCF 17, Isthmus and Oriente. As discussed under Supply Agreements (paras 3.12-3.15) there was little to choose among these grades when the full series of multi-year runs were analyzed including an examination of shadow values. Maya, however, was US$0.70 to $1.00 per barrel less economic than these crudes, and Forcados some US$3.00 to $4.00 per barrel less attractive. The butane spike is always taken to maximum in all cases, since it is a very economic way to transport this product which is always in deficit when produced from whole crude in the refinery. The naphtha and gasoil spikes are only attractive to the refinery as a hydroskimmer; when cracking is simulated these spikes disappear in most years. In the case of the kerosene spike its high alternate pricing basis always excludes it as a feedstock.

6.30 The refinery utilization is relatively low in the business-as usual case, ranging between 82 percent and 90 percent over the forecast period for the full Jamaican demand on the refinery, and between 50 percent and 87 percent, when half of the gasoline and jet fuel markets are assumed to be unavailable to the refinery. The LP chooses to import a significant amount of product in these cases, rather than producing the product in the available topping capacity. In the cracking cases II and III, the LP chooses to run the refinery at 100 percent capacity throughout, even in the reduced-local-demand cases. It chooses to completely fill the refinery in all years by exporting the surplus.

Cash Flow Modeling Results - EIRR and NPV

6.31 As indicated by the modeling information system flowsheet Figure 6.1, the yearly data on prices, Jamaica demands and the refinery LP outputs - crude/spike runs, product imports and product exports are integrated in a cash flow model. The model also links with the capital and operating costs files which resulted from the engineering analysis. Detailed documentation of this spreadsheet model is provided as Annex 6.3. The results of this cash flow analysis for the base assumptions are provided in

Table 6.6. An LP analysis was not done for Case IV, the 100 KBD refinery on a new site with a major export component. Case IV was evaluated using product yields for BCF 24 developed as part of the process engineering study. It was assumed that total sales from the facility would average 90 KBD over a 15 year period, 1996-2010; based on our domestic demand forecast, 37 KBD would be sold in Jamaica at import parity and the remaining 53 KBD at export parity. The prices are in accordance with the base forecast, and capital and operating costs as defined in the engineering analysis.

6.32 Each refining case was compared with the Base Case alternative of importing all products in a terminaling operation. The net present value of the difference in cash flows between the refining case and terminaling case was then discounted at 15 percent and the associated EIRR was computed. The 15 percent discount rate was used to reflect real minimum returns required in the petroleum industry in view of the risks and uncertainty.

6.33 As indicated, the incremental NPV of Case I (BAU) is positive at $34 million and the EIRR is greater than 100 percent due to the low up-front capital investment in relation to later positive cash flows. In Case II, with balanced cat cracking at the same crude capacity, the NPV is $60 million and EIRR 27 percent versus terminaling. With the much - increased investment of Case III, expanded crude and cracking, the NPV is slightly higher at $71 million, while the EIRR drops off slightly to 25 percent. The flattening to slight decline in returns of Case III is due to the lower refining margins earned on export business as compared to local demands. Local product requirements average about 37 KBD over the project life so that the export component is an important element of this expanded, 50 KBD case. Case IV has the same component of domestic market, but with a total capacity of 100 KBD it is predominantly an export refining operation. The high investment of $737 million due to the expansion to another site and many "grass-roots" facilities, combined with lower margins on the large export component, result in a negative NPV and an EIRR of only 4 percent with the base assumptions.

TABLE 6.6: SUMMARY OF ECONOMIC EVALUATION OF REFINING CASES

REFINING CASES incremental to terminaling case	CAPITAL INVESTMENT US$ Million Jan 1991	NET PRESENT VALUE US$ Million @15% Jan 1991	ECONOMIC INTERNAL RATE OF RETURN Percent	RATIO OF NPV TO CAPITAL
I BUSINESS AS USUAL	16	34	>100%	2.2
II BALANCED CRACKING NO CRUDE EXPANSION	131	60	27	0.5
III EXPANDED CRUDE AND CRACKING TO LIMIT OF SITE	176	71	25	0.4
IV EXPORT REFINERY EXPANDED BEYOND SITE	737	297	4	NEGATIVE

6.34 Table 6.7 presents a further evaluation of the refining Cases II and III incremental to case I (BAU), and Case III incremental to Case II. The base assumptions on prices, demands, capital and operating costs still apply. As indicated real returns of 20 percent would be earned on the additional investments inherent in the more complex, upgraded refining cases.

TABLE 6.7: FURTHER ECONOMIC EVALUATION OF THE TWO CRACKING CASES AT THE EXISTING SITE, CASES II AND III

(Base Assumptions)

REFINING CASES	INCREMENTAL TO CASE I		INCREMENTAL TO CASE II	
	CAPITAL US$ MILLION	EIRR PERCENT	CAPITAL US$ MILLION	EIRR PERCENT
II BALANCED CRACKING	115	20	NA	NA
III EXPANDED CRUDE AND CRACKING	160	20	45	21

Sensitivity Analysis

6.35 In addition to the results for the base assumptions, several sensitivity analyses were performed by varying the input parameters. The four cases were evaluated for the effect of a variation in product prices in relation to crude. This variation is expressed in terms of the change in the level of equivalent refinery margin in the USGC in relation to the base margin assumed of US$ 4.58. Table 6.8 summarizes these sensitivities. As indicated, the NPV for Case I (BAU), drops to a slightly negative value at the lower margin assumption, yielding a 13 percent EIRR. With balanced cracking, Case II, the refinery economics are more robust to a weaker margin. The NPV in this case is zero; in other words a 20 percent lower margin corresponds to a "switching value" for this case, the level at which the minimum EIRR target of 15 percent is met. The return in Case III is also quite robust to a decline in margin, showing a slightly negative return and a 14 percent EIRR. The already-low base return in Case IV would be negative in the low margin case. The sensitivities to higher margins illustrate the upside potential for the expansion/upgrading projects, with Cases II and III showing EIRRs of 43 percent and 38 percent respectively. The EIRR for Case IV at 9 percent is still well below the minimum target return.

TABLE 6.8: SENSITIVITY OF NPV AND EIRR TO VARIATION IN PRODUCT PRICE VS. CRUDE, EXPRESSED AS USGC REFINING MARGIN

	NET PRESENT VALUE US$ MILLIONS @15%			INTERNAL RATE OF RETURN PERCENT		
CHANGE FROM BASE	BASE	-20%	+20%	BASE	-20%	+20%
USGC MARGIN $/B	4.58	3.66	5.50	4.58	3.66	5.50
I	34	-2	70	>100%	13	>100%
II	60	0	118	27	15	43
III	71	-4	146	25	14	38
IV	-297	-409	-185	4	NEG	9

6.36 Another sensitivity analysis was performed to check the reaction of refinery economics to a loss of part of the Jamaica demand. It was assumed that, for example in a liberalized market, the refinery may lose 50% of the local gasoline and 50% of the jet fuel market to direct product importers. This represents a loss of some 18 percent in total local market volume and 23 percent of total local market revenues. This assumption was input to the LP, for Cases I and II only, and the resultant new refinery balances were input to the cash flow model. Table 6.9 provides a summary of these sensitivities to local demand on the refinery. As indicated, the minimum refining Case I (BAU) would still be viable versus terminaling, and the cracking Case II would only show a modest decline in NPV and EIRR from the base. The reason that the refinery is reasonably robust to a loss in local market is the opportunity it has to minimize the loss through exporting, albeit at lower returns than on the domestic market. Although not shown in this table, an examination of the LP solutions and cash flows for each refinery case indicate that the upgraded refinery, II, is actually more stable in the face of a loss of local market, than the BAU Case I. This is due to the fact that the upgraded refinery has opportunities to make money on the export of light products and the refinery is kept full. In the BAU case the lowest-cost solution is to reduce crude running, and even retain some net imports of finished product.

TABLE 6.9: SENSITIVITY OF PROJECT NPV AND IRR TO LOSS IN LOCAL DEMAND ON THE REFINERY

	NET PRESENT VALUE US$ MILLION @ 15%		INTERNAL RATE OF RETURN PERCENT	
JAMAICA DEMAND ON REFINERY	BASE	MOGAS AND JET -50% EACH	BASE	MOGAS AND JET -50% EACH
I	34	25	>100%	367
II	60	43	27	23

6.37 Additional sensitivities to changes in project capital and operating costs were performed on the cash flows for all four refining cases. These results are summarized in tables 6.10 and 6.11, respectively.

TABLE 6.10: SENSITIVITY OF PROJECT NPV AND EIRR TO VARIATIONS IN CAPITAL COSTS

	NET PRESENT VALUE US$ MILLION @ 15%			INTERNAL RATE OF RETURN PERCENT		
	BASE CAPITAL	+20% CAPITAL COST	-20% CAPITAL COST	BASE CAPITAL	+20% CAPITAL COST	-20% CAPITAL COST
I	34	30	38	>100%	>100%	>100%
II	60	41	78	27	22	34
III	71	47	95	25	21	32
IV	-297	-410	-184	4	2	7

TABLE 6.11: SENSITIVITY OF PROJECT NPV AND EIRR TO VARIATIONS IN PLANT OPERATING COSTS

	NET PRESENT VALUE US$ MILLION @ 15%			INTERNAL RATE OF RETURN PERCENT		
	BASE OP COST	+20% O&M	-20% O&M	BASE OP COST	+20% O&M	-20% O&M
I	34	24	44	>100%	>100	>100%
II	60	42	76	27	23	32
III	71	54	87	25	22	29
IV	-297	-330	-264	4	3	6

Export Oriented Options

Grass-Roots Refinery

6.38 The case for constructing a grass-roots refinery of 100,000 barrels per day to sell into the regional export market was examined as part of this study. Annex 6.4, "Feasibility of Jamaica Grass Roots Refinery," documents the assumptions, results and conclusions of this side study. It was concluded that sufficient capacity exists, could be upgraded or could be added to existing refineries in the region at lower cost than grass-roots construction, rendering such a new facility uneconomic in the medium term. Jamaica would offer no logistical advantage since it is neither close to crude source or to product markets. Other locations such as the Bahamas appear more attractive from an independent refiner's point of view. As with previous refinery cases this case is based on the economics of an independent refiner purchasing crude and selling products under arms-length arrangements. Vertical integration providing direct access to crude or markets may well change the economics but in that case Jamaica would merely be leasing the site.

6.39 This conclusion is substantiated by an extrapolation from the process engineering and attendant estimates on Case IV of the least-cost study summarized above. Based on this conceptual definition and estimate, it is projected that a 100,000 barrel per day refinery of similar conversion capability, but on a completely new site would cost some US$ 1000 million (1991). Its complete export market dependency would result in lower average gross margins than Case IV since it was assumed in this case that all the domestic market would be served by the expanded Kingston facility, some 37 kBD on average over the project life. On the basis of this level of capital investment and crude/product price relationships inherent in the main study the NPV and EIRR of such a project would be considerably lower than Case IV. i.e. negative.

Transhipment Terminal

6.40 In June 1990, Arthur D. Little (ADL) did an analysis (ref. "Jamaican Transhipment Terminal A Proposal" June, 1990) for PCJ of the feasibility of constructing a crude oil transhipment terminal on the south coast of Jamaica. The proposed site is owned by PCJ and was selected for a major export refinery, a study of which was also done by ADL in 1974.

6.41 An analysis of this transhipment proposal indicates that it is a high risk project with low to marginal returns. ADL estimates a gross US$.0.18 per barrel advantage to transhipment against lightering for USGC crude supply. This assumes Nigerian "short-haul" crude lightered in the USGC as the alternative. Transhipment is usually most viable when applied to "long-haul" crudes such as those sourced in the Arab Gulf, destined for the USGC.

6.42 This scale of margin can be diminished or completely overridden by other factors such as environmental costs, including the required contribution to a spill clean-up fund; such a margin is

unlikely to attract many shippers who would prefer to retain present arrangements for reasons of strategic control, reliability and confidence in a known situation.

6.43 ADL also defined an "environmental" sensitivity case where they assumed that lightering will not be viable or will be physically restricted from inshore USGC waters for reasons of environmental costs and risks. The gross margin between this terminal and the lightering alternative was $0.50 per barrel in this case. The differential between $0.18 in the base case and $0.50 per barrel in the environmental case largely reflects real environmental costs and risk factors. If such costs and risks ultimately impact Jamaica, then this differential will be eliminated. It will only exist in the short-term until Jamaica tightens its environmental standards to USGC levels.

6.44 Even with environmental costs fully reflected, there may be one or more private operators who would be attracted to such a site. It is impossible to estimate all the logistical situations and opportunities specific to individual international oil operators. With appropriate controls and standards in place and strictly enforced, the site could be made available to private sector development. This could be done under long-term lease, which might incorporate some upside profit sharing arrangements. Under no circumstances, however, should the government invest in such a terminal operation or otherwise absorb any of the risk. Such investment and proposed operation should be subject to the most careful scrutiny, including risk assessment, with regard to preservation of the environment. Among other things there is potential for damage to the tourism industry. This could occur through adverse publicity even without major ecological impacts.

VII FINANCIAL EVALUATION

7.1 Based on the economic screening analysis of petroleum product supply options, two refining cases - I, Business as Usual, and II, Upgraded Refinery with Balanced Catalytic Cracking - were subjected to detailed financial evaluation. In addition, the foreign exchange impact of a full product importation/terminaling case was compared with that of the refining cases. One of the objectives of the financial evaluation is to examine the net foreign exchange product supply cost to Jamaica under different assumptions as to:

(a) ownership structures (100 percent GOJ or minority GOJ with private foreign investment).

(b) regulatory environments re: petroleum product trade and pricing.

(c) mechanisms for financing required expansion and upgrading of investments.

7.2 An equally important objective of this evaluation is to make a preliminary assessment as to the range of terms and conditions that would be attractive to a private participant in the refinery, while still adhering to the target of minimizing net supply cost to Jamaica.

7.3 A third, and possibly most important, objective of this modeling work is to develop a flexible analytical tool that may be used both to assist in the development of a standardized request for proposals (prospectus) for investment/participation in the refinery, as well as in the analysis by the government of any resultant offers.

Methodology

7.4 The following presents the methodology of the financial evaluation of the cases:

(a) The product demands on the refinery, product imports by marketing companies, product and crude prices and the refinery LP solutions with refinery crude and spike import volumes, product imports and product exports all by year for the full 20-year project life, as well as capital and operating costs for each case, were imported as linkages into a financial spreadsheet model.

(b) A total of five product supply volumetric configurations were considered in the analysis:

- all product imports/terminaling;
- refining for full Jamaica demands, Case I, Business-as-Usual;
- refining for full Jamaica demands, Case II, balanced catalytic cracking;
- refining Case I, to meet a portion of Jamaican demands, with marketers importing remainder;
- refining Case II, to meet a portion of Jamaican demands, with marketers importing remainder.

(c) The linkages from the economic cash flow modeling and refinery LP analysis as indicated above, for each case were integrated with financial/taxation assumptions, as developed by the local Jamaican consultant, to formulate the financial spreadsheet model. These data linkages as well as the financial consultants' data inputs are illustrated in a flowsheet, Figure 7.1. More complete model documentation is provided in Annex 7.1, with accompanying model output runs.

(d) The financial consultant incorporated model structures and data on depreciation, financing structure, tax-related allowances, income tax rate, dividend distribution, receivables, inventories, net assets in service, payables, interest on debt, ownership structure and generated separate year-by-year model output components for the 20 year project period on:

- refinery income statement;
- refinery balance sheet;
- refinery sources and applications of funds;

- Bank of Jamaica, marginal cash flow analysis of net foreign exchange flows;
- private marketing companies, marginal cash flow analysis;
- Ministry of Finance, marginal cash flow analysis of fiscal flows;
- offshore partner in refinery, marginal cash flow analysis.

Case Selection

7.5 As indicated above, as a result of the economic screening study, two refinery configurations were selected for financial evaluation, case I business as usual, and II balanced cracking. The full terminaling case was also examined. Each of these refinery variations were examined at two different refinery gate price structures "full", reflecting the present structure with all differentials unchanged and, "reduced" with the reductions in differentials as reflected in the ex-refinery pricing analysis paras 4.3-4.11. The reduced pricing cases were also examined at lower demands on the refinery, reflecting the loss of 50 percent of gasoline and 50 percent of jet fuel demands to direct importers. This latter set of cases is intended to simulate a "worst case" effect on the refinery financial picture, of a liberalized petroleum products sector. In addition to these variations, the base set of runs incorporated permutations in ownership structure. Because of the enormous number of permutations and combinations of possible case variations, the initial approach was to run a limited number of cases and examine the results summarized in matrix form. Table 7.1 summarizes the identification and definition of this base set of runs. After examination of this selected matrix, a few more specific cases were run as sensitivities.

FIGURE 7.1: JAMAICA ESSIP STUDY - SCHEMATIC OF PETROLEUM SECTOR FINANCIAL MODELING SYSTEM, INCLUDING LINKAGES WITH ECONOMIC MODELS

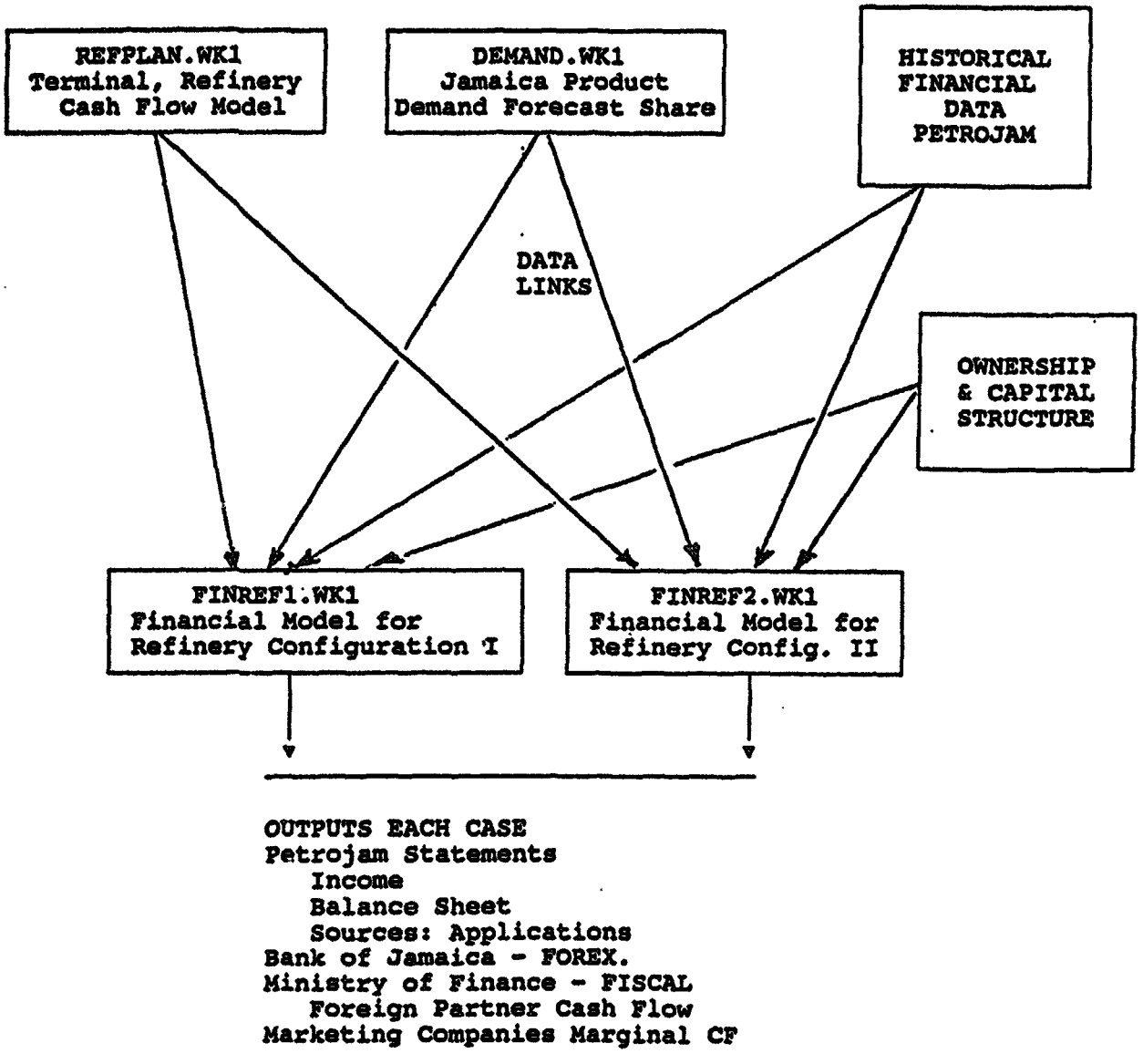


TABLE 7.1: BASE FINANCIAL EVALUATION CASES - IDENTIFICATION AND DEFINITION

CASE ID#	REFINERY FACILITIES	DEMAND ON REFINERY	EX-REFINERY PRICES	PRIVATE FOREIGN OWNERSHIP%
1.0	BAU	FULL	FULL	0
2.0	CRACKING	FULL	FULL	0
1.1	BAU	FULL	FULL	50
2.1	CRACKING	FULL	FULL	50
1.2	BAU	FULL	REDUCED	50
2.2	CRACKING	FULL	REDUCED	50
1.3	BAU	REDUCED	REDUCED	50
2.3	CRACKING	REDUCED	REDUCED	50
0.2	NA/TERMINAL	ZERO	REDUCED	NA
1.0.3	BAU	REDUCED	REDUCED	0
2.0.3	CRACKING	REDUCED	REDUCED	0

Financial Evaluation Results

7.6 The key parameters that were summarized for each of the cases in the above matrix were:

(1) present value of refinery net profit,
(2) present value of total dividends,
(3) present value of net foreign exchange flows - capital, expenses, equity, debt service, dividends,
(4) per barrel forex (foreign exchange) cost of the total composite product demand for Jamaica mix over the 20 year period, determined as PV cost divided by quantity
(5) present value of Ministry of Finance fiscal flows,
(6) present value of forex investment (it is assumed that the offshore partner contributes the forex portion of the refinery investment; no debt financing has initially been assumed, nor has a valuation been placed on shares in the existing refinery.
(7) present value of foreign partner net cash flow;
(8) payback period of discounted NCF to the foreign partner based on 80 percent dividend payout;
(9) present value of the marginal cash flow of marketing companies in applicable cases.

The results are summarized in Table 7.2.

TABLE 7.2: RESULTS OF BASE FINANCIAL EVALUATION CASES

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
CASE ID#	PV REF PROFIT US$mio	PV REF DIV US$mio	PV FOREX US$mio	FOREX COST US$/B	PV NOF FISCAL US$mio	PV FOREIGN PARTNER EQUITY CONTRIB US$mio	PV NCF FOREIGN PARTNER EQUITY US$mio	DISCOUNTED PAYBACK PERIOD FOREIGN PARTNER EQUITY YEARS	PV NCF MKT COS US$mio
1.0	21[illegible]	152	-2080	22.87	250	NA	NA	NA	NA
2.0	291	216	-1999	21.98	326	NA	NA	NA	NA
1.1	214	155	-2148	23.63	177	9	69	0.2	NA
2.1	319	238	-2038	22.41	243	76	43	6.9	NA
1.2	146	106	-2124	23.36	118	9	44	0.8	NA
2.2	251	189	-2013	22.14	185	76	19	10.3	NA
1.3	131	95	-2130	23.42	107	9	39	1.0	4
2.3	229	173	-2026	22.28	167	76	11	12.6	4
0.2	NA	NA	-2198	24.17	11	NA	NA	NA	21
1.0.3	127	92	-2091	23.00	150	NA	NA	NA	4
2.0.3	201	151	-2020	22.22	218	NA	NA	NA	4

7.7 Several conclusions can be drawn from this set of cases:

(a) Even if it is assumed in the highest-cost refining cases, wherein the refinery loses a major portion of the market to direct imports, as in cases 1.03 and 2.03 (100 percent GOJ-owned) or 1.3 and 2.3 (50 percent offshore, 50 percent GOJ), the net forex cost per barrel of total Jamaica demand is lower for refining than for 100 percent terminaling, case 0.2. The comparison is as shown in Table 7.3, using the case definitions for clarity of comparison.

TABLE 7.3: COMPARISON OF FOREIGN EXCHANGE COST FOR REFINING VS. Terminaling - BASE ASSUMPTIONS

CASE ID#	REFINERY FACILITIES	DEMAND ON REFINERY	EX-REFINERY PRICES	PRIVATE FOREIGN OWNERSHIP %	FOREX COST OF JAMAICA DEMAND US$/B	DISCOUNTED PAYBACK PERIOD FOREIGN PARTNER EQUITY YEARS
1.3	BAU	REDUCED	REDUCED	50	23.42	1.0
2.3	CRACKING	REDUCED	REDUCED	50	22.28	12.6
0.2	TERMINAL	ZERO	REDUCED	NA	24.17	NA
1.0.3	BAU	REDUCED	REDUCED	0	23.00	NA
2.0.3	CRACKING	REDUCED	REDUCED	0	22.22	NA

(b) A comparison of the two facilities' variations for the refining cases indicates that for the same ownership assumption, the cracking case is clearly the lowest-cost to the country. From the financial point-of-view, however, this conclusion may not be valid until the ownership vs. equity contribution is examined in cases 1.3 and 2.3. If the payback period[5] for each of these cases is examined, it is seen that based on the offshore partner getting his ownership share through equity contribution of the entire foreign exchange portion of the required investment, the government would be justified in negotiating a higher valuation of shares in the existing refinery in return for 50 percent ownership in the BAU case, with a payback of 1 year. In the cracking case, other combinations of higher share ownership by the foreign partner and/or debt financing replacing part of his equity would have to be considered to increase the foreign partner's ratio of dividend flow to equity contribution and reduce the payback period of 12.6 years. If it were decided to carry on with the BAU case it would be better for Jamaica that the government finance the US$9 million itself, corresponding to case 1.03 since the average cost per barrel would be reduced from US$ 23.42 per barrel to US$ 23.00 per barrel.

(c) In the cracking case 2.3, it was decided to run an additional case, labelled 2.3.1, with a higher ownership share of 75 percent given to the offshore partner in turn for the same equity contribution. This results in a payback period of 6.2 years on his investment and a net present value of US$ 54 million which is not unreasonable, while the foreign exchange cost to Jamaica increases from US$22.28 to US$22.76 per barrel of product. This cost is still much lower than that of the terminaling case, but it is approaching the cost of the BAU case 1.0.3, with 100 percent GOJ control. From this it is concluded that

5. *The discounted payback period is defined as the number of years required for the NPV to reach zero at a 12% discount rate.*

in order to attract an offshore partner to participate through contribution of the cat cracker foreign exchange, an ownership in the 75 percent range would have to be relinquished. Although this would result in the foreign exchange cost to Jamaica approaching that of the BAU case in 100 percent GOJ hands, both the economic and financial analysis indicate that the cracking refinery would be a more robust and flexible facility in an uncertain world.

(d) Although the 100 percent GOJ - owned refinery with cracking, case 2.0.3, appears to be the best from a least-cost supply standpoint at US$ 22.22 per barrel, it may not be desirable from a financing standpoint. The required refinery borrowing would result in a maximum debt/equity ratio for Petrojam of 68 percent. If held as public sector debt, this structure would run counter to government objectives for privatization.

Sensitivity Analyses

7.8 In the economic analysis, the base study assumption for the product/crude price relationship is expressed in terms of equivalent gross refinery cracking margin in the USGC, i.e. US$ 4.58 per barrel for BCF 17 crude. Sensitivity analyses were performed to lower and higher average margins which might prevail over the life of the project. In this financial analysis the effect of a lower long-term average margin was also evaluated for its effect on cases 1.0.3 and 2.3.1 as defined above. In addition the short-term fluctuations or "volatility" of the margin was tested for its effect on the cash situation and general financial viability of the project. As a worst case it was assumed that the margin is 60 percent of its long term average base value during the first two operating/revenue-earning years of the project, rebounding to 140 percent for two years, and then a steady 100 percent. This four year cycle parallels the historical pattern as illustrated in Figure 6.5. The lower product prices inherent in the low margin sensitivity cases also results in lower prices to the terminal case. The effect on the forex cost of product supply for this case was evaluated.

7.9 Table 7.4 comprises a master summary of a limited selection of the most logical cases to be considered. As indicated, the cracking case with foreign participation of 75 percent, in turn for the equity contribution of the project foreign exchange, (case 2.3.1), provides a reasonable cash flow and payback to the foreign partner in the base refinery margin case. If it is assumed that the margin is 20 percent lower than the base over the life of the project (US$ 3.66 per barrel) then the payback period is somewhat long at 7.4 years, and more equity may have to be relinquished; the effect of an 85 percent share is shown, reducing payback to 6.7 years. The foreign exchange cost of Jamaica's total product supply is US$ 22.37 per barrel in this case. This compares with US$ 22.41 per barrel in the business-as-usual case and US$ 23.17 per barrel in the full terminaling case.

Debt/Equity Structure

7.10 These cases considered equity financing, by the foreign partner, of the entire forex portion of the catalytic cracking investment. Another variation of case 2.3.1 which was examined in which the foreign partner would contribute 50 percent of the project foreign exchange, while still retaining a 75 percent ownership, and Petrojam would borrow the other 50 percent. The equity partner would be asked to secure non-recourse financing for this project loan. This debt/equity structure would result in the foreign partner realizing a 4-year discounted payback on his equity investment in the expanded facilities and an average annual 37 percent return on his equity. The leverage effect of partial debt financing would give the government room to negotiate the valuation of, and attendant sale price of, participation in the existing refinery. Additional financial evaluation cases could be run to test the range of reasonable possibilities with combinations of Petrojam debt and foreign equity financing. The bases for these case runs would be more readily defined in the process of reviewing and analyzing actual proposals.

TABLE 7.4: COMPARISON OF REFINING CONFIGURATIONS AND REFINING VS. Terminaling FOR BASE AND LOW USGC REFINING MARGINS

CASE ID#	REFINERY FACIL	DEMAND ON REFINERY	EX-REFINERY PRICES	PRIVATE FOREIGN OWN %	PV REF PROFIT US$mio	FOREX COST TO JAMAICA US$/B	PV NCF FOREIGN PARTNER US$mio	DISCOUNTED PAYBACK PERIOD FOREIGN PARTNER YEARS
2.3.1 BASE MARG	CRACKING	REDUCED	REDUCED	75	229	22.76	54	6.2
2.3.1 LOW MARG	CRACKING	REDUCED	REDUCED	75	184	22.22	36	7.4
2.3.2 LOW MARG	CRACKING	REDUCED	REDUCED	85	184	22.37	43	6.7
1.0.3 BASE MARG	BAU	REDUCED	REDUCED	0	127	23.00	NA	NA
1.0.3 LOW MARG	BAU	REDUCED	REDUCED	0	103	22.41	NA	NA
0.2 BASE MARG	TERMINAL	ZERO	REDUCED	NA	NA	24.17	NA	NA
0.2 LOW MARG	TERMINAL	ZERO	REDUCED	NA	NA	23.17	NA	NA

7.11 Comparing the foreign exchange costs for the low margin cases, it is seen that the cracking configuration with foreign participation at US$ 22.37 per barrel is still marginally better than the 100 percent GOJ, business-as-usual case at US$ 22.41 per barrel although the difference has narrowed. This narrowing is due to the much higher product and spike imports in the BAU case which become cheaper with lower refining margin. Both refining cases are significantly better than the terminaling case at US$ 23.17 per barrel.

7.12 The reaction of each case to the margin volatility was not significant. Net profit remains positive in the two low margin years, declining from 37 to 23 US$million per year in the cracking case and from 15 to 9 US$million per year in the business-as-usual case. Cash in the bank remained well on the positive side throughout the period in both cases.

7.13 A more detailed examination of net foreign exchange and MOF fiscal flow was performed. Four cases were used for comparison purposes, three of which, 1.0.3, 2.0.3 and 2.3.1 were identified and analyzed above. In order to complete the comparison a fourth case, 1.3.1, was defined and analyzed. This is an extension of Business as usual case 1.3, increasing the foreign ownership to 75 percent. All four of these cases have the full detailed financial spreadsheet included in Annex 7. Table 7.5 summarizes the results for each case. Although these cases are provided to illustrate the full range of function of the model, it should be pointed out that none are proposed as basis for divestment. Case 1.3.1, for example, as an extension of 1.3 from 50 percent to 75 percent ownership, indicates that the government could be justified in negotiating an even higher valuation of shares in the existing refinery, since payback is less than a year, based on the project capital investment as equity contribution.

TABLE 7.5

CASE ID#	REFINERY FACILITY	PRIVATE FOREIGN OWNERSHIP	PV OF FOREX COST US$ MILLIONS	FOREX COST US$/BARREL	PV OF MOF FISCAL US$ MILLIONS	DISCOUNTED PAYBACK FOREIGN PARTNER YEARS
1.0.3	BAU	0	2091	23.00	150	NA
1.3.1	BAU	75	2153	23.68	83	0.4
2.0.3	CRACKING	0	2020	22.22	218	na
2.3.1	CRACKING	75	2070	22.76	124	6.2

Note: All cases assume the Base refinery margin reduced demand on the refinery and reduced refinery gate prices.

MOF - Ministry of Finance. Fiscal receipts are in local currency expressed in US$ equivalent.

EVALUATION OF EX-REFINERY PETROLEUM PRODUCT PRICE STRUCTURE - JAMAICA
IMPORT PARITY EX THE USGC FOR FINISHED PRODUCTS

6	PRICE REFERENCE INFORMATION									
5		USGC SPOT								
6	GRADE	US CPG EXCEPT FO, ASPH $/BBL			BBLS/MT	MIX		CURRENT TRANSPORTATION		
7	.....	REF LOW	REF HIGH	REF AVG				REFERENCE		
8	LPG MIX				11.26	FORMULA				
9	PROPANE	45.20	45.50	45.35		20%		CLEAN	$12.25	$/LT
10	BUTANE	64.50	65.00	64.75		80%		DIRTY	$7.15	$/LT
11	PREM UL	80.75	81.50	81.13				LPG	$49.32	$/MT
12	MOGAS 95	80.25	80.75	80.50	8.60			ASPHALT	$53.45	$/LT
13	DP KERO	94.75	95.25	95.00	7.94					
14	GAS OIL	89.75	90.00	89.88	7.58	85%				
15	BUNKER C	19.00	19.50	19.25	6.57	15%		FREIGHT EVALUATION	NEW	RATE
16	ASPHALT	20.91	23.64	22.27	5.50			WS POINTS	WS FLAT	RATE	RATIO
17			MDO		7.40			250	$3.10	$7.75	0.63
18								200	$3.10	$6.20	0.87
19											
20											
21											
22											

23	CURRENT STRUCTURE, US$/BBL	PREMIUM		ADO	MDO	HFO			TOTAL
24	.....	MOGAS	KERO			OTHER	ASPHALT	LPG	
25									
26	REFERENCE PRICE, USGC	$33.81	$39.90	$37.75	$34.97	$19.25	$22.27	$25.57	
27	ACQUISITION DIFFERENTIAL	$1.36	$0.73	$0.76	$1.49	$0.81	$0.58	$1.76	
28	FREIGHT	$1.42	$1.54	$1.62	$1.66	$1.09	$9.72	$4.40	
29	INSURANCE	$0.03	$0.03	$0.03	$0.03	$0.01	$0.02	$0.02	
30	OCEAN LOSS	$0.18	$0.21	$0.16	$0.15	$0.05	$0.08	$0.16	
31	TERMINAL FEE	$0.95	$0.95	$0.95	$0.95	$1.03	$0.95	$0.95	
32	EX REF PRICE	$37.75	$43.36	$41.24	$39.25	$22.24	$33.63	$32.85	
33	RIN	$0.30	$0.30	$0.49	$0.00	$0.00	$0.00	$0.00	
34	RACK FEE	$0.17	$0.17	$0.17	$0.00	$0.00	$0.35	$0.35	
35	RACK PRICE	$38.22	$43.83	$41.90	$39.25	$22.24	$33.98	$33.20	
36									
37									
38									
39	PROPOSED ADJUSTMENTS								
40	SAME QUALITIES, PER BARREL								
41	.....								
42									
43	CREDIT	($0.11)	($0.11)	($0.11)	($0.11)	($0.06)	($0.08)	($0.08)	
44	SIZE	($0.25)	($0.32)	($0.32)	($0.63)	$0.00	($0.50)	$0.00	
45	MARINE INS	($0.01)	($0.01)	($0.01)	($0.01)	($0.01)	($0.01)	($0.01)	
46	FREIGHT	($0.52)	($0.57)	($0.59)	($0.82)	($0.14)	$0.00	$0.00	
47	RIN	($0.30)	($0.30)	($0.49)	$0.00	$0.00	$0.00	$0.00	
48	RACK AT 25%	($0.13)	($0.13)	($0.13)	$0.00	$0.00	($0.26)	($0.26)	
49	LOSS	($0.04)	($0.04)	($0.04)	($0.04)	$0.00	$0.00	($0.13)	
50	TERMINAL FEE	$0.07	$0.07	$0.07	$0.07	($0.01)	$0.07	$0.07	
51									
52	NET CHANGES, SAME QUALITIES	($1.71)	($1.41)	($1.62)	($1.54)	($0.23)	($0.79)	($0.41)	
53	QUALITY ADJUSTMENT	($1.00)	($0.30)	($0.31)	($0.75)	($0.75)	$0.00	$0.00	
54	MAX ADJUSTMENT	($2.71)	($1.71)	($1.93)	($2.29)	($0.98)	($0.79)	($0.41)	
55									
56	BARRELS PER DAY	5250	3500	3500	1235	9986	309	721	24502
57									
58	MIN REDUCTION /YR MMS	-3.28	-1.80	-2.07	-0.69	-0.82	-0.09	-0.11	-8.87
59	MAX REDUCTION /YR MMS	-5.20	-2.19	-2.47	-1.03	-3.55	-0.09	-0.11	-14.63
60	DIFFERENTIAL MAX-MIN	-1.92	-0.38	-0.40	-0.34	-2.73	0.00	0.00	-5.77
61									
62									

63 SOURCE: Petrojam for "current" information; no date for this price structure was
64 provided but the pattern and level of USGC reference prices indicate the high
65 price period in January 1991 or fall of 1990.

Petrojam Refinery Operating Performance

	1986-87 BPD	1986-87 SHARE OF TOT SUPPLY	1987-88 BPD	1987-88 SHARE OF TOT SUPPLY	1988-89 BPD	1988-89 SHARE OF TOT SUPPLY	1989-90 BPD	1989-90 SHARE OF TOT SUPPLY	1990-91 BPD	1990-91 SHARE OF TOT SUPPLY	5 YEAR AVERAGE BPD	5 YEAR AVERAGE SHARE OF TOT SUPPLY
CRUDE RUN, BPD	15,642		13,454		14,668		17,502		20,415		16,336	
AS % RATED CAPACITY 35,500 BPCD	44%		38%		41%		49%		58%		46%	
REFINERY PRODUCTION												
Propane	50	13.5%	28	8.8%	38	14.5%	106	36.9%	141	61.8%	73	24.8%
Butane	67	8.7%	142	16.2%	151	16.2%	207	19.2%	241	21.0%	162	16.8%
Mogas	2,108	45.2%	2,131	47.6%	2,275	48.9%	2,686	50.9%	3,026	56.3%	2,445	50.0%
Turbo	1,854	71.0%	240	7.9%	149	5.1%	457	16.1%	2,118	65.6%	964	33.0%
Kerosene	(56)	-3.9%	1,021	100.0%	1,178	100.0%	1,306	100.0%	492	100.0%	788	72.2%
ADO	1,916	58.1%	1,682	52.7%	1,432	31.0%	2,095	35.3%	2,607	43.1%	1,946	42.2%
NDO	744	99.2%	972	100.0%	1,261	100.0%	1,139	100.0%	1,190	100.0%	1,061	99.9%
HFO	7,791	61.4%	6,267	59.4%	7,177	65.6%	8,395	73.5%	9,563	77.5%	7,839	67.6%
Asphalt	93	36.4%	229	64.9%	231	56.7%	256	100.0%	160	100.0%	194	67.7%
TOTAL	14,566	54.2%	12,712	51.3%	13,892	51.1%	16,647	56.4%	19,538	64.7%	15,471	55.8%
PRODUCT IMPORTS												
Propane	319	86.5%	288	91.2%	225	85.5%	180	63.1%	87	38.2%	220	75.2%
Butane	703	91.3%	735	83.8%	781	83.8%	870	80.8%	910	79.0%	800	83.2%
Mogas	2,554	54.8%	2,345	52.4%	2,377	51.1%	2,587	49.1%	2,352	43.7%	2,443	50.0%
Turbo	756	29.0%	2,781	92.1%	2,763	94.9%	2,380	83.9%	1,111	34.4%	1,958	67.0%
Kerosene	1,515	103.9%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	303	27.8%
ADO	1,381	41.9%	1,512	47.3%	3,187	69.0%	3,833	64.7%	3,435	56.9%	2,670	57.8%
NDO	6	0.8%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	0.1%
HFO	4,894	38.6%	4,292	40.6%	3,758	34.4%	3,028	26.5%	2,779	22.5%	3,750	32.4%
Asphalt	163	63.6%	124	35.1%	176	43.3%	0	0.0%	0	0.0%	93	32.3%
TOTAL	12,292	45.8%	12,077	48.7%	13,268	48.9%	12,879	43.6%	10,674	35.3%	12,238	44.2%
TOTAL PRODUCT SUPPLIED												
Propane	369		316		263		286		228		292	
Butane	771		877		932		1,077		1,151		962	
Mogas	4,662		4,477		4,653		5,274		5,378		4,889	
Turbo	2,610		3,021		2,912		2,838		3,229		2,922	
Kerosene	1,459		1,021		1,178		1,306		492		1,091	
ADO	3,297		3,194		4,619		5,928		6,042		4,616	
NDO	751		972		1,261		1,139		1,190		1,062	
HFO	12,685		10,558		10,935		11,423		12,341		11,589	
Asphalt	256		353		408		256		160		287	
	26,857		24,789		27,160		29,526		30,211		27,709	

Table A4.2

RECORD OF PETROJAM REFINERY OUTAGES
1986-90

YEAR	MONTH	DURATION	REASON
1986	JAN	4	RUNOUT
1986	FEB	1	POWER
1986	MAR	12	UNPLANNED
1986	MAY	62	PLANNED
1986	AUG	1	POWER
1986	SEP	1	POWER
1986	DEC	12	PLANNED
1987	JAN	5	PLANNED
1987	JAN	10	UNPLANNED
1987	FEB	9	UNPLANNED
1987	FEB	1	UNPLANNED
1987	MAR	1	UNPLANNED
1987	APR	10	UNPLANNED
1987	JUN	18	PLANNED
1987	OCT	79	PLANNED
1987	DEC	2	UNPLANNED
1988	MAY	48	RUNOUT
1988	AUG	1	POWER
1988	SEP	6	UNPLANNED
1988	NOV	14	UNPLANNED
1988	DEC	13	PLANNED
1989	JAN	1	UNPLANNED
1989	JAN	1	UNPLANNED
1989	FEB	1	POWER
1989	MAR	1	UNPLANNED
1989	MAR	1	POWER
1989	APR	1	UNPLANNED
1989	MAY	1	POWER
1989	MAY	16	PLANNED
1989	OCT	24	PLANNED
1990	JAN	4	RUNOUT
1990	APR	1	UNPLANNED
1990	JUN	32	PLANNED
1990	OCT	7	RUNOUT
1990	NOV	3	RUNOUT
1990	NOV	4	RUNOUT
1990	NOV	1	POWER

TOTAL NUMBER OF OUTAGES 5 YEARS	37
TOTAL DURATION OF OUTAGES 5 YEARS	409 DAYS
AVERAGE NUMBER OF OUTAGES PER YEAR	7.4
AVERAGE DURATION PER OUTAGE	11.1 DAYS
AVERAGE OUTAGE TIME PER YEAR	81.8 DAYS
AVERAGE SERVICE FACTOR	77.6%

REASON	YEAR	MONTH	DURATION	REASON
PLANN	1986	MAY	62	PLANNED
	1986	DEC	12	PLANNED
	1987	JAN	5	PLANNED
	1987	JUN	18	PLANNED
	1987	OCT	79	PLANNED
	1988	DEC	13	PLANNED
	1989	MAY	16	PLANNED
	1989	OCT	24	PLANNED
	1990	JUN	32	PLANNED

TOTAL NUMBER OF OUTAGES 5 YEARS	9
TOTAL DURATION OF OUTAGES 5 YEARS	261 DAYS
AVERAGE NUMBER OF OUTAGES PER YEAR	1.8
AVERAGE DURATION PER OUTAGE	29 DAYS
AVERAGE OUTAGE TIME PER YEAR	52.2 DAYS

REASON	YEAR	MONTH	DURATION	REASON
UNPLANNED	1986	MAR	12	UNPLANNED
	1987	JAN	10	UNPLANNED
	1987	FEB	9	UNPLANNED
	1987	FEB	1	UNPLANNED
	1987	MAR	1	UNPLANNED
	1987	APR	10	UNPLANNED
	1987	DEC	2	UNPLANNED
	1988	SEP	6	UNPLANNED
	1988	NOV	14	UNPLANNED
	1989	JAN	1	UNPLANNED
	1989	JAN	1	UNPLANNED
	1989	MAR	1	UNPLANNED
	1989	APR	1	UNPLANNED
	1990	APR	1	UNPLANNED

TOTAL NUMBER OF OUTAGES 5 YEARS	14
TOTAL DURATION OF OUTAGES 5 YEARS	70 DAYS
AVERAGE NUMBER OF OUTAGES PER YEAR	2.8
AVERAGE DURATION PER OUTAGE	5 DAYS
AVERAGE OUTAGE TIME PER YEAR	14 DAYS

REASON	YEAR	MONTH	DURATION	REASON
POWER	1986	FEB	1	POWER
	1986	AUG	1	POWER
	1986	SEP	1	POWER
	1988	AUG	1	POWER
	1989	FEB	1	POWER
	1989	MAR	1	POWER
	1989	MAY	1	POWER
	1990	NOV	1	POWER

TOTAL NUMBER OF OUTAGES 5 YEARS	8
TOTAL DURATION OF OUTAGES 5 YEARS	8 DAYS
AVERAGE NUMBER OF OUTAGES PER YEAR	1.6
AVERAGE DURATION PER OUTAGE	1 DAY
AVERAGE OUTAGE TIME PER YEAR	1.6 DAYS

REASON	YEAR	MONTH	DURATION	REASON
RUNOUT	1986	JAN	4	RUNOUT
	1988	MAY	48	RUNOUT
	1990	JAN	4	RUNOUT
	1990	OCT	7	RUNOUT
	1990	NOV	3	RUNOUT
	1990	NOV	4	RUNOUT

TOTAL NUMBER OF OUTAGES 5 YEARS	6
TOTAL DURATION OF OUTAGES 5 YEARS	70 DAYS
AVERAGE NUMBER OF OUTAGES PER YEAR	1.2
AVERAGE DURATION PER OUTAGE	11.7 DAYS
AVERAGE OUTAGE TIME PER YEAR	14 DAYS

Jamaica Petroleum Product Demand Forecast

1. Key inputs to the preparation of an investment/business plan for the petroleum fuels sector are projections of the Jamaican domestic demand for each of the distinct product categories imported direct or capable of being produced by the Petrojam refinery. The approach to preparation of such a forecast has been to break each main product category to the extent possible into sub-categories by sub-sector use. The basis for each of these sub-categories is then defined separately. The resultant base forecast is shown as Table A5.1. The bases are described below in accordance with the sub-category designations shown in the demand forecast table. An overall economic (GDP) growth rate of 3% p.a. throughout the forecast period was assumed, as used as the basis for the GOJ's Five Year Plan 1990-1995. 1989 was used as the base year since completely reliable figures for estimated 1990 consumption for all categories could not be obtained.

2. LPG - 5% per annum growth throughout assumes continued penetration of the total household stock for basic cooking, but at lower than historical rate, 6.5%.

3. Avgas - 3% p.a. growth throughout; this is a minor product which must be imported.

4. (Motor) Gasoline - 3.0% p.a. growth throughout; looking at historical growth of 6.4%, the growth rate would be higher than 3.0% p.a. based on relationship with GDP growth; but it is assumed that growth in driving activity (vehicle-miles) would be 4% p.a. with an 18.5% improvement in average vehicle fleet consumption efficiency over the 20 year period. It is assumed that leaded gasoline will be completely phased out by the year 2000. For purposes of conservatism in the economic evaluation we have assumed a linear, 10% per year, shift from leaded to unleaded; in actual fact the refinery cases incorporate capability to make 100% unleaded by the year 1994. What will happen in an actual marketing/profit maximization environment is a much faster lead phase-out once these refinery capital facilities are installed and paid for.

5. Turbo fuel - 4.0% p.a growth throughout; compares with historical 9.3%; passenger mile growth assumed to be 6% p.a over the period with an improvement in combined load factor and aircraft fuel consumption efficiency over the period.

6. Kerosene, retail/peddler - 1.0% p.a growth throughout; this category is assumed to be mostly household lighting and cooking, predominantly in the non-urban areas and in the lower income strata. The cooking will continue to be substituted by LPG and lighting by electricity. Growth is expected to be somewhere between 0 and 1.0% p.a. based on this penetration and experience elsewhere.

7. Kerosene, other (bulk)- 2.5% p.a. throughout; this is a small, industrial demand, the historical growth for which was extremely variable and not completely reliable because of possible classification problems in the statistics gathering.

8. Auto diesel, retail/peddler - 4.0 % p.a.; this is assumed to be predominantly vehicle use and usually exhibits a slightly higher growth rate than gasoline in a given economy, being more tied to commercial/industrial trucking activity and less prone to the efficiency gains we assume to be "imported" into the gasoline-driven (mostly auto)fleet.

9. Auto diesel, marine - 3.5% per annum; this is a small bunkering demand related to commercial/industrial activity.

10. Auto diesel, power generation - not based on a growth rate assumption but forecast volumes obtained from the mission power specialist during March 1991.

11. Auto diesel, bauxite - not based on growth rate assumption but rather on the bauxite/alumina industry's production plans and associated specific fuel consumption, as obtained from interviews of the bauxite industry association officials.

12. Auto diesel, other(bulk) - 3.5% p.a.; this is mostly industrial/ commercial use for vehicle fleets, own-generation of power etc. Growth rate assumed to be slightly higher than GDP.

13. Marine diesel, marine - 3.5% p.a. same as 9.above.

14. Marine diesel, power generation - no projected consumption per advice of mission power specialist, March 1991.

15. Marine diesel, bauxite - same as 11. above.

16. Marine diesel, cement - 8% p.a. up to a maximum of 40% higher than actual 1990 levels; basis obtained from cement company officials per their production plans.

17. Marine diesel, other(bulk) - 4.0% p.a. based on an industrial growth rate slightly higher than GDP growth.

18. Fuel oil, high vanadium, marine - 3.5% p.a. same as 9. above.

19. Fuel oil, high vanadium, power generation - not based on a growth rate assumption but forecast volumes obtained from the mission power specialist during March 1991.

20. Fuel oil, high vanadium, cement - same as 16. above.

21. Fuel oil, other - 3.5% p. a. based on an industrial growth rate slightly higher than GDP growth.

22. Fuel oil, bauxite, cracked - this was developed from the bauxite industry association's projection of industry production of bauxite and alumina, combined with projections of specific fuel consumption. As yet no distinction has been made between high and low vanadium material, but this possible quality constraint is being investigated. In our refinery production modelling we treat the bauxite fuel oil demand as an export market.

23. Lubricants are shown in the forecast for sake of completeness; they are non-fuel, imported specialty products which have no bearing on the investment plan. A growth rate of 5.0% p.a. was assumed.

24. Asphalt is another non-fuel specialty product; it is important that this be included in the forecast since it is produced by the refinery. The production capacity of the refinery is well in excess of the order-of-magnitude of local consumption of this product. Local consumption is highly dependent on the level of funding available for road construction and maintenance and has fluctuated quite widely in the recent past. A growth rate of 6% p.a. from base year 1989 has been assumed.

Product Specifications

25. The following are key product specifications assumed for the base investment screening cases; where there are possibilities that specifications may be changed, these are indicated:

Gasoline, leaded

Base case maximum distillation end-point 401 degF; this compares with higher end-points, up to 438 degF for regular gasoline in international trade and could possibly be relaxed.

Base case minimum research octane number(RON) 95.0; this could probably be relaxed to 93.0 or even 92.0 without any major effect on the vehicle fleet.

Turbo Fuel/Kerosene - Dual Purpose

Base case assumes Jamaica's continued compliance with the very stringent DERD 2494 specification; this is a British spec. which, among others, is particularly tough on corrosion (silver strip max.= 1); the U.S. spec is not so stringent, a typical one being that required by the Colonial Pipeline. The SPOT prices for kero/turbo in major U.S. markets e.g. Gulf Coast or New York Harbour, reflect this less stringent specification.

Automotive Diesel Oil

Base case minimum cetane index number 45.0; maximum distillation end point 700 degF.; maximum sulphur content 0.5% by weight.

Bunker "C" Fuel Oil (non-bauxite)

Base case maximum Viscosity 200 SSF @ 122 degF; maximum sulphur content 3.0% by weight. There could possibly be some relaxation of the viscosity spec to 300 or even 400 SSF @ 122; JPS is the principal customer and this would have to be reviewed with them as well as other clients such as the cement plant.

No. 6 Fuel Oil for Bauxite/Alumina

Base case maximum viscosity 225 SSF @ 122 degF and maximum sulphur 3.0%. The industry specifications also indicate maximum API gravity specs of 11.0 for one company and 12.0 for the other two; as well, one of the three companies specifies a minimum calorific value of 151,250 Btu/USgal (Gross), while one has a price debit below 6.4

million Btu/barrel. The third does not specify calorific value. If these specifications are strictly enforced, the straight-run material from the present Petrojam refinery would normally not meet these specs. Even if the low-BTU content per barrel, high API gravity, straight-run material from the present refinery were acceptable at a BTU debit, the refinery is not normally competitive with cracked fuel from the USGC, especially compared with the alternative of selling this atmospheric bottoms into the USGC as cracker feedstock, when that market is available.

Another quality issue is the vanadium content. It appears that vanadium is a problem in the alumina calcining operation but is not a problem in under-the-boiler use. One company specifies 400 ppm max for boiler use and 200 ppm max for calcination fuel. A second specifies a maximum of 250 ppm(with exceptions granted as agreed on an individual cargo) and the third a maximum of 350 ppm, without additional notation. As noted above, this possible quality constraint is being investigated.

Table A5.1
Jamaica - Petroleum Fuel Products Demand Forecast (Thousands of Barrels)

	ACTUALS					GROWTH RATE %p.a. ACTUAL	FCST	<--	FORECAST				
	1985	1986	1987	1988	1989	85-89	91-2000	1991	1992	1993	1994	1995	1996
LPG	367	395	413	429	473	6.5%	5.0%	521	547	575	604	634	665
Avgas	11	11	10	12	14	5.7%	3.0%	15	15	16	16	17	17
Gasoline, leaded	1,523	1,566	1,680	1,760	1,949	6.4%		1,861	1,704	1,536	1,356	1,164	959
Gasoline, unleaded	0	0	0	0	0			207	426	658	904	1,164	1,439
S/Total Gasoline	1,523	1,566	1,680	1,760	1,949	6.4%	3.0%	2,068	2,130	2,194	2,260	2,328	2,398
Turbo Fuel	798	932	1,035	1,052	1,139	9.3%	4.0%	1,232	1,282	1,333	1,386	1,442	1,499
Kerosene													
Retail/Peddler	327	328	396	439	367	2.9%	1.0%	374	378	382	385	389	393
Other(Bulk)	21	26	37	51	65	32.0%	2.5%	68	70	72	73	75	77
S/Total Kerosene	348	354	433	490	432	5.5%	1.3%	442	448	453	459	465	470
Total Turbo + Kero	1,146	1,286	1,469	1,542	1,571	8.2%	3.4%	1,675	1,729	1,786	1,845	1,906	1,970
Auto Diesel													
Retail/Peddler	596	628	764	643	679	3.3%	4.0%	734	764	794	826	859	894
Marine	19	13	43	35	52	28.7%	3.5%	56	58	60	62	64	67
Power Gen.	113	32	78	240	646	54.8%	NA	235	355	456	899	399	340
Bauxite	75	80	76	79	111	10.3%	NA	166	163	159	168	164	164
Other(Bulk)	302	231	168	310	300	-0.1%	3.5%	321	333	344	356	369	382
S/Total Auto Diesel	1,105	983	1,129	1,307	1,789	12.8%	3.4%	1,513	1,672	1,814	2,312	1,856	1,846
Marine Diesel													
Marine	38	47	53	39	44	3.8%	3.5%	47	48	50	52	54	56
Power Gen.	3	23	7	0	0		NA	0	0	0	0	0	0
Bauxite	62	64	77	77	101	13.2%	NA	151	148	144	153	149	149
Cement	0	56	49	101	212		8.0%	140	152	164	177	182	182
Other(Bulk)	18	58	71	103	146	69.8%	4.0%	158	164	171	178	185	192
S/Total Mar Diesel	120	249	256	320	503	43.2%	2.2%	496	512	529	559	569	579
Fuel Oil,Hi Van													
Marine	26	33	42	94	94	38.3%	3.5%	100	104	107	111	115	119
Power Gen.	2,686	2,595	2,903	2,835	3,125	3.9%	NA	3,927	4,055	4,170	3,852	4,364	4,379
Cement	0	110	335	313	163		8.0%	97	105	113	122	126	126
Other(Bulk)	377	331	313	338	401	1.5%	3.5%	429	444	460	476	493	510
S/Total FO,local	3,088	3,091	3,593	3,580	3,782	5.2%	-0.8%	4,554	4,708	4,850	4,562	5,098	5,134
Bauxite,Cracked	3,060	2,115	1,999	2,105	3,826	5.7%	NA	7,143	7,000	6,847	7,230	7,057	7,057
Total FO Hi Van	6,148	5,206	5,592	5,685	7,608	5.5%	-0.3%	11,697	11,708	11,697	11,791	12,155	12,191
Fuel Oil, Lo Van													
Bauxite	681	994	1,209	1,059	1,416	20.1%	NA						
Cement	0	125	0	0	0								
Other	0	50	0	0	0								
Total FO Lo Van	681	1,169	1,209	1,059	1,416	20.1%	ERR	0	0	0	0	0	0
TOTAL FUEL PRODUCTS	11,100	10,866	11,757	12,114	15,322	8.4%	1.2%	17,985	18,314	18,610	19,387	19,464	19,666
Lubes	67	79	73	78	83	5.8%	5.0%	92	97	101	107	112	117
Asphalt	43	77	108	167	97	22.7%	6.0%	109	116	123	130	138	146
TOTAL ALL PRODUCTS	11,210	11,023	11,938	12,358	15,503	8.4%	1.3%	18,186	18,527	18,833	19,623	19,714	19,930

Table A5.1 continued

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
LPG	699	734	770	809	849	892	936	983	1,032	1,084	1,138	1,195	1,255	1,317
Avgas	18	18	19	19	20	20	21	22	22	23	24	24	25	26
Gasoline, leaded	741	509	262	0	0	0	0	0	0	0	0	0	0	0
Gasoline, unleaded	1,729	2,035	2,358	2,698	2,779	2,863	2,949	3,037	3,128	3,222	3,319	3,418	3,521	3,626
S/Total Gasoline	2,469	2,544	2,620	2,698	2,779	2,863	2,949	3,037	3,128	3,222	3,319	3,418	3,521	3,626
Turbo Fuel	1,359	1,622	1,686	1,754	1,824	1,897	1,973	2,052	2,134	2,219	2,308	2,400	2,496	2,596
Kerosene														
Retail/Peddler	397	401	405	409	413	417	422	426	430	434	439	443	448	452
Other(Bulk)	79	81	83	85	87	89	92	94	96	99	101	104	106	109
S/Total Kerosene	476	482	488	494	501	507	513	520	526	533	540	547	554	561
Total Turbo + Kero	2,035	2,104	2,175	2,248	2,325	2,404	2,486	2,572	2,660	2,752	2,848	2,947	3,050	3,157
Auto Diesel														
Retail/Peddler	929	967	1,005	1,045	1,087	1,131	1,176	1,223	1,272	1,323	1,376	1,431	1,488	1,547
Marine	69	71	74	77	79	82	85	88	91	94	97	101	104	108
Power Gen.	316	173	185	138	188	247	312	292	271	352	446	430	415	400
Bauxite	164	164	164	164	164	164	164	164	164	164	164	164	164	164
Other(Bulk)	395	409	423	438	453	469	486	503	520	539	557	577	597	618
S/Total Auto Diesel	1,874	1,784	1,851	1,862	1,972	2,092	2,222	2,270	2,318	2,471	2,640	2,702	2,768	2,838
Marine Diesel														
Marine	58	60	62	64	66	68	71	73	76	78	81	84	87	90
Power Gen.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bauxite	149	149	149	149	149	149	149	149	149	149	149	149	149	149
Cement	182	182	182	182	182	182	182	182	182	182	182	182	182	182
Other(Bulk)	200	208	216	225	234	243	253	263	274	284	296	308	320	333
S/Total Mar Diesel	588	598	609	619	631	642	654	667	680	694	708	723	738	754

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Fuel Oil,Hi Van														
Marine	123	128	132	137	141	146	151	157	162	168	174	180	186	193
Power Gen.	4,546	3,939	3,797	3,148	3,240	2,564	2,643	2,777	2,913	2,260	2,305	2,465	2,630	2,766
Cement	126	126	126	126	126	126	126	126	126	126	126	126	126	126
Other(Bulk)	528	546	565	585	606	627	649	671	695	719	744	770	797	825
S/Total FO,local	5,323	4,739	4,620	3,996	4,113	3,463	3,570	3,731	3,896	3,273	3,349	3,541	3,739	3,910
Bauxite,Cracked	7,057	7,057	7,057	7,057	7,057	7,057	7,057	7,057	7,057	7,057	7,057	7,057	7,057	7,057
Total FO Hi Van	12,380	11,796	11,677	11,053	11,171	10,520	10,627	10,788	10,953	10,330	10,407	10,598	10,796	10,967
Fuel Oil, Lo Van														
Bauxite														
Cement														
Other														
Total FO Lo Van	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL FUEL PRODUCTS	20,063	19,577	19,721	19,309	19,746	19,434	19,896	20,339	20,795	20,576	21,083	21,608	22,154	22,685
Lubes	123	129	136	143	150	157	165	174	182	191	201	211	221	233
Asphalt	155	164	174	185	196	208	220	233	247	262	278	295	312	331
TOTAL ALL PRODUCTS	20,342	19,871	20,031	19,637	20,092	19,799	20,281	20,745	21,224	21,030	21,562	22,113	22,687	23,249

JOINT UNDP/WORLD BANK
ENERGY SECTOR ASSISTANCE PROGRAMME
(ESMAP)

JAMAICA

ENERGY SECTOR STRATEGY
AND
INVESTMENT PLANNING STUDY

PETROLEUM SUBSECTOR
PROCESS ENGINEERING ANALYSIS

CONSULTANT REPORT BY

RTM ENGINEERING LTD.
CALGARY, ALBERTA, CANADA

August 1991

FOREWORD

This process engineering analysis was carried out by Mr. Thomas McCann, refinery engineer and president of RTM Engineering Ltd. (Canada). It was based on field work in January 1991, and on further analytical work in the home office.

The initial draft report was reviewed by Petrojam, MME, and World Bank Staff, all of whose comments were taken into consideration for this final version.

The results of these analyses were used to derive cashflows in the economic and financial analyses of the petroleum product alternatives.

TABLE OF CONTENTS

Page

Foreword i
Table of Contents ii

1.0 PETROJAM REFINERY FACILITIES 1

1.1 Existing Facilities and Operation 1

1.1.1 General 1
1.1.2 National Roles 1
1.1.3 Environmental Situation 2
1.1.4 Process Units 10
1.1.5 Tankage and Product Blending 10
1.1.6 Utilities 11
1.1.7 Spacing and Safety 12

2.0 PRODUCT SPECIFICATIONS 12

2.1 Propane and Butane 12

2.1.1 General 12

2.2 Gasolines 13

2.2.1 Unleaded Gasoline 13
2.2.2 Gasohol 14
2.2.3 Environmental Factors 14
2.2.4 Gasoline Specifications other than Octane 14

2.3 Kero/Turbo 15
2.4 Diesel Fuels 15

2.4.1 General 15
2.4.2 New Gas Turbine (GTO) Specification 15
2.4.3 ADO Specification 16
2.4.4 MDO Specification 17

2.5 Heavy Fuel Oil 17

2.5.1 General 17

3.0 REFINERY PROCESS MODIFICATION CASES 18

3.1 Introduction 18
3.2 Base Case: Terminal Only 25

3.2.1 Outline 25
3.2.2 Facility Changes 25
3.2.3 Environmental Activities 25
3.2.4 Staffing 26
3.2.5 Inventories 26
3.2.6 Costs 26

3.3 Case I: Business As Usual 28

3.3.1 Outline 28
3.3.2 Facility Changes 28
3.3.3 Unleaded Gasoline 30
3.3.4 New Tankage 30
3.3.5 Environmental Changes 30
3.3.6 Costs 31
3.3.7 Crude Selection 33

3.4 Case II: Matching Catalytic Cracking 33

3.4.1 Outline 33
3.4.2 Existing Facility Changes 35
3.4.3 New Facilities 35
3.4.4 Unleaded Gasoline 37
3.4.5 Environmental Changes 37
3.4.6 Costs 39
3.4.7 Crude Selection 41
3.4.8 Space 41
3.4.9 Hydrocracker Alternate in Case II 41

3.5 Case III: Expanded Catalytic Cracking 42

3.5.1 Outline 42
3.5.2 Existing Facilities 42

3.5.3 New Facilities 44
3.5.4 Unleaded Gasoline 44
3.5.5 Environmental Changes 44
3.5.6 Costs 44
3.5.7 Crude Selection 47
3.5.8 Space 48

3.6 Case IV: 100,000 BPD Refinery 49

3.6.1 Outline 49
3.6.2 Existing Facilities 50
3.6.3 New Units 50
3.6.4 Environmental 51
3.6.5 Crude Selection and Yields 51
3.6.6 Costs 52
3.6.7 Space 54

4.0 ESTIMATING BASES 55

4.1 Capital Estimate Extensions 55
4.2 Capital Estimate Bases 56
4.3 Operating Cost Bases 57

5.0 ENVIRONMENTAL IMPACT ASSESSMENT 58

5.1 General 58
5.2 Coverage 58
5.3 Environmental Impact Measurement 58
5.4 Assessment 59
5.5 Refinery-Specific Compounds 59
5.6 Operations Phase 60

1.0 PETROJAM REFINERY FACILITIES

1.1 EXISTING REFINERY FACILITIES AND OPERATION

1.1.1 GENERAL

The Petrojam refinery, built by ESSO in 1963, has a nominal capacity of 38,000 BPSD of crude oil and spikes of partially processed butane, naphtha, or gas oil. The refinery was designed to use an optimum mix of ESSO Venezuela1/ whole crudes and spikes, in order to minimize the need for processing. The refinery was designed with an overriding emphasis on capital cost reduction, with process units being tightly integrated and tankage areas minimized to reduce the costs of developing the site.

While Petrojam has maintained a high standard of maintenance, some of the equipment is aging--e.g. fired heaters and storage tanks--and now needs significant maintenance. With the assistance of PetroCanada International, opportunities for energy conservation were identified, and in 1987 a gas turbine cogenerator with heat recovery was added, among other items, to improve energy efficiency. Because the original specifications were for desalted crude and spikes, the refinery was not equipped with a desalter to remove salt and dirt from the crude. This is now causing sludge buildup in the crude and HFO tanks, and fouling exchangers, despite the reasonably low salt contents of Venezuelan crudes. Crudes from other countries have even higher salt content and therefore create even more sludge and exchanger fouling.

The refinery currently operates between 20,000 and 30,000 BPSD, according to the demand for products. The refinery processes primarily Venezuelan and Mexican crudes, and spikes the Venezuelan crudes with semi-finished products when economic. It also uses some Ecuadorian Oriente crude.

1.1.2 NATIONAL ROLES

The refinery tries to maintain a 30-day inventory of crude and spike products to allow for normal operational flexibility and protect against delays in crude shipments, emergency shutdowns, and other unforeseen circumstances. Shortages of foreign exchange sometimes make this inventory much slimmer, however.

1/ *The ESSO affiliate in Venezuela, originally known as Creole Petroleum, is now the nationalized subsidiary of Petroleos de Venezuela-Lagoven.*

Refinery managers spend a significant amount of time on national affairs, as distinct from Petrojam operational planning and management--e.g. national energy conservation planning, air quality monitoring, and creation of refined petroleum quality standards. The refinery has become, in effect, the technical arm of the government in matters concerning refined products, crude oil supply, and environmental monitoring protocols. Such activities should more appropriately be made the responsibility of GOJ agencies such as Bureau of Standards, MME, and NRCA.

1.1.3 ENVIRONMENTAL SITUATION

1.1.3a Refinery Issues

(i) Summary

The refinery is not a significant, constant source of emissions to the Kingston environment. The effluent water has some minor peaks of sulphur compounds and on occasion could have oil present. There is also a problem of oil in ground water under part of the refinery.

(ii) Atmospheric Emissions

The four refinery furnaces exiting through two stacks, and the gas turbine generator exhaust, both release sulphur dioxide (SO_2), nitrogen oxides (NO_x), water vapour, and traces of particulates. The flare stack normally contributes very little in the way of pollutants.

As Table 1 illustrates, the refinery's contribution to SO_2 is small and projected to stay small, even with new units.

Table 1
Preliminary Estimates of Jamaican SO_2 Emissions
- Thousands of tonnes per year -

Source		1989	1995	2000	2005
Heavy Fuel Oil (HFO) (a)					
•	Electricity	26.0	29.0	32.5	30.0
•	Alumina/Bauxite	45.0	60.5	60.5	60.5
•	Other	2.5	60.0	7.0	8.5
Diesel (a)		3.0	4.5	4.5	4.5
Other Fuels (Gasoline and Kerosene)		1.0	1.0	1.5	1.5
Refinery (Gas and HFO)		3.0	3.0	3.0	3.0
Other Sources (b),(c)		3.0	3.0	3.0	3.0
Total		83.5	107.0	112.0	111.0

Notes:
(a) Prepared from estimates of future Jamaican fuel demands, excluding coal.
(b) HFO assumed to have 2.7 wt percent sulphur; diesels assumed to have 0.5.
(c) May be incomplete--sulphuric acid production, etc.

Based on observation and on calculations of heavy fuel oil burned, the consultant concludes that:

• Sulphur dioxide (SO_2) production is low on a per capita basis. At the six measuring stations involved in the Petrojam Community Health Hazard Survey (see below), average ground level concentration was approximately 6 ug/m^3, which is half the the U.S. per capita rate.

• Recovery of hydrogen sulphide (H_2S) from refinery fuel gases, and conversion to sulphur for sale, is uneconomic at the 2 to 3 tonne per day quantity available.

• Petrojam emissions of nitrogen oxides (NO_x) are less than 10 percent of the emissions from nearby JPS facilities. NO_x ground levels are normally related to the higher brown haze and partial conversion to ozone.

- NO_x emissions from the JPS power plants, especially from the Hunts Bay gas turbines and the eastern heavy fuel oil based diesels, are obvious. Petrojam's emissions are minimal by comparison. The Petrojam gas turbine gives off a slightly brownish plume when operating. The proposed addition of burners downstream of the gas turbine should reduce these emissions, and also contribute to increased heat recovery and energy efficiency.

- Petrojam particulate emissions relate only to heavy fuel oil use, and, as with SO_2, are a small percentage of total local emissions, most of which come from JPS.

- Odours from the refinery are related to the odourant used in LPGs. There is also some smell from gasoline loading operations with the top loading system. The refinery has high maintenance standards for leak-prone equipment, and is vigilant in controlling leaks.

The air quality in Kingston was also tested by the Petrojam Community Health Hazard Survey, conducted between August 7 and 11, 1990. This survey was based on air samples collected at six air monitoring stations: 1) Texaco Fuel Storage Depot on Windward Road in Rockfort; 2) Gillette Caribbean Limited on Gordon Town Road in Hope Tavern; 3) Residence in Golden Springs on Valleyview Road; 4) Residence in Havendale on Coolshade Drive; 5) Berger Paints on Spanish Town Road in Riverton City; and 6) Petrojam Limited Refinery on Marcus Garvey Road. Sampling was conducted during the daylight hours for 8-hour periods to measure the ambient levels of benzene, sulphur dioxide, total suspended particulates, and lead. The results of the survey are presented in Tables 2 through 5. Community Ambient Air Standards, which provide acceptable reference air concentrations for these pollutants, are shown in Table 6.

With regard to benzene (Table 2), the Petrojam area blips were due most likely to gasoline truck loading. In time, bottom loading of gasoline trucks will reduce such emisssions.

With regard to sulphur dioxide (Table 3), the refinery area is in the downwash during east winds from the Hunts Bay power plant and, hence, subject to great variation in SO_2 levels. As noted above, the refinery's SO_2 contribution is not large, although the visible emissions from refinery stacks are disturbing to area residents.

With regard to total suspended particulates, Petrojam is not as significant a contributor as JPS, cement plants, and dumps.2/ Much current work concerns particles smaller than 210 micrometers relative to human health; this survey (Table 4), however, collected larger particles as well. The survey did not identify diesel exhaust particulates as a health hazard, but are of concern in the U.S. and Europe with regard to diesel engine design and sulphur in diesel.

With regard to lead (Table 5), the sampling and analytical procedure did not permit analysis below the 2 ug/m^3 level, but it appears to be within acceptable ambient air concentrations. Since lead uptake by children often comes from soil and solids like paint, however, the ambient air test alone cannot fully measure health impacts.

Table 2
Air Monitoring Data for Benzene Collected from August 7, 1990 to August 11, 1990 for Petrojam Ltd.

	Benzene (ug/m^3)				
Sample Location	Day 1	2	3	4	5
Texaco	<1	Tr	<1	Tr	Tr
Gillete	<1	<1	Tr	<1	<1
Golden Springs	<1	<1	<1	<1	<1
Havendale	<1	<1	<1	<1	4
Berger Paints	Tr	Tr	Tr	6	Tr
Petrojam	12	57	Tr	<1	<1

Source: ESE, 1990.
Day 1: August 7, 1990.
Tr = Trace-Benzene was detected at levels near the detection limit which based upon the average air volume collected is 0.001 mg/m^3 or 1 ug/m^3.

2/ *According to the report, "Solid Waste, Toxic Waste and Air Pollution," by H.S. Silva, Acting Director of the GOJ's Environmental Control Division, particulate emissions in tons/yr were estimated to be: JPS, 256; cars and trucks, 313; cement factory, 3200; dumps, 2240. No estimate was available for Petrojam; however, total refinery fuel use is about 10% of JPSuse, so that particulate emissions would be on the order of 25 tons/year from the refinery.*

Table 3
Air Monitoring Data for Sulphur Dioxide Collected on August 7, to August 11, 1990 for Petrojam Ltd.

Sample Location	Sulfur Dioxide (ug/m^3) Day 1	2	3	4	5
Texaco	9	2	4	3	2
Gillete	9	5	8	3	18
Golden Springs	<2	<2	<2	5	7
Havendale	5	9	7	5	3
Berger Paints	6	3	14	4	6
Petrojam	5	14	40	4	<2

Source: ESE, 1990. Day 1: August 7, 1990.
Day 1: August 7, 1990.
Samples analyzed by NIOSH Method 268.

Table 4
Air Monitoring Data for Total Suspended Particulates Collected on August 7, 1990 to August 11, 1990, for Petrojam Ltd.

Sample Location	Total Particulates (ug/m^3) Day 1	2	3	4	5
Texaco	<20	<20	<20	73	<20
Gillete	<20	<20	81	<20	<20
Golden Springs	<20	<20	26	<20	<20
Havendale	<20	<20	<20	<20	<20
Berger Paints	<20	92	70	<20	<20
Petrojam	<20	180	120	<20	<20

Source: ESE, 1990.
Day 1, August 7, 1990.

Table 5
Air Monitoring Data for Lead Collected on August 7, 1990 to August 11, 1990, for PetroJam Ltd.

Sample Location	Lead (ug/m^3) Day 1	2	3	4	5
Texaco	<2	<2	<2	<2	<2
Gillete	<2	<2	<2	<2	<2
Golden Springs	<2	<2	<2	<2	<2
Havendale	<2	<2	<2	<2	<2
Berger Paints	<2	<2	<2	<2	<2
PetroJam	<2	<2	<2	<2	<2

Source: ESE, 1990.
Day 1, August 7, 1990.

Table 6
Community Ambient Air Standards

Parameter	NAAQS	AAC (UG/M^3)
Benzene	--	320
Sulfur Dioxide	80 (annual) 365 (24 hr)	105
Lead	1.5 (quarterly)	1.5
Total Suspended Particulate	260 (24 hr) 150 (24 hr) respirable)	260

NAAQS = National Ambient Air Quality Standards
AAC = Ambient Air Concentrations
Source: ESE, 1990.

(iii) Water Borne Effluents

Petrojam's oily water system has only a small oil separator and several catch basins on the line to the harbour trap most oil that gets by the separator. This is not good practice. A typical North American refinery, by contrast, has at least two separators sized for flows during a major fire, followed by a

dissolved air flotation unit to remove traces of oil, a bio-oxidation unit to remove any organics, and several holding ponds in which water can be checked before release.

Waste water from the process area contains sulphur compounds which occasionally show in the effluent water; the refinery needs a small system that can strip out these compounds before release to the oily water system. The refinery's bio-oxidation unit and human waste processing are satisfactory.

The refinery also needs additional separator capacity and a dissolved air flotation system to bring the refinery up to "good practice." The retention ponds are large enough to handle to low waste water flow rate.

In the southwest corner of the refinery, oil is seeping into the ground water because the area inside tank dykes is permeable to both oil and water, and not all tank water drains are routed to the oily water sewer system. This configuration is contrary to good practice and there is a potential for slow leakage out to the west into the harbour. The refinery staff have recommended an oil barrier on the west side to keep the oil onsite until it is recovered. The east and west side of the sites are not affected by ground water movement.

In general, the survey noted community concerns about the lack of systems to control spills and storm runoff from industrial areas. Eventually, the contaminants carried from these industrial properties by storm water find their way into the community and may contaminate the land and waterways.

The consultant recommends that all tank water drains be connected to the oily water sewer, or sealed to prevent draining except to a barrel under carefully controlled conditions. All areas inside the dykes should be made impervious to oil and water to prevent further ground water degradation. These dykes should have valved drains to oily water treatment systems for cases when evaporation does not dry up storm water.

A small dissolved air flotation system should be added to the final treatment process.

(iv) Land

Control of land contamination is satisfactory except for the sludge buildup in crude tanks.

1.1.3b Product Issues

The quality of gasoline and diesel products is satisfactory.

The refinery is preparing for all-unleaded gasoline production by the end of the next decade. The availability of unleaded gasoline means that vehicles with catalytic exhaust systems can be imported. These systems will reduce vehicle emissions, which react with NO_x to form ozone and contribute to urban haze. The impact of current emissions on the environment is undefined. The gasoline in the catalytic cracking case may, however, be more reactive in ozone formation; this would require further study if NO^x concentrations are found to be sufficiently serious.

About 90 percent of the sulphur dioxide emitted into Jamaica's atmosphere comes from heavy fuel oil; the remainder comes from the Spanish Town sulphuric acid plant. The JPS plants' contribution to SO_2 emissions is projected to increase by 20 percent in tonnage terms by the year 2005, but will remain at 30 percent of the total, since the emissions of the alumina/bauxite industries will also increase. Table 1, above, indicates projected total SO_2 emissions by 2005.

The extent to which the general use of heavy fuel oil in Jamaica contributes to acid rain (SO_2 plus nitrogen oxides, NO_x) has not been determined. As indicated in Table 1, above, the refinery at present is not a significant source of total SO_2 emissions. New refinery facilities are expected to control NO_x emissions with special burners.

1.1.3c National and International Issues

Jamaica needs to develop an enhanced national program for a) emissions inventories; b) spot and continuous monitoring; c) impact assessment, including selected soil and vegetation inspections; and d) defining fuel and emissions standards.

Jamaica has no environmental emission control agreements with other countries, but is participating in a United Nations effort to create global agreements concerning acid rain, volatile organic compounds, and greenhouse gases (carbon dioxide, methane, NO_x, chloro-fluorohydrocarbons, etc.). These issues will be addressed in a U.N. environmental meeting in Brazil in June 1992. Prior to that meeting, Jamaica should develop a sound understanding of its local emissions issues, and formulate its position relative to a global accord.

1.1.4 PROCESS UNITS

The refinery has the following process units with nominal (design crude) calendar day averages:

	Unit	Approximate Capacities
•	Atmospheric crude distillation	35,500 BPCD
•	Naphtha hydrotreater combined with light ends processing and naphtha fractionator	6,400 BPCD
•	Powerformer upgrading heavy naphtha	3,500 BPCD
•	Kerosene hydrosweetener	5,000 BPCD
•	Gas oil (diesel) hydrotreater	8,000 BPCD
•	Vacuum unit for asphalt only	3,000 BPCD

While the refinery capacities are shown at a 93 percent onstream factor, maximum availability is actually closer to 85 percent. This is due to such Powerformer system limitations as excessive number and length of shutdowns, and slow startups because of lack of hydrogen for the hydrotreaters until the Powerformer is operating.

Crude is usually fed only from one tank, but on occasion a simple two-tank system is used to blend crudes from different tanks. In that case, gate valves are controlled by hand, and the level in each tank is periodically monitored.

Aside from the heater for the small vacuum tower, the crude charge and Powerformer feed and interreactor furnaces provide the process heat. Exhaust gases from the new (1988) gas turbine generator heat a portion of the crude before it enters the crude heater.

1.1.5 TANKAGE AND PRODUCT BLENDING

Although ESSO originally installed a system to blend light naphtha, Powerformate, butane and heavy naphthas, and imported cracked gasoline, gasoline is now blended in tankage. The refinery originally produced two leaded grades, premium and regular, but leaded regular has been eliminated. About 10 percent of total Jamaican demand is unleaded and is directly imported because the refinery is not presently able to produce unleaded gasoline that meets octane requirements.

Kerosene for domestic use and for jet fuel is produced directly from the kerosene hydrosweetener. The jet fuel contains significant amounts of water, due to the steam stripper used in processing, and this creates the problem of enhanced biological activity at the bottom

of storage tanks. Special water draw-off systems have not solved the problem. Diesel tankage has an identical problem, but it is much more severe with jet fuel because of its tight specifications.

A significant area of the refinery is devoted to kerosene drumming, drum storage, and truck loading operations.

Heavy fuel oil is blended off the process unit. It consists of atmospheric column bottoms plus gas oil from the asphalt vacuum unit, with some lighter fractions as needed to meet viscosity specifications. HFO tanks have low pressure steam coils but no insulation, and can produce only one grade at a time. HFO sulphur content varies with the crudes, and there is no blending control of HFO sulphur. Content can be varied only through crude selection.

Gasoline tanks are the only product tanks with mixing capabilities, by means of jet nozzles and transfer pumps.

HFO for the JPS Hunt Bay plant is transferred by pipeline to an ESSO tank in the marketing terminal, and then on to JPS. A system is in construction that will permit direct refinery transfers to Hunt Bay.

Tank trucks for gasoline, diesel, and kero/turbo are top loaded. A separate rack is used for HFO truck loading. All loading meters are centrally monitored for billing and product control.

1.1.6 UTILITIES

The refinery produces its own power with a gas turbine generator which burns refinery fuel gas. The waste heat is used to preheat the crude oil. Refinery process steam is generated in several small boilers. An inert gas generator is used for Powerformer regeneration. Instrument air compressors feed a drier and the plant instrument air system.

Instrumentation is pneumatic, except for some new electronic instruments that have replaced obsolete pneumatic systems.

A small flare line collects vents from low-level relief valves in the process area, and leads to a 6-inch flare stack. Relief valves vent to the atmosphere above each distillation column.

1.1.7 SPACING AND SAFETY

The refinery was tightly laid out, but does not meet new standards. The refinery generally has a good record; however, several small fires, due to column relief valves releasing to the atmosphere and liquids condensing back onto hot surfaces, clearly indicate situations which must be immediately corrected. Any new facilities will be required to meet current standards, which reflect a tightening due to the high incidence of fires at other refineries in recent years.

Two fire pumps provide 3,000 GPM of fire water, which is marginal coverage. Two more pumps are under consideration.

2.0 PRODUCT SPECIFICATIONS

This section reviews current and prospective product specifications which may affect expansion planning.

2.1 PROPANE AND BUTANE

2.1.1 GENERAL

The addition of a catalytic cracking unit will introduce large quantities of light olefins into C_3 and C_4 pools. Even with polymerization, products will contain 5 to 20 percent light C_3 and C_4 olefins.

More definitive engineering studies must be done to determine whether polymerization or equal processing of the light olefins from catalytic cracking will prove economic. If light olefins are not converted to gasoline, as discussed in Section 3.4 and 3.5 (catalytic cracking facility cases II and III), the "propane" olefin content could go as high as 65 percent and butane could go to 60 percent, after dilution with paraffinic C_3 and C_4 from catalytic reforming and crude.

Other refineries sell propane with a maximum 5 percent olefin specification; but higher concentrations (up to 60 percent) have proved satisfactory for other than internal combustion use. The refinery's propane and butane products now have no olefins. Due to potential polymerization when C_3 bottles are exposed to the sun for any length of time, the consultant does not recommend propane for domestic bottled use with a propylene content above 20 percent. The olefin content of butane should be kept at a similar level.

2.2 GASOLINES

2.2.1 UNLEADED GASOLINE

As noted above, the refinery produces only a premium grade of leaded gasoline, with the country importing unleaded gasoline to satisfy the current demand (10 percent of total gasoline sales). Unleaded gasoline is now available at many gas stations that were originally set up to sell two grades of leaded.

The premium leaded gasoline grade has a minimum Research Octane Number (RON) specification of 95 and minimum Motor Octane specification of 85. The Jamaican Bureau of Standards is considering lowering these specifications by up to two numbers, with a final decision depending on an analysis of the Jamaican road vehicle population. We foresee the standards being lowered to 92 or 93 for Research Octane and 82 or 83 for Motor Octane, which would be consistent with U.S. regular unleaded 87 octane on an (R+M)/2 basis.

With the addition of catalytic cracked gasoline and poly gasoline components in certain cases, the Motor Octane specification will become more important than the Research specification. Other additive requirements will also change dramatically to control gum formation and other qualities that are now of little concern.

As unleaded gasoline continues to achieve significant penetration, and as worldwide lead use drops, the phaseout of leaded gasoline will become economically necessary. The declining use of tetraethyl lead will cause the price to rise and will affect reliability of supply. This may result in less than maximum lead content being economic in the short run.

Unleaded gasoline will increase the importance of the octane of light and heavy fractions, which are not always fully mixed at all engine cylinders under same operating conditions (some cylinders receive a predominance of light or heavy). With the addition of TEL, the lighter paraffinic compounds, which predominate in Petrojam's current light gasoline fractions, are boosted from octanes of about 70 RON to about 90 RON; but no such boost is available when lead is not used. The consultant recommends that a minimum octane specification for the lighter fractions be considered in preparation of a national standard.

This study assumes a 10 percent per year phase-in of unleaded sales, rising to 100 percent by the year 2000. But sales are likely to increase even without incentives. Once facilities are installed to make 100 percent unleaded gasoline (by about 1994 in all cases) it will not be economic for Jamaica to retain a leaded gasoline grade.

2.2.2 GASOHOL

The consultant did not analyze the economics of "gasohol" (10 percent ethanol, 90 percent hydrocarbon) in any detail. But it is clear that costs will vary with the flucuation of feedstock and ethanol markets. As with any change in gasoline composition, ethanol should be added gradually to minimize the effects on vehicle performance. Ethanol use requires long-term planning.

2.2.3 ENVIRONMENTAL FACTORS

Available Jamaican data do not support the setting of specific controls on benzene, total aromatics, olefins, or oxygen contents in order to limit concentrations of ambient benzene, volatile organic compounds, or carbon monoxide. However, further review should be done as regional and national air quality objectives are established, since these compounds are a major concern in U.S. cities where air pollution is exacerbated by temperature inversions which frequently occur in the Kingston area.

2.2.4 GASOLINE SPECIFICATIONS OTHER THAN OCTANE

All gasoline specifications should be national and apply to both imports and Petrojam production for domestic sale. Distillation end point specifications for all grades should be set between 420°F and 430°F. Except for octane and lead, specifications should mirror U.S. (A.S.T.M.) standards for areas other than those with severe temperature inversions. Areas with those problems require reformulated gasolines.

The use of up to 10 percent ethanol and 15 percent MTBE (methyltertiarybutylether) should be permitted in all grades. Fifteen percent ETBE (ethyltertiarybutylether) should also be permitted. These allowances would apply to imported gasolines in blending stocks, as they are unlikely to be produced in Jamaica. Methanol should not be used pending more data on its emissions.

Petrojam's gasolines should have a balanced composition with aromatics below 40 percent by volume, and olefins below 50 volume percent. Such constraints can be accommodated within the process configurations specified for the cases presented below.

With cracked materials (i.e. olefins) present, inhibitors are needed to make the product stable in storage. For ethanol, a special additive package is needed for corrosion control and other properties. Further study and laboratory testing can optimize the use of these additives.

2.2.5 OCTANE REQUIREMENTS

High octane gasolines are generally promoted heavily by marketing companies because of the higher profits obtained. Market analysis in USA,3/ however, has revealed that high octane premium gasoline is being oversold and that only about 10% of cars require higher than the regular grade gasoline of 87 octane (R+M)/2.

2.3 KERO/TURBO

Kero/turbo standards have a tight British DERD (Defense Engineering Research Department) corrosion test not normally used in North America.

The specification calls for 0.2 percent sulphur by weight, as opposed to an ASTM (American Society for Testing and Materials) specification of 0.3. The refinery is proposing a change to the latter and we concur. This will reduce the demands on the kerosene hydrotreater (a mild operation, with a stripper marginal for meeting the specification). It will also permit a wider range of crude used for kero/turbo production. The refinery is now using smoke point plus naphthalene as an alternate to the luminometer combustion quality specification. This is a generally accepted approach and should be confirmed in a national standard.

2.4 DIESEL FUELS

2.4.1 GENERAL

Petrojam produces an automotive diesel fuel oil (ADO) and a marine diesel fuel (MDO). Load growth will occur primarily in Jamaica Public Service gas turbine plants, which use ADO. By 1995, the gas turbine diesel fuel use is expected to be more than 50 percent of total ADO demand. MDO demand is projected to be 18 percent of ADO demand, up markedly from the years before 1985.

2.4.2 NEW GAS TURBINE FUEL (GTO) SPECIFICATION

Although GTO is often identical to ADO, this fuel could have a separate specification, but this does not appear warranted at projected volumes. JPS fuel quality needs should be analyzed to

---

3/ "Why Pay for Premium?" AAA World, American Automobile Association, Jan/Feb 1991, and "Do You Need High Octane?" Consumer Research Reports, March 1991.

determine minimum quality requirements. GTO may have a lower flash point than ADO and may not require a cetane specification. General Electric suggests a 12 percent hydrogen content when their gas turbines are using "true distillate" fuels; this needs confirmation. At that level, about 30 percent light cycle oil from catalytic cracking may be acceptable for optimizing refinery operations.

2.4.3 ADO SPECIFICATION

In order to allow more light cycle oil to be incorporated into diesel, and to reflect North American standards, we recommend that the cetane specification be revised from the current level of 45 octane number minimum to 40, with a 40 cetane index as an acceptable alternative. The use of cetane-improving chemicals should be allowed, however, in which case cetane index is not a comparable specification. This will necessitate some outside diesel engine testing for quality and customer acceptance, since no test engine is available locally. But such a change will allow increased use of low cetane crudes like BCF-17, or increased use of FCC light cycle oil in ADO.

The new Environmental Protection Agency (U.S.) standard is 40 minimum cetane index, established to control aromatic content of diesel. A current Canadian government study indicates that cetane improvers create emissions that are equivalent to those of lower aromatic content diesel without improver. Hence, a cetane number specification is also acceptable.

European and Japanese diesel engine manufacturers prefer a 50 cetane diesel, but have adapted, when necessary, to the standards in North America.

Mandated changes in diesel engine design to meet restrictive new exhaust particulate emission standards will require very low sulphur diesel. The U.S. will adopt a specification of 0.05 weight percent sulphur on-road in 1993; Canada will follow in 1995; and Europe is expected to adopt the specification by the year 2000. Canada is adopting the U.S. standard because nearly all of its diesel engines are imported from the U.S.. Also, many U.S. trucks cross over into Canada, and their new exhaust system components may be damanged from a higher sulphur diesel fuel. Design changes in construction, marine, railway, and other off-road diesel engines are also likely as diesel-generated particulate emissions are reduced.

The refinery's gas oil hydrofiner is capable of processing only a small amount of the high-sulphur light cycle oil from catalytic cracking along with the diesel fractions from crude oil. Putting light cycle oil directly to diesel may cause corrosion; it also adversely affects product stability because of the olefinic/aromatic nature of light cycle oil. Processing the light cycle oil to improve stability and reduce sulphur content necessitates greater pressure and more hydrogen

circulation per unit of feed than the hydrofiner can produce. The processing of virgin gas oils to a 0.05 weight percent level entails the same problems.

There is no evidence that diesel-originated particulate emissions are a problem or that U.S. particulate exhaust standards are necessary. If the new low diesel engine particulate emission standards set for the U.S for 1994 are not required in a particular jurisdiction, U.S. diesel engine manufacturers will likely supply Jamaican plants with basic engines that have not had special exhaust treatment.

We recommend, however, that space be provided for a new diesel hydrotreater to process both virgin and catalytic cracked light cycle oil to a 0.05 weight percent level, in the event that this standard is adopted in the future. A small hydrogen unit may also be needed to provide sufficient hydrogen for the new hydrotreater.

2.4.4 MDO SPECIFICATION

The current 37 cetane index specification (with a 37 cetane number alternate) could be relaxed to allow the refinery to use light cycle oil when a catalytic cracking unit is added. Canada uses a 32 specification for railroads and heavy construction equipment; and the U.S. uses a 4-D heavy diesel specification allows as low as 30. Both these specifications have been found acceptable. The Jamaican MDO is a lighter, completely distillate material, however, and may need different specifications. For example, Jamaica's current corrosion specification of a No. 1 copper strip is more appropriate for heavier diesel fuel. A No. 2 or 3 copper strip should be considered. The consultant recommends that the Jamaica Bureau of Standards conduct a user survey before making any changes.

2.5 HEAVY FUEL OIL

2.5.1 GENERAL

Petrojam's heavy fuel oil product is lighter in gravity and lower in heat content per barrel than that preferred by bauxite and alumina processors, and the refinery has in the past traded its own oil for the more conventional heavy fuel oil in order to supply these companies. The Petrojam HFO product now contains appreciable vacuum gas oil, which is a valuable feedstock for conversion refineries in the USGC. Hence, the value of Petrojam HFO is now greater than that of conventional heavy fuel oil.

The Petrojam heavy fuel oil specification applies to a low viscosity heavy fuel oil which can be stored in non-insulated tanks with only steam coils. The maximum viscosity of 200 Saybolt Furol Seconds (SFS) at 122°F is thinner than the "nominal" A.S.T.M. maximum for No. 6 fuel oil at 300 SFS, and much less than the 600 SFS heavy fuel oil (pitch) used in many refineries and central electricity generating plants.

The Hunts Bay Jamaica Public Service steam-based electrical generating plant, by contrast, does not have significant fuel oil preheating or burners designed for high viscosity pitch and prefers a viscosity of only 175 maximum SFS at 122°F.

The consultant recommends that Petrojam raise the heavy fuel oil viscosity maximum specification to 250 SFS at 122°F and charge a premium for all heavy fuel oil under that limit, due to the need for additional diesel or kerosene to lower the viscosity. The maximum specification should be set at a level appropriate for both Petrojam's heavy fuel oil handling system and for an independent system.

Ideally, heavy fuel oil specifications should be tailored for each major customer, and the tankage and blending system set up for custom blends. This is not difficult in cases of catalytic cracking, where available cutter stock storage will allow for final heavy fuel oil blending to suit customer needs. The sulphur content, it should be noted, will be determined by the crude being processed unless low sulphur cutter stocks are used.

3.0 REFINERY PROCESS MODIFICATION CASES

3.1 INTRODUCTION

This review considers five scenarios: Terminal Only (Base Case); Business as Usual (Case I); Matched FCC Addition (Case II); Expanded FCC (Case III); and 100,000 BPD (Case IV).

Cases I, II, and III propose to add a new desalter to improve the onstream factor and reduce the ash content of HFO, which will result in lower particulate emissions and reduced boiler tube failure rates. These cases also revamp the Powerformer and use a new C_5C_6 isomerization unit to facilitate the production of unleaded gasoline.

Case IV has been developed only in conceptual form. It presents a complex processing scheme to maximize premium kerosene and diesel for export sales into markets generally surplus in gasoline. An all-unleaded gasoline capability has been assumed with export gasoline nearing expected U.S. reformulated qualities.

The model used in these analyses was based on a linear program supplied by Petrojam, with minor modifications, and on a variety of linear program runs and hand calculations. Figure 1 provides a schematic description of the existing facilities.

All of the following cases provide realistic process configurations. The team developed the various estimates in collaboration with Petrojam staff, using recent refinery cost data. Tables 7 through 10 set out the anticipated changes for the various cases.

Figure 1
Existing Refinery Block Diagram

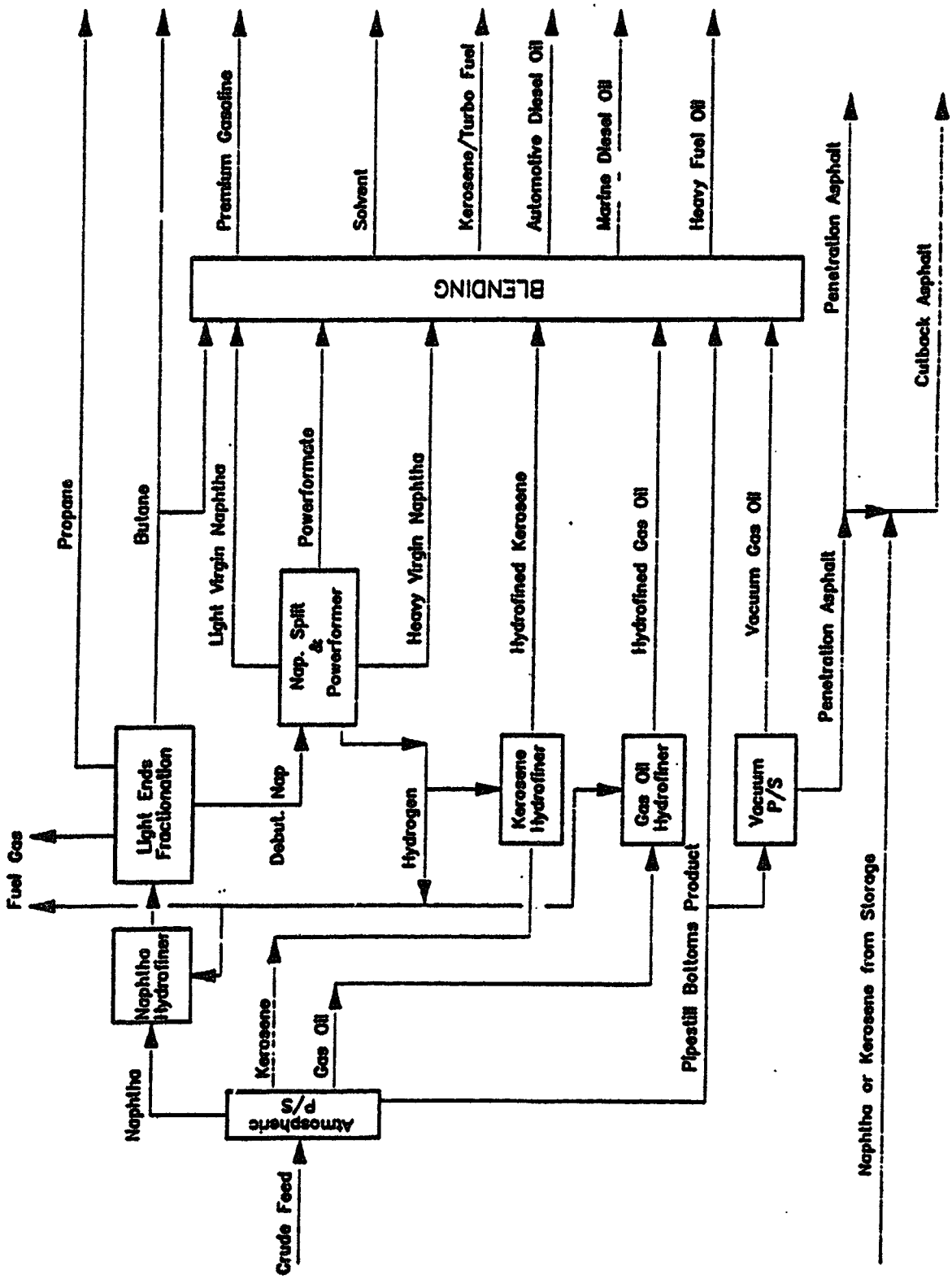


Table 7
Process Facility Change Patterns

PROCESS SECTION (a)	CASE				
	TERMINAL	BUSINESS AS USUAL	MATCHING FCC	EXPANDED FCC	100,000 BPD
Desalter #1	—	40,000 BPSD	40,000 BPSD	55,000 BPSD	40,000 BPSD
Desalter #2	—	—	—	—	60,000 BPSD
Atmosphere Dist.	Mothball	No Change	No Change	Revamp	No Change or Revamp
Atmosphere Dist. #2	—	—	—	—	60,000 BPSD
Naphtha HT	Mothball	Debottleneck	Debottleneck	Debottleneck	Debottleneck
Naphtha HT #2	—	—	—	—	15,000 BPSD
Powerformer	Mothball	Debottleneck & New Cat	Debottleneck & New Cat	Debottleneck & New Cat	Debottle/New Cat
Powerformer #2	—	—	—	—	8,000 BPSD
C5C6 Isomerization #1		2,000 BPSD	2,000 BPSD	2,000 BPSD	6,000 BPSD
Kerosene HT	Mothball	Debottleneck	Debottleneck	Debottleneck	Shutdown
Gas Oil HT	Mothball	Debottleneck	Debottleneck (b)	Debottleneck (b)	Convert to kero HT
Gas Oil HT #2	—	— (c)	— (c)	— (c)	25,000 BPSD
Asphalt Vacuum #1	Mothball	No Change	No Change	No Change	No Change
Vacuum #1	—	—	20,000 BPSD	31,000 BPSD	60,000 BPSD
FCC #1	—	—	12,500 BPSD	19,00 BPSD	20,000 BPSD
Poly/Equal #1	—	—	To Match (d)	To Match FCC (d)	—
Alkylation #1	—	—	—	—	C4(C5) Feed to Match FCC (f)
C3C4 Saturation #1	—	—	— (d)	— (e)	C3 to Match FCC (f)
Sulphur Recovery #1	—	Optional (g)	20 to 30 tpd (h)	30 to 40 tpd (h)	50 to 70 tpd (h)
Hydrogen Plant #1	—	—	— (d)	— (e)	15,000,000 SCFD
Hydrocracker #1	—	—	—	—	20,000 BPSD
Visbreaker #1	—	—	—	—	20,000 BPSD

Notes:

(a) A number indicates a new unit.
(b) Plan for some FCC L.C.O. in feed, maximize H2 to unit.
(c) Space left for future more severe gas oil HT. At such time as built, convert existing gas oil HT to kerosene service.
(d) In next stage of studies, examine alternate C3C4 olefin options, including 2 process routes.
(e) In next stage of studies, examine C3C4 saturation option as well as middle distillate production options, may require small hydrogen unit.
(f) This requires Jamaican market swing C4 to C3.
(g) Reconsider in 1992 with newest technology options - outside this analysis.
(h) Size for maximum available under all scenarios. Capacity is tonnes per stream day.
(i) Sulphuric acid type.

BPSD = Barrels per day on stream.

Table 8
Tankage and Blending Change Patterns

SECTION	CASE				
	TERMINAL	BUSINESS AS USUAL	MATCHING FCC	EXPANDED FCC	100,000 BPD
Crude Tanks	Mothball	See HFO	See HFO*	See HFO*	Add 1,000,000 bbls**
Crude Blending	—	2 cpt System (a)	2 cpt System (a)	3 cpt System (a)	2 cpt System (a) for each crude unit
Gasoline Tanks	No Change	Reuse T-106 (b)	Reuse T-106 (b)	Reuse T-106 (b) New 50,000 (Export)	Add 200,000 (Export)
Gasoline Blending	Remove all TEL facilities	Upgrade (c)	Expand (d)	Expand (d)	New System
Kerosene Tanks	No Change	No Change	No Change	No Change	Add 100,000 (Export)
Diesel Tanks	No Change	New 15,000 MDO for T-106	New 15,000 MDO for T-106	New 15,000 MDO for T-106	Add 200,000 (MDO-Export)
Diesel Blending	—	—	3 cpt (e)	3 cpt (e)	3 cpt (e)
Light Cycle Oil Tank	—	—	New 1 @ 80,000	New 1 @ 100,000	New 1 @ 100,000
HFO Tanks	No Change	Add 1 @ 100,000 (f)	Add 1 @ 100,000	Add 1 @ 100,000	Add 3 @ 200,000**
HFO Blending	—	—	2 cpt System (g)	3 cpt System (g)	4 cpt System (g)
Miscellaneous	Decommission all systems not being used	—	—	— (h)	Plant Fuel Oil Slop (2). C3C4 etc.

Notes:

* Relocate T-116 to make room for new process facilities. New tank assumed in 100,000 BPD case.
** May need to relocate T101, 102, 103, etc. to make room for new units - not allowed in costs.

(a) Blend to suction of main crude pumps.
(b) From MDO service.
(c) Recommission existing system and add 1 cpt to 2 grades. Convert to digital controls and meters.
(d) Essentially rebuild existing.
(e) Allow for kerosene and L.C.O. to final ADO/MDO.
(f) Added to allow more atmosphere bottoms sales to U.S. in trade for conventional HFO.
(g) Blend to specific customer needs.
(h) May need additional C3 storage if C3 ex FCC saturated.

Table 9
Utility and Support System Change Patterns

SECTION	CASE				
	TERMINAL	BUSINESS AS USUAL	MATCHING FCC	EXPANDED FCC	100,000 BPD
Steam Generation	Shutdown all but 1 boiler	No change	2 new boilers - one on FCC fl. gas (a)	2 new boilers - one on FCC fl. gas (a)	3 new boilers - one on FCC fl. gas (a)
Boiler Feed Water	See above	No change	No change	No change	
Water Supply	No change	Add for desalter	Add for desalter, wash water and CT - well?	Add for desalter, wash water and CT - wells	New wells (a)
Electric Generation	S/D GTG	No change	Generate 4 MW from steam (b) (from waste heat and boilers)	Generate 4 MW from steam (b) (a)	Steam turbine gen 5 MW 6 MW Added gas turbine gen. 8 MW (with waste heat recovery)
Electric Supply	S/D unused portions	No change	Upgrade	Upgrade	New area/upgrade
Fire Water	No change	(c)	(d)	(d)	New pumps and loops (one in each area)
Cooling Water	Shutdown (sell?)	No change	New 8,000 GPM tower, pumps (b)	New 12,000 GPM tower (b)	New tower - BIG
Air Systems	Shutdown (sell?)	No change	Add new compressor and drier	Add new compressor and drier	New system
Flare System	Shutdown, take down	No change	New system - Ground flare - New elev. flare? - New KO drum Tie in existing RV's	New system - Ground flare - New elev. flare? - New KO drum Tie in existing RV's	New system - Ground flare - New elev. flare - New KO drum Tie in existing RV's
Chemical Systems	Shutdown	No change	Caustic handling	Caustic handling	Caustic, acid handling
Interconnections	See tankage	---	New rack, etc.	Major new rack, etc.	Extensive (f)
Miscellaneous	Decommission where not used	---	To be defined (e)	To be defined (e)	Control building, new
TOTAL					
Site Development	No change	No change	Move T-118 to provide room for new units	Move T-118 to provide room for new units	Relocate T-118, 101, 102 and 103 Develop new 70 acre area for atmos storage
Dockage	No change	No change	No change	New product dock	New product dock (larger)

Notes:

(a) FCC flue gas expander not included - evaluate in study.
(b) Multi level steam turbine generator, last stage to condensing. Consider larger system to sell power to utility. Note 40 PSIG steam to ethanol plant. New cooling tower size to suite.
(c) Continue with plans (no $ here) for added pumps.
(d) 2 new pumps and intake plus loops in new areas.
(e) Lab equipment, special maintenance equipment, spent cat disposal, sulphur truck loading, etc.
(f) Marine crossing to/from new 60± hectare tank farm area.

Table 10
Environmental Control Change Pattern (a)

SECTION	CASE				
	TERMINAL	BUSINESS AS USUAL	MATCHING FCC	EXPANDED FCC	100,000
Existing Process Systems	Mothball all	Sour Water Stripper	Sour Water Stripper	Sour Water Stripper	Sour Water Stripper
			Recover H2S from fuel gas	Recover H2S	Recover H2S
		—	All RV's to flare	All RV's to flare	All RV's to flare (c)
New Process Systems	—	—	Sour Water Stripper	Sour Water Stripper	Twin Sour Water Strippers
			Sulphur Recovery (including existing)	Sulphur Recovery (including existing)	Sulphur Recovery - Twin Units
			S transfer additive to FCC catalyst to reduce SO2 emissions	S transfer additive to reduce SO2 emissions	S transfer additive to reduce SO2 emissions
			Special sale of spent FCC catalyst to cement or others	Spent FCC cat sales	Spent FCC cat sales
					Spent H2SO4 regeneration if no new process by that time
			All RV's to flare	All RV's to flare	All RV's to flare (c)
Tankage	Program to impermeate dyked area floors	Program to impermeate dyked area floors	Program to impermeate dyked area floors	Program to impermeate dyked area floors	Program to impermeate dyked area floors (b)
Oily Water	All tank drains to oily water systems	All tank drains to oily water systems	All tank drains to oily water systems	All tank drains to oily water systems	All tank drains to oily water systems
		New 1500 GPM API separator	New 1500 GPM API separator	New 1500 GPM API separator	2 New 1500 GPM API separators on site and one new one in new area
	New DAF system after API separator	New DAF system after API separator	New DAF system after API separator	New DAF system after API separator	2 New DAF system's, one after each API system
		Outfall extended	Outfall extended	Outfall extended	Outfall extended New Outfall from new area
Ground Water	Barrier around area(s) with oil present	Barrier around area(s) with oil	Barrier around area(s) with oil	Barrier around area(s) with oil	Barrier around area(s) with oil
	Added pump systems	Added pump systems	Added pump systems	Added pump systems	Added pump systems

Note:

(a) Solid wastes will be landfilled or shipped to secure disposal in all cases. More study may be needed in that area.
(b) In this case, new tankage area required with lines to/from existing site. Such lines, if underwater, should be placed inside a large sleeve or other safeguard.
(c) Move T-101 or 102 for new ...e.

3.2 BASE CASE: TERMINAL ONLY

3.2.1 OUTLINE

This case assumes that the refinery is converted to a terminal operation with no processing, and that all products are imported for distribution in Jamaica.

3.2.2 FACILITY CHANGES

With the exception of systems needed to generate steam for heavy fuel oil tank heating, fire protection, and product transfers, all process and utility facilities would be shut down. Equipment would not be dismantled except where it has immediate sales value or may rapidly become unusable. Basic processing equipment would be cleaned and treated for storage. Catalysts would be removed and returned to vendors or sold.

Pressure vessels would be kept under nitrogen pressure. Periodically, fired heaters and boilers would be warmed to eliminate water buildup on unprotected surfaces under refractory. Alternatively, refractory might be removed and the bare metal given protective coatings.

Crude oil tanks would be taken out of service, assuming no immediate demand for products. Tetraethyl lead facilities would also be taken out of service, cleaned, and dismantled, with the lead wastes removed to a secure landfill.

3.2.3 ENVIRONMENTAL CHANGES

A new dissolved air flotation (DAF) system would be added downstream of the existing API separator to remove additional oil from waste waters. Collection and separation of oily water in the truck loading area would continue, possibly with another DAF system in that area.

All tank water drains would be connected to the oily water systems. Areas inside tank dykes would be made impervious to oil and water by means of drains that would route all water from tankage areas via the API separator/DAF systems before discharge.

The existing oil recovery from waters under the southwest portions of the refinery would continue with an oil barrier installed to prevent oil to the harbour. Pumping stations would be added to speed up the cleanup process. The flare stack would be taken down.

3.2.4 STAFFING

Staffing would be decreased to the level essential for the terminal operation--about 55 percent of the staffing level in the business as usual case.

3.2.5 INVENTORIES

Crude inventories would be processed before the shutdown. Other inventories would be adjusted to levels appropriate for a terminal operation.

3.2.6 COSTS

Preliminary estimates of one-time costs (as of 1992) for converting the refinery to terminal operation are shown in Table 11.

Table 11
Costs to Convert to Terminal Operation
- In Millions of 1991 U.S. Dollars -

Cost Sector	Basic Cost	Contin-gency	Total Cost	Foreign Exchange %	Foreign Exchange Total
Studies, Outside Assistance	0.07	0.03	0.10	95.0	0.10
Environmental Improvements	0.36	0.14	0.50	20.0	0.10
Mothball Existing Unit	2.14	0.86	3.00		
Revise Tank Farm Equipment	0.71	0.29	1.00	10.0	0.10
Staff Redundancy Payments	1.00	0.00	1.00	0.0	0.00
Sub Total	4.28	1.32	5.60		0.29
Inventory Reduction	-3.00	0.00	-3.00	100.0	-3.00
Net Total	1.28	1.32	2.60		-2.71

Projected annual operating costs for the terminal operation are shown in Table 12:

Table 12
Annual Terminal Operating Costs
- In Millions of 1991 U.S. Dollars -

Cost Sector	Annual Cost	Foreign Exchange %	Foreign Exchange Total
Fixed			
• Salaries, Wages, Benefits	1.45	0	0.00
• Electricity, Water	0.12	0	0.00
• Maintenance and Repair Materials	0.88	50	0.44
• Materials, Supplies	0.32	50	0.16
• Contract Services	0.48	0	0.00
• Auto/Service Equipment	0.36	50	0.18
• Taxes, Land, Etc.	0.25	0	0.00
• Insurances	0.70	100	0.70
• Demurrage	0.30	100	0.30
• Training	0.05	50	0.03
• Inspection, Testing	0.08	75	0.06
• Miscellaneous	0.75	100	0.75
Total Fixed	5.74	46	2.62

Cost Sector	$/Bbl of Throughput	Foreign Exchange %	Foreign Exchange Total
Variable Cost			
• Additives	0.01	100	0.01
• Electricity, Water	0.03	0	0.00
• Miscellaneous	0.02	0	0.00
Total Variable	0.06	20	0.01

In addition to these costs, the capital cost of providing a safe, environmentally clean workplace with up-to-date equipment will be about $400,000 U.S. ($140,000 U.S. in foreign exchange).

The time distribution of capital costs is estimated to be:

- 1992 $2.6 million U.S.

3.3 CASE I: BUSINESS AS USUAL

3.3.1 OUTLINE

In the Business as Usual Scenario, it is assumed that this scenario, the refinery would be upgraded to allow for an operation rate of 35,500 BPCD and an average availability of 93 percent, with minimal capital changes.

3.3.2 FACILITY CHANGES

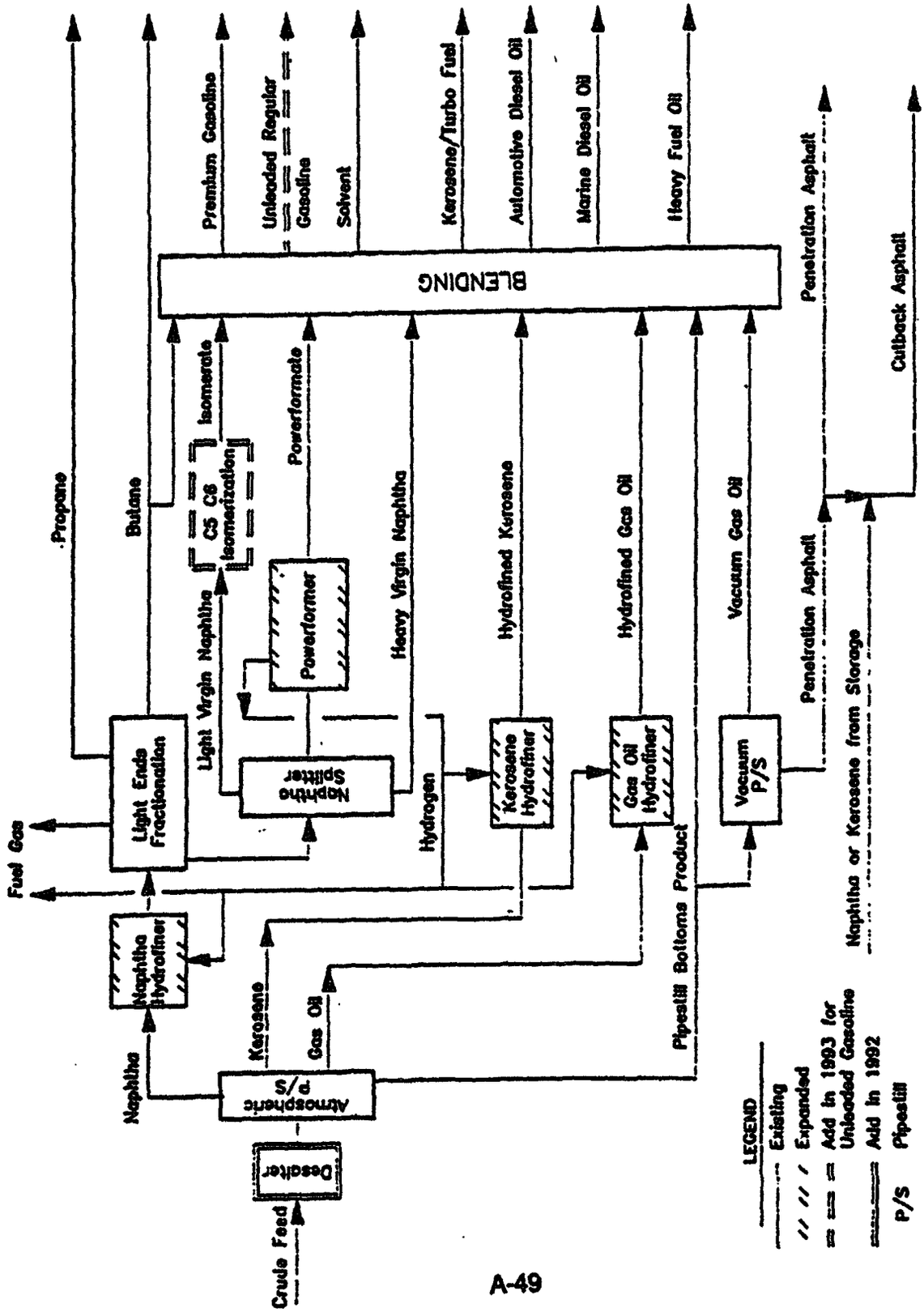
The existing naphtha hydrofiner/Powerformer combination would be revised and a new Powerformer catalyst installed to permit longer run lengths at higher Powerformer severities and feed rates (up to 5,000 BPCD). Modifications to the kerosene hydrosweetener and gas oil hydrofiner would increase the capacity of those units by 10 and 25 percent, respectively, which would permit flexibility in crude selection and improved product qualities. These changes are shown in Figure 2.

The naphtha hydrofiner would produce a Powerformer feed with lower sulphur and nitrogen content than at present. New laboratory equipment would be needed for measuring the nitrogen content.

A new desalter for processing all crude charge would be needed to keep the crude exchangers clean, permit the use of higher salt content crude oils, and allow crude tank mixers to operate continuously to prevent sludge buildup in storage tanks. This would be a single vessel, since the low salt levels do not warrant the more common two vessel system. The crude would be washed with water to separate the bulk of the salts; any sludge present would also separate out into the water.

The new desalter will reduce the ash content of the Petrojam HFO, resulting in reduced particulate emissions from its combustion.

Figure 2
Business as Usual Case



3.3.3 UNLEADED GASOLINE

In the Business as Usual Scenario, it is assumed that unleaded gasoline would be imported until sales of that product reach about 25 percent of the total, say in 1993. At that time, a 2,000 BPSD light virgin naphtha (LVN, C_5C_6) isomerization unit would be built to upgrade LVN from about 70 to 84 octane (without lead). This LVN would be used in both unleaded regular (with Powerformate at about 94 research octane and butane) and in leaded regular (with butane, a lower quality Powerformate, and some tetraethyl lead).

The leaded grade would contain some unprocessed Powerformer feed in the first year or two, but this would eventually be eliminated, in order to maximize Powerformer feed, reduce TEL demand, and maximize hydrogen production for better kerosene and diesel hydrotreating.

The new C_5C_6 isomerization unit would be the "once through" type, with a high activity catalyst and no hydrogen circulation. A pretreatment vessel would contain a special adsorbent to prevent any sulphur from reaching the isomerization catalyst. The unit would also have special driers to keep water out of the LVN or the makeup hydrogen. Since a small amount of chlorine would be continuously added to the catalyst, the byproduct gases would pass through a chemical wash before going to fuel gas, to prevent the release of hydrochloric acid into the atmosphere.

The production of unleaded gasoline would necessitate rebuilding or replacing portions of the original leaded gasoline blending facilities, and cleaning portions of the existing tankage and piping.

3.3.4 NEW TANKAGE

A new HFO tank would permit easier exchange of oil for heavier conventional HFO for the aluminum industry. A second tank might be warranted for tank cleaning purposes, in which case its cost would be accommodated within the sustaining capital budget.

A new 15,000 barrel MDO tank would be needed in order to free T-106 for gasoline blending, its original service.

3.3.5 ENVIRONMENTAL CHANGES

To eliminate sulphur compounds from the waste water, a sour water stripper would process the waters which enter the crude and hydrofiner vessels with the steam and crude. The stripper might also process water from the desalter system, but if the crude contains no light sulphur compounds, the stripped water would be used in the desalting water, to minimize water consumption.

Gases from the stripper and from degassing desalter waste water would be routed to the crude unit furnace fire box and burned to recover their energy content.

The API separator would be paralleled with a new separator capable of handling fire water in the event of a process unit fire. A single dissolved air flotation (DAF) facility would back up the API separator to provide an oil-free waste water. The cleaned water would be disposed of far out in the harbour to maximize diffusion.

All tank drains would be routed to the oily water system, and areas inside the dykes made impervious to oil and water and provided with valved drains to the oily water treating system. The program to remove oil from ground water would be accelerated, with at least two pump systems operating at all times and a barrier to oil movement installed on the west side of the contaminated area(s) to prevent oil movement to the harbour.

The current program for improving dykes and oily water collection in the truck loading area would continue, with a small DAF system on the final water effluent.

3.3.6 COSTS

Capital costs have been estimated as follows:

Table 13
Business As Usual Case Capital Costs
- in Millions of 1991 U.S. Dollars -

Cost Sector	Basic Cost	Contin-gency	Total Cost	Foreign Exchange %	Foreign Exchange Total
Studies & Preliminary Engineering	0.07	0.03	0.10	95	0.10
Environmental Improvements	0.35	0.15	0.50	60	0.30
Powerformer Revamp +	3.60	0.80	4.40	70	2.90
Unleaded Gasoline Facilities*	5.30	1.10	6.40	85	5.40
Tankage Additions	1.80	0.60	2.40	50	1.20
Instrument Upgrade	1.50	0.20	1.70	65	1.20
Total	12.62	2.88	15.50	72	11.13

\+ Includes desalter at $0.9 million U.S. total cost.
* Primarily C_5C_6 isomerization unit.

The refinery staff provided appreciable assistance relative to these costs, since the Powerformer revamp, tankage program, and instrumentation upgrade were well along in development. Our review of current capital programs and discussion of future small project needs indicates that $2.5 million U.S. should be allowed each year to provide a safe, environmentally clean, reasonably updated refinery. This concurs with the estimate by the refinery staff, which includes the cost of continuing to upgrade truck loading facilities and similar improvements.

The time distribution of capital costs is estimated to be:

- 1992 $9.1 million U.S.
- 1993 $6.4 million U.S.

Table 14
Annual Business As Usual Case Operating Costs
- In Millions of 1991 U.S. Dollars -

Cost Sector	Annual Cost	Foreign Exchange %	Foreign Exchange Total
Fixed			
• Salaries, Wages, Benefits	2.70	0	0.00
• Electricity, Water	0.40	0	0.00
• Maintenance and Repair Materials	2.20	50	1.10
• Materials, Supplies	0.80	50	0.40
• Contract Services	0.60	0	0.00
• Auto/Service Equipment	0.90	50	0.45
• Taxes, Land, Etc.	0.25	0	0.00
• Insurances	1.00	100	1.00
• Demurrage	0.40	100	0.40
• Training	0.10	50	0.05
• Inspection, Testing	0.10	75	0.08
• Miscellaneous	1.50	100	1.50
Total	10.95	45	4.98

Cost Sector	$/Bbl of Throughput	Foreign Exchange %	Foreign Exchange Total
Variable Cost			
• Additives	0.35*	100	0.35
• Electricity, Water	0.04	0	0.00
• Catalyst Chemicals	0.03	90	0.03
• Miscellaneous	0.05	10	0.00
Total	0.47	81	0.38

* Decreases to 0.10 in 1994 when C_5C_6 isomerization unit installed.

3.3.7 CRUDE SELECTION

The modelling indicates a blend of naphtha and gas oil spikes in conjunction with BCF-24 crude as the optimum feedstock. Adding naphtha to the crudes and the Venezuelan spikes would maximize hydrogen production, which would improve the operation of all three hydrotreaters and the new C_5C_6 isomerization unit. The addition of naphtha might also help fill up the Powerformer and eliminate gasoline imports, although the analysis did not explore these possibilities, or the alternative of purchasing gasoline blending components.

It is essential that crude blending facilities be capable of blending two or more feedstocks at any time, in order to maximize throughputs and to make economic use of various crudes. The modelling indicates that the sequential use of a variety of crudes leads to reduced throughputs, due to different pinch points for each crude.

3.4 CASE II: MATCHING CATALYTIC CRACKING TO EXISTING CRUDE CAPACITY

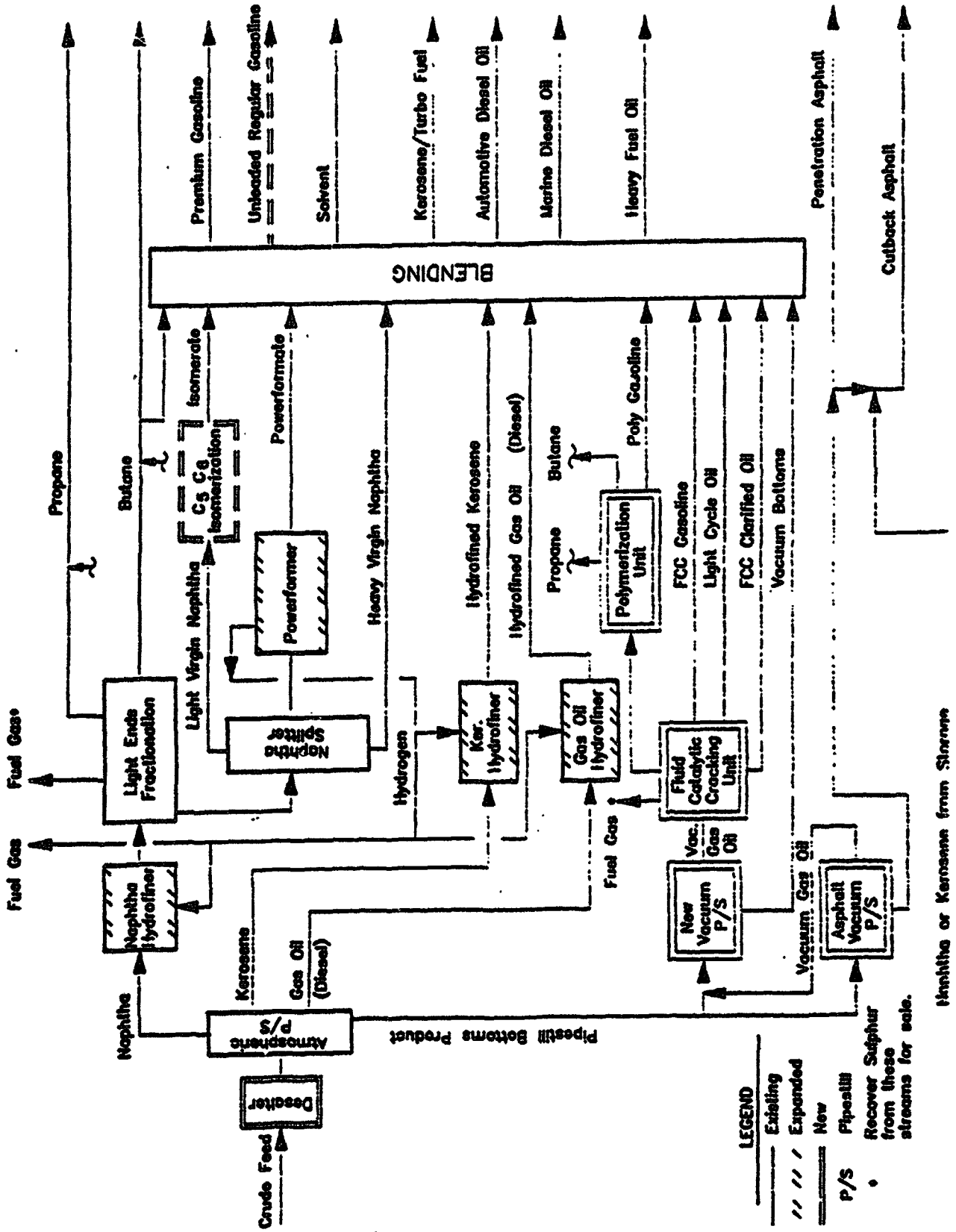
3.4.1 OUTLINE

This case adds vacuum distillation and catalytic cracking units to the existing facilities, with crude capacity unchanged from the Business As Usual case. Some changes would be required in the existing facilities to optimize crude use and integrate the the naphtha hydrofiner/Powerformer revisions of the Business As Usual case, as shown in Figure 3.

A polymerization unit to convert light olefins from the catalytic cracking unit would also be added, but alternate approaches should be analyzed in future studies. Sulphur compounds would be captured from fuel gases, and elemental sulphur recovered and sold to the sulphuric acid plant in Spanish Town.

The catalytic cracking unit would process distillate fractions heavier than diesel now present in HFO, converting them to propane, butane, and gasoline and low viscosity heavy fuel oil blending stocks. The lower boiling fraction of the light cycle oil could be used in 20 percent concentrations in ADO if the sulphur content is acceptable, and in 30 percent concentrations in Marine diesel.

Figure 3
Matching Catalytic Cracking Case



Catalytic cracking reduces the HFO yield and increases its specific gravity and volumetric heating value, a factor important to the alumina industry. It also increases the total yield of gasoline, propane, and butane in roughly equal proportion to the reduced heavy fuel oil yield.

3.4.2 EXISTING FACILITY CHANGES

Minor changes at the bottom of the crude column would allow for heavier feed; and the kerosene hydrotreater would require some debottlenecking (a new separator and added catalyst). The gas oil hydrotreater would use all available hydrogen, and would operate at its maximum pressure in order to process a small amount of catalytic cracked light cycle oil along with virgin gas oil.

The Powerformer would be revamped as in the Business As Usual case, but once the catalytic cracking unit is on line, its load would decrease and severity increase as more unleaded gasoline is produced. For hydrogen balancing, the purchase of naphtha for direct feed to the naphtha hydrotreater would be considered.

A desalter would be installed at the same time as the Powerformer revisions.

3.4.3 NEW FACILITIES (OTHER THAN FOR UNLEADED GASOLINE)

A new 20,000 BPSD vacuum unit would produce feed for a 12,500 BPSD fluid catalytic cracking unit (FCCU). The FCCU gasoline product would be treated to convert smelly and corrosive mercaptans to low odour disulphides. A C_3C_4 treating system would feed a polymerization unit.

This case, which uses a polymerization unit option in the economic evaluation, does not determine the optimum route for processing FCC C_3C_4s. A route with saturation of the FCC C_3C_4 olefins to produce propane and butane for local sale might be marginally more attractive than exporting additional excess gasoline. The precision of the linear program, and the alternate crude and process yield and steam qualities, were not accurate enough to draw any final conclusion. Such a route would require a small hydrogen production unit, resulting in capital costs similar to those of the polymerization route. The hydrogen plant would improve gas oil hydrotreating and provide more rapid startups after shutdowns, but would add to operating complexity.

The detailed feasibility/final engineering study should investigate:

- Polymerization of C_3 and C4 olefins for gasoline,
- Polymerization for jet fuel (with backup hydrotreating required),
- Mobil MOG and MOGD processes (with backup hydrotreating in the latter case for jet or diesel production),
- Other similar C_3 and C_3C_4 conversion options,
- C_3C_4 saturation for local propane and butane sales, and
- Combinations of the above routes.

For such studies, Petrojam anticipates a more elaborate linear program, much licensor contact, and extensive analyses.

In the Business as Usual case, all FCC C_3C_4s went to gasoline polymerization. In this case, only C_4s would go to gasoline polymerization, to gain on blending octane number over C_3C_4 poly gasoline and to reduce gasoline yield slightly with C_3's to saturation for sale as propane. This latter move would require a change in Jamaican LPG pricing to promote more C_3 use. The C_3 olefin saturation will necessitate a small hydrogen plant but the latter will greatly assist in crude unit startups and all excess hydrogen will be routed to the gas oil hydrotreater to all units to process a small amount of light cycle oil blended into ADO.

This case uses a middle distillate-oriented version of catalytic cracking designed for reduced gasoline production, and maximum light cycle oil for HFO cutter stock and incremental diesel. This approach would require different design, catalyst, and operating conditions than those used in the normal gasoline-oriented version.

The yields in this analysis were taken from nonconfidential UOP Inc. seminar papers. Confidential Petrojam data are consistent. The catalytic cracking yield structure assumes that the FCC gasoline would be "undercut"; that is, that heavy aromatic and olefin components normally found in FCC gasoline would be transferred to light cycle oil.

New boilers and electricity generating facilities would support the new units with guaranteed electrical supply. Byproduct low pressure steam from the new processes would be used for the ethanol plant, improving its economics. The FCCU flue gas would provide significant high pressure steam production. Petrojam studies show that electricity generation through expansion of that flue gas would not be economic; further study of this question is needed.

The original gasoline blending system would be reactivated and upgraded to provide most blending prior to tankage. A light cycle oil tank and a new HFO blending system would enable the refinery to customize HFO blends.

3.4.4 UNLEADED GASOLINE

The catalytic cracked plus poly gasoline would have an octane equivalent to unleaded regular. The refinery would need a C_5 C_6 isomerization unit, in addition to the Powerformer revamp, to improve the overall octane for all-unleaded production.

To minimize lead purchase and produce enough hydrogen for the three hydrotreaters, all heavy virgin naphtha would be processed in the Powerformer. As unleaded gasoline sales increase, average Powerformer severity would also increase; but the amount of lead in leaded gasoline would depend on economic bases from the startup of the isomerization unit. This should be kept low until leaded gasoline is phased out. The facilities would give the refinery the capability of producing 100 percent unleaded fuel by 1994.

3.4.5 ENVIRONMENTAL CHANGES

Technologies and approaches now exist that would enable Petrojam to create an environmentally acceptable expanded facility. Any changes must take into account the Environment Impact Assessment Program, discussed in Section 5. Any new FCC unit would require a major flare system to a new vertical cylindrical ground flare with minor releases going to the existing flare. Relief valves now going to atmosphere in the existing crude unit would also be connected to that system.

In the catalytic cracking unit, part of the feed would be converted to coke on the catalyst. This coke would be burned off in the regenerator, producing a trace of carbon monoxide (in the latest unit designs) and some SO_2. The latter would be partially controlled by two special additives which capture part of the SO_2 and then release it in the main reactor as H_2S. The H_2S would be recovered from all fuel gas in the FCCU and converted to elemental sulphur.

As the FCCU would produce significant fuel gas, the amount of heavy oil used in the refinery would drop to a low level. With the capture of H_2S from all fuel gases (existing hydrotreating as well as FCCU-reduced HFO, combined with some SO_2 from the FCCU flue gas), overall SO_2 emissions would remain constant or decline slightly.

The FCCU flue gas would contain some NO_x, but special burners on new boilers and the vacuum unit heater would be designed for low NO_x production in those services. Reduced HFO use would result in lower NO_x emissions. Overall NO_x is expected to remain constant; this requires further study.

The FCCU flue gas would contain catalyst fines, and the refinery might need elaborate system, beyond the simple cyclone, for fines control. This also needs further study.

As catalytic cracking units produce a waste water stream containing various sulphur, nitrogen, and oxygenated chemical byproducts, this water would have to be stripped to

remove most sulphur and nitrogen compounds from the gases going to the sulphur plant. The stripped water would then be bio-oxidized to make it suitable for discharge or for use in the desalter. A surge tank would be essential for ensuring effluent quality. Bio-oxidation would be the key to this cleanup system, and would require significant study and attention to operating details.

The new API separator would be much larger than in Case I. New fire water pumps are also essential. Other waste water treating revisions would be as in Case I.

3.4.6 COSTS

Capital costs for this case have been estimated as follows:

Table 15
FCC Case Capital Costs
- In Millions of 1991 U.S. Dollars -

Cost Sector	Basic Cost	Contingency	Total Cost	Foreign	Exchange Total
Studies & Preliminary Engineering	2.20	0.80	3.00	95	2.85
Environmental Improvements	0.35	0.15	0.50	60	0.30
Powerformer Revamp	3.60	0.80	4.40	70	3.08
Unleaded Gasoline	5.30	1.10	6.40	85	5.44
Tankage Additions	1.80	0.60	2.40	50	1.20
Instrument Upgrade	1.50	0.20	1.70	65	1.20
FCC Project	89.70	20.90	109.60	84	91.64
Sub Total	104.45	23.55*	128.00		105.62
Inventory Increase	2.50	0.00	2.50	100	2.50
Total	106.95		130.50		108.12

* 22.5 percent contingency on basic costs.

The Powerformer includes the new desalter, the unleaded gasoline facilities, the instrument upgrade and tankage carryover from the previous case. Inventories would increase due to the provision for FCC feed and light cycle oil storage. The FCC project breakdown would be:

•	Process	80.0%
•	Tankage	1.7%
•	Utilities	16.0%
•	Site Development (including T-118 relocation)	3.6%
•	Owner's Costs (items not covered elsewhere)	8.3%
Total		100.0

Annual sustaining capital needs would continue at $2.5 million U.S. level, as in Case I, until the year 2000, when they would increase to about $3.3 million U.S.

The time distribution of capital costs is estimated to be:

- 1991 $3.0 million U.S.
- 1992 $19.9 million U.S.
- 1993 $61.3 million U.S.
- 1994 $46.3 million U.S.

Operating costs are estimated in Table 16.

As before, the cost of letters of credit have not been included. Electricity costs are related to fuel use, as onsite generation is assumed for 75 to 80 percent of site requirements.

Table 16
FCC Case Annual Operating Costs
- in Millions of 1991 U.S. Dollars -

Cost Sector	Annual Cost	Foreign Exchange %	Foreign Exchange Total
Fixed			
• Salaries, Wages, Benefits	3.60	0	0.00
• Electricity, Water	0.30	0	0.00
• Maintenance and Repair Materials	3.80	50	1.90
• Materials, Supplies	1.00	50	0.50
• Contract Services	0.70	0	0.00
• Auto/Service Equipment	1.30	50	0.65
• Taxes, Land, Etc.	0.25	0	0.00
• Insurances	1.50	100	1.50
• Demurrage	0.40	100	0.40
• Training	0.20	50	0.10
• Inspection, Testing	0.15	75	0.11
• Miscellaneous	2.00	100	2.00
Total Fixed	15.20	47	7.16

Cost Sector	$/Bbl of Throughput	Foreign Exchange %	Foreign Exchange Total
Variable Cost			
• Additives	0.15	100	0.15
• Electricity, Water	0.05	0	0.00
• Catalyst Chemicals	0.10	90	0.09
• Sulphur Credits	-0.05	80	-0.04
• Miscellaneous	0.07	10	0.01
Total Variable	0.32	65	0.21

3.4.7 CRUDE SELECTION

The use of a heavy crude slate would introduce a variety of intermediate and product quality concerns. For example, there would be concerns with HFO sulphur, since the current linear program selects a crude slate resulting in an HFO sulphur of about 2.9 weight percent and a marginal turbine fuel smoke point. The FCC feed would also be high in sulphur, with resulting high gasoline and light cycle oil sulphur contents. Another concern is that the nitrogen content of naphtha would stress the naphtha hydrotreater. There are a variety of such issues to be satisfied. A less optimum lower sulphur feedstock mix might prove necessary.

Again, on-line crude blending would be essential.

3.4.8 SPACE

The new facilities would be constructed from modules obtained from Caribbean/USGC sources, which would come in over the ESSO dock. The refinery would also need significant areas for laydown of equipment and materials, and for small shops for onsite fabrication. Ideally, these areas would be next to the new units. T-118 should be moved north about 300 feet to provide safety clearances around the new facilities. This would add to costs, but these would be recovered by easier construction.

3.4.9 HYDROCRACKER ALTERNATE

A hydrocracker-based alternate to catalytic cracking would produce large quantities of premium kerosene and diesel, but its large incremental capital costs and variable yield patterns would make this alternative uneconomic.

3.5 CASE III: EXPANDED CATALYTIC CRACKING

3.5.1 OUTLINE

This case would expand crude capacity without new crude distillation facilities, as shown in Figure 4.

Aside from changes to the atmospheric column, this would be roughly a 50 percent expansion of Case II, with larger new units. In this case, however, only butylenes would be polymerized, and propylene would be saturated with hydrogen to produce propane for local sale.

The 50,000 BPCD available capacity is a preliminary estimate. Definitive analyses have yet to be made of the potential capacity of the existing crude column and associated bottoms systems with the optimum crude slate.

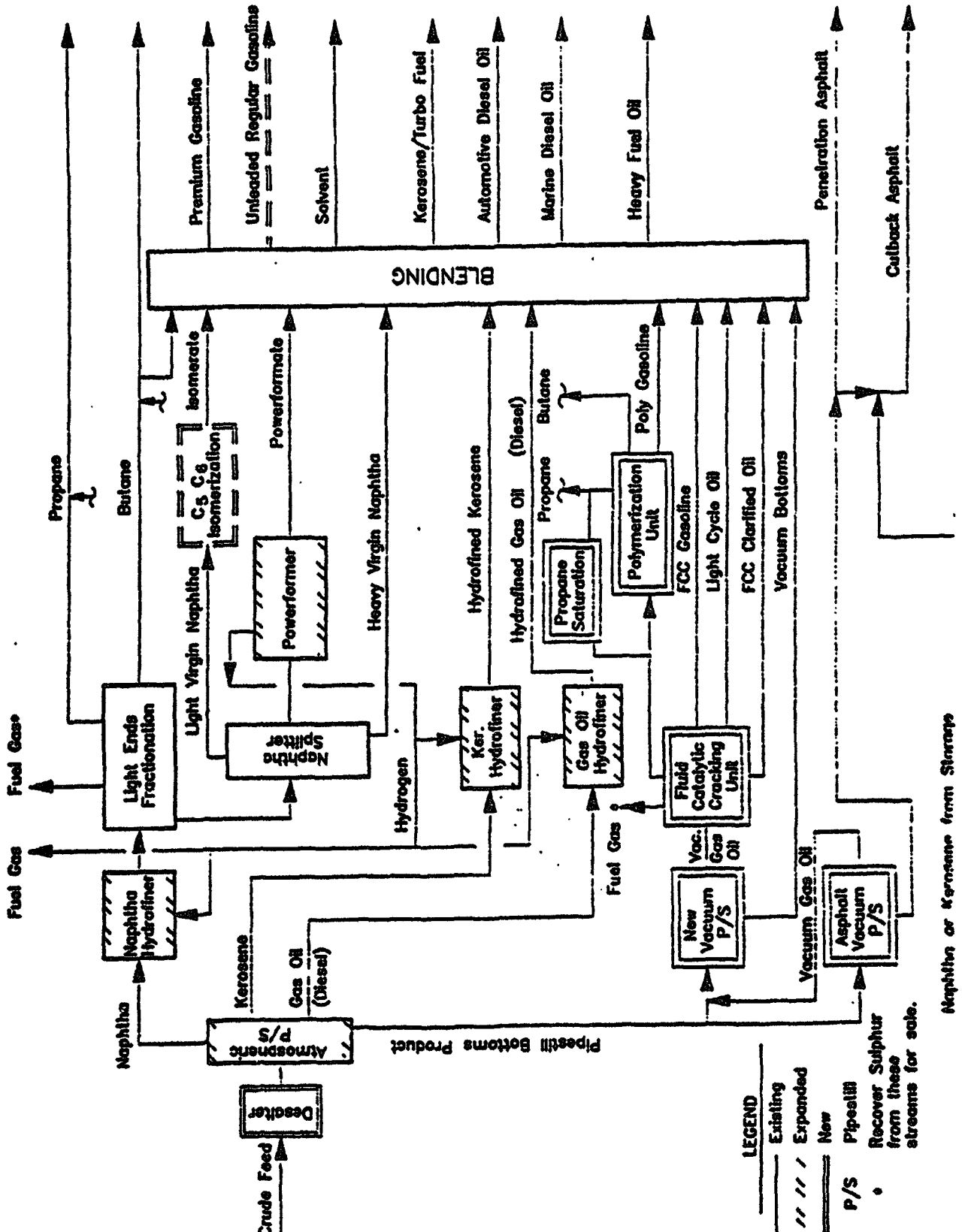
In this case, production would exceed local demand, and the refinery would depend more on exports.

3.5.2 EXISTING FACILITIES

The bottom portion of the existing crude column and all bottoms handling facilities would be debottlenecked to their maximum capacity. The bottom portion of the crude column would be at the 35,500 BPCD level and could be readily modified to suit a higher throughput, albeit of a heavier crude charge.

The Powerformer revamp would proceed as in the Business As Usual case. Kerosene hydrosweetener and gas oil hydrofiner debottlenecking would be much more important than in the lower crude cases.

Figure 4
Expanded Catalytic Cracking Case



3.5.3 NEW FACILITIES

The FCCU C_3C_4s would be fractionated to provide a propylene rich stream for conversion to propane for sale, and a C_4 stream for polymerization. An alkylation unit, a more expensive alternative, should be considered in future studies. The C_4 poly gasoline would have a higher octane than the poly gasoline of the previous case, but would be a smaller percentage of the crude's yield.

The polymerization unit would be simpler than in Case II due to more reactivity of the feed and to the presence of only C_4s.

If further octane enhancement is required, the C_4 poly gasoline could be hydrotreated to raise its motor octane from about 84 to 98. Such a step--not incorporated into the cost analysis--would also reduce the olefin content of Petrojam gasolines and further enhance their quality. The addition of hydrotreated poly octane would allow for a reduction of Powerformer severity.

To control domestic gasoline quality, exports would be primarily catalytic cracked gasoline. The refinery would need additional storage to handle the export volumes, and a second dock to handle additional crude shipments.

3.5.4 UNLEADED GASOLINE

The approach will be identical to that in Case II.

3.5.5 ENVIRONMENTAL CHANGES

Environmental controls would be the same as in Case II, except that the new facilities would be larger.

3.5.6 COSTS

Recent Petrojam licensor discussions have been based on new units similar in size to those in this case. Therefore, Petrojam's cost analysis was used for the principal process units.

Table 17
Expanded FCC Case Capital Costs
- In Millions of 1991 U.S. Dollars -

Cost Sector	Basic Cost	Contin-gency	Total Cost	Foreign Exchange %	Foreign Exchange Total
Studies & Preliminary Engineering	2.7	0.6	3.3	95.0	3.2
Environmental Improvements	0.5	0.2	0.7	20.0	0.1
Powerformer Revamp	3.6	0.8	4.4	70.0	3.1
Unleaded Gasoline	5.4	1.0	6.4	85.0	5.4
FCC Project	123.0	26.2	149.3	77.0	115.3
Tankage Additions	1.8	0.6	2.4	50.0	1.2
Instrument Upgrade	1.5	0.2	1.7	65.0	1.1
Port Expansion	2.0	0.5	2.5	10.0	0.3
Sub Total	140.5	30.2	170.7		129.7
Inventory	5.0	0.00	5.0	100.0	5.0
Total	145.5	30.2	175.7	70.5	134.7

- 21.5 percent of basic cost.

The FCC project is broken down as follows:

•	Process Facilities	112.5%
•	Tankage (not in other accounts	3.0
•	Utilities	20.0
•	Site Development (including tank relocation)	4.0
•	Owner Costs (project team, spare parts, start-up, special construction facilities, etc.)	9.8
Total		100 %

Sustaining capital needs would be the same as in Case II until the year 2000, after which the new facilities would need some special attention. At that time, these costs would rise to $3.7 million U.S. a year.

The time distribution of capital costs is estimated to be:

•	1991	$3.3 million
•	1992	$15.6 million
•	1993	$92.1 million
•	1994	$64.7 million
Total		$175.7 million

with a start-up in mid-1994.

Table 18
Annual Operating Costs for Expanded FCC Case
- In Millions of 1991 U.S. Dollars -

Cost Sector	Annual Cost	Foreign Exchange %	Foreign Exchange Total
Fixed			
• Salaries, Wages, Benefits	4.00	0	0.00
• Electricity, Water	0.40	0	0.00
• Maintenance and Repair Materials	4.50	50	2.25
• Materials, Supplies	1.20	50	0.60
• Contract Services	0.80	0	0.00
• Auto/Service Equipment	1.50	50	0.75
• Taxes, Land, Etc.	0.25	0	0.00
• Insurances	1.75	100	1.75
• Demurrage	0.50	100	0.50
• Training	0.25	50	0.13
• Inspection, Testing	0.20	75	0.15
• Miscellaneous	2.50	100	2.50
Total Fixed	17.85	48	8.63

Cost Sector	$/Bbl of Throughput	Foreign Exchange %	Foreign Exchange Total
Variable Cost			
• Additives	0.15	100	0.15
• Electricity, Water	0.09	0	0.00
• Catalyst Chemicals	0.12	90	0.11
• Sulphur Credit	-0.5	80	-0.4
• Miscellaneous	0.07	10	0.01
Total Variable	0.38	59	0.23

3.5.7 CRUDE SELECTION

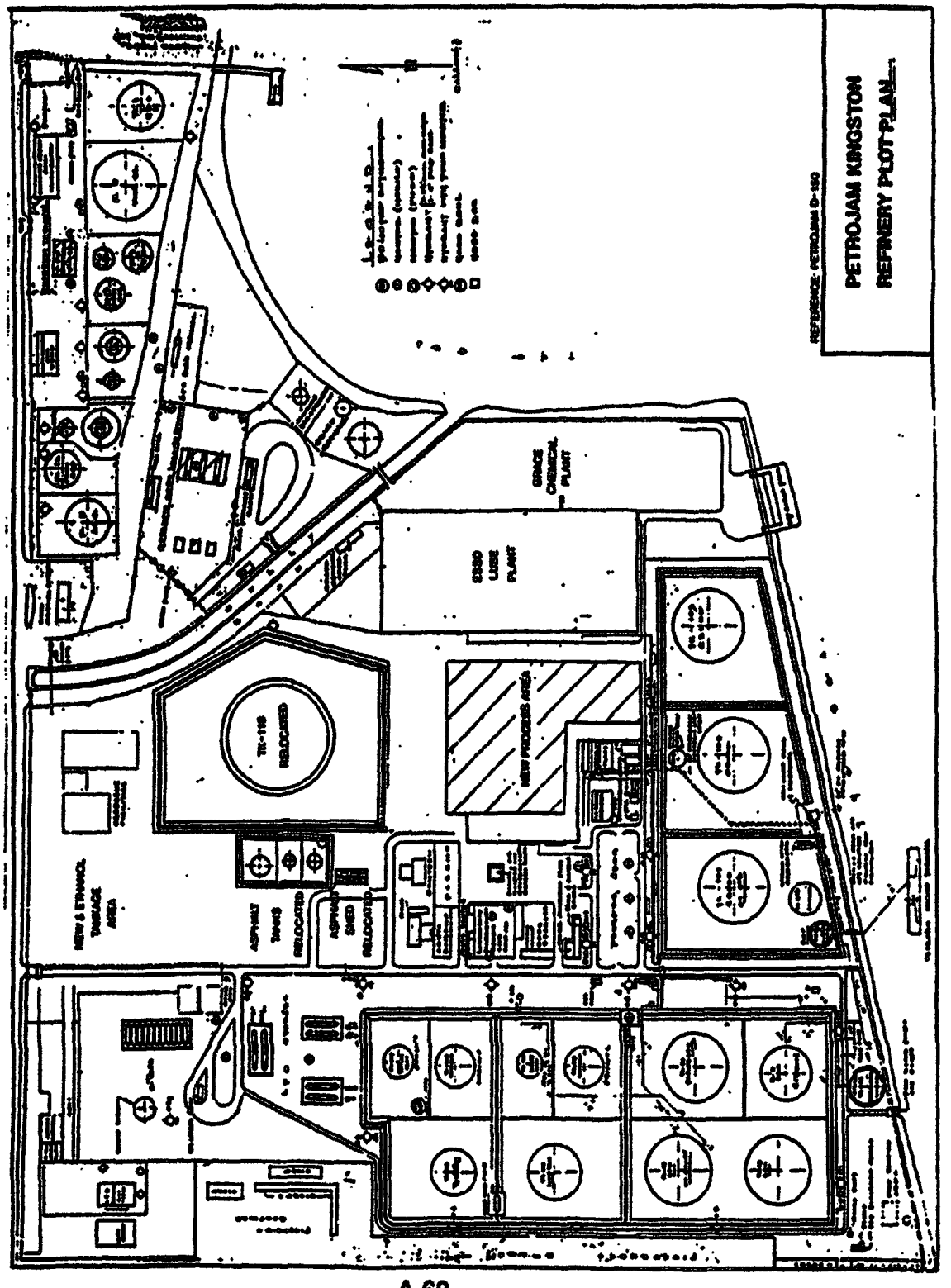
The crude slate would become heavier to fit the new unit capacities, which are now designed to process lighter fractions. Hydrogen for hydrotreating would be supplied by added Powerformer throughput. Although hydrogen needs for hydrotreaters are not reflected in the LP, this could be handled by importing naphtha separately from crude.

Again, in-line crude blending would be essential to optimize capacity and crude use, for which provision has been made.

3.5.8 SPACE

The new units would require marginally more land than those in Case II. Thus, T-118 would have to be moved, and even then, construction space would be tight, as shown in Figure 5.

Figure 5
Petrojam Refinery Plot Plan



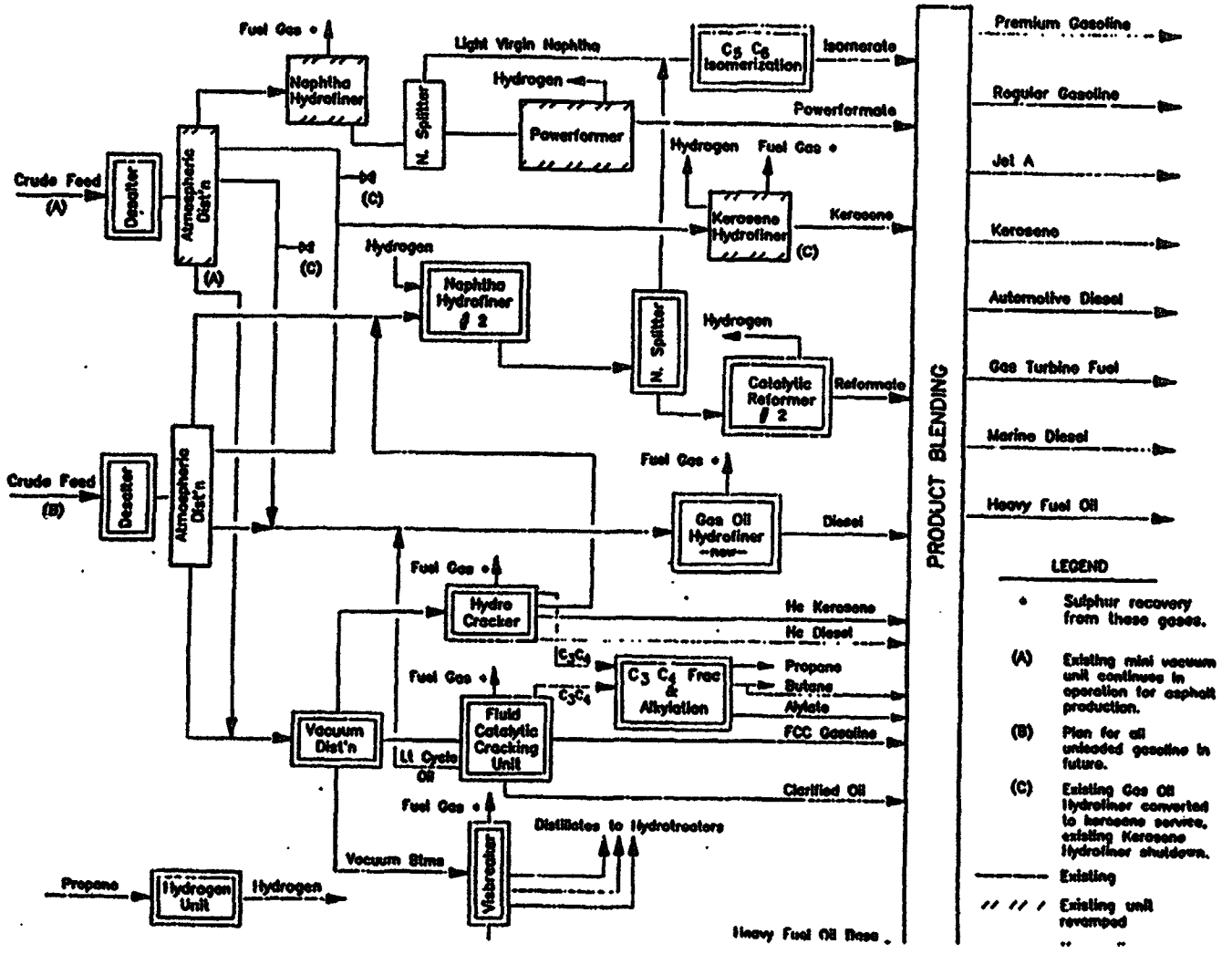
Land near the Petrojam property might be needed for construction storage. The tight space would increase safety concerns, and would necessitate close collaboration with the insurance underwriters, beginning at the design stage.

3.6 CASE IV: 100,000 BPD REFINERY

3.6.1 OUTLINE

This case is export oriented, and involves a configuration capable of producing quality products for both export and the domestic market, as shown in Figure 6.

Figure 6
100,000 BPD Refinery Case (Simplified)



This configuration would meet the rising demands for premium kerosene and diesels, and provide finished gasolines suitable for southeast U.S. markets. This configuration requires only mild processing of residual materials, largely in order to minimize degradation of kerosene and diesel to HFO.

All processing would take place on the site to take advantage of existing units and support facilities. This would be less costly than building a 100,000 BPD processing complex on another site. Either way, however, a new site would be required for tankage, both for new storage and for that displaced by the new processing units.

3.6.2 EXISTING FACILITIES

Changes would be similar to those in the Business As Usual case, except that the kerosene hydrosweetener would be shut down, and the gas oil hydrotreater would be ungraded to the new #2 model.

3.6.3 NEW UNITS

A new crude oil atmospheric distillation unit would process about 60 percent of the crude charge, with a single new vacuum unit processing the bottoms from both crude units.

Parallel hydrocracking and catalytic cracking units would be used to convert vacuum gas oil to premium gas components and distillate products as well as cutter stock for HFO blending.

To minimize the need for stocks that could otherwise be sold as diesel, a visbreaking unit would mildly thermally crack the residual product from the new vacuum unit. This would create an HFO component that requires only clarified oil from the FCC and a small amount of light cycle oil to meet sales viscosity. This approach would increase the sulphur content of the heavy fuel oil, and closely approach the Petrojam 3.0 percent specification. The small quantity of distillates from the visbreaker would be processed in the hydrotreating units.

A new gas oil hydrotreater would process diesel fractions from both crude units, and process light cycle oil from the catalytic cracking unit. This would provide 0.05 percent sulphur/40 cetane diesel for the U.S. and domestic markets.

The hydrocracker naphtha co-product and the new crude unit naphtha would be hydrotreated in a new unit. A subsequent splitter would feed a new C_5C_6 isomerization unit, which would also process light naphtha from the existing splitter. A new catalytic reformer (Powerformer or an equivalent licensed process) would allow the added heavy naphtha to provide needed octane, and would help meet overall hydrogen needs.

The C_3C_4 streams from the Powerformer, new reformer, and FCCU hydrocracker, and some FCC C_3s, would be fractionated to produce a C_3 stream, which would then be hydrotreated to produce propane for the local market. The surplus would go to plant fuel and hydrogen plant

feed. There would be less butane for local sale in this case than in the other cases; hence, some price revision might be needed to promote propane.

The C_4 and C_5s from this fractionation would be fed to an alkylation unit to produce high octane blending stock. The olefins present would react with the isobutane in the feeds to produce a very high octane, nonolefinic, nonaromatic blend stock. This unit would use a sulphuric acid catalyst and an acid regeneration system, would might be integrated with a new sulphuric acid plant to supply Jamaican needs. While the unit would be able to process some FCC C_5s, that would be done only as isobutane is available, and then only to reformulate the gasoline for export markets.

One of the reformers would have a redistillation step to eliminate benzene from the reformulated export gasoline. The benzene-rich cut would go to the C_5C_6 isomerization unit where the benzene be converted to components of less environmental concern.

A propane-fed hydrogen plant would provide hydrogen to the hydrocracker.

This configuration would consist of proven processes and provide highly saleable products. It would be an expensive facility but would handle smaller tanker loads of premium products to selected markets, especially those with only small tanker capabilities.

A significant volume of new tankage would be required on a new site for crude and export products. The new tankage would include tanks displaced at the refinery by new units, added utilities and environmental controls.

3.6.4 ENVIRONMENTAL

The 100,000 BPD facility would result in increased onsite SO_2 emissions due to added HFO consumption. HFO sulphur emissions would rise unless the refinery uses lower sulphur crudes, but these emissions would be partly offset by increased sulphur recovery. Since the refinery would be devoted mainly to export, there would be a question of whom to "charge" for the SO_2, the refinery or the offshore consumer.

Other environmental controls would be similar to those in the catalytic cracking cases.

3.6.5 CRUDE SELECTION AND YIELDS

The refinery would be configured to suit an average of BCF-24 crude without any spikes. A poorer crude could be used if HFO sulphur limits were not exceeded. With higher sulphur crudes, the hydrocracking unit would require more capacity to pretreat FCCU feed and to hydrocrack to naphtha and middle distillates. With two crude units and the hydrocracker/FCC combination, a wide range of crudes could be processed.

This case was examined outside the linear program, since the process configuration would have required extensive changes to the model not considered appropriate for a preliminary evaluation. For the purposes of analysis, BCF-24 crude was assumed to produce the following yield:

- Product Yield

		LV%
C3 + C_4	=	1.9% maximum*
Gasoline	=	24.4 unleaded premium and unleaded regular
Kero/Turbo A	=	15.7 maximum, 0.05% sulphur, 20 smoke point
Diesel	=	22.5 minimum, 0.05% sulphur, 42± cetane
HFO	=	31.5*, 2.8 to 3.0% sulphur
Total	=	96.1

* Can burn these as fuel and increase HFO yield. C_3 or C_4 can be increased at expense of other.

LV = liquid volume

Unit capacity requirements were estimated as follows:

Crude	100,000 BPCD	
Vacuum	57,100 BPCD	
Hydrocracker	15,000 BPCD	(fresh feed, 7,600 converted to lighter products)
FCCU	18,500 BPCD	(7,400 ex hydrocracker)
Reformers	12,000 BPCD	
Alkylation	2,300 BPCD	(product) (C_4 feed only)
C_3 Saturation	800 BPCD	(propylene in feed)
Hydrotreaters		
• Naphtha	16,700 BPCD	
• Kerosene	14,700 BPCD	
• Gas Oil	22,000 BPCD	
Hydrogen Plant	21 million SCFD	(with C_3C_4 feed + some recycled gases)

If more middle distillate and less gasoline were required, the hydrocracker conversion could be raised with decreased feed to the FCCU and alkylation. As noted above, the alkylation unit is dependent on the FCCU, the hydrocracker, and the reformer for isobutane. In this case, however, there would be a surplus, and some C_3 or C_5 olefins could be considered for incremental alkylation feedstock.

This configuration would match or exceed the quality and flexibility factors of a new 100,000 BPD refinery, at less cost.

3.6.6 COSTS

The incremental costs over the 50,000 BPD catalytic cracking case would be comparable to a new grass roots 50,000 BPD refinery; these costs would include a second site and added tankage to offset that displaced by new processing units. The new units would permit significant shop prefabrication in modular form, although the larger units would tend to lose this cost advantage. This configuration would match or exceed the quality and flexibility factors of a new 100,000 BPD refinery, at less cost.

The capital costs of the 100,000 BPD case would be about $735 million U.S., with a contingency of 20 percent. These costs would break down as follows:

Table 19
100,000 BPD Case Capital Costs
- in Millions of 1991 U.S. Dollars -

Cost Sector	Cost
Studies & Preliminary Engineering	5.0
Environmental Improvements	0.7
Powerformer Revamp	4.4
Instrument Upgrade	1.7
New Process Units	544.9
New Tankage	40.1
New Utility Systems	55.2
Site Development	26.0
Largely new site for tankage	
Port Expansion	6.5
Owner Costs	22.5
Sub Total	707.0
Inventories	30.0
Total	737.0

While annual sustaining capital needs would initially be the same as in the Business As Usual case at $2.5 million U.S., these would rise to $5.0 million U.S. in the year 2000.

Operating costs for this case are projected as follows:

Table 20
Operating Costs in 100,000 BPD Case
- in Millions of 1991 U.S. Dollars -

Cost Sector	Annual Cost	Foreign Exchange %	Foreign Exchange Total
Fixed			
• Salaries, Wages, Benefits	5.2	0	0.00
• Electricity, Water	0.4	0	0.00
• Maintenance and Repair Materials	11.0	50	5.50
• Materials, Supplies	3.0	50	1.50
• Contract Services	1.0	0	0.00
• Auto/Service Equipment	2.0	50	1.00
• Taxes, Land, Etc.	0.5	0	0.00
• Insurances	3.0	100	3.00
• Demurrage	0.8	100	0.80
• Training	0.3	50	0.15
• Inspection, Testing	0.3	75	0.23
• Miscellaneous	3.6	100	3.60
Total Fixed	31.1	51	15.78

Cost Sector	$/Bbl of Throughput	Foreign Exchange %	Foreign Exchange Total
Variable Cost			
• Additives	0.15	100	0.15
• Electricity, Water	0.09	0	0.00
• Catalyst Chemicals	0.12	90	0.11
• Sulphur Credit	-0.05	80	-0.04
• Other	0.05	10	0.00
Total Variable	0.36	62	0.22

Onsite electrical generation has been assumed, with fuel charged to the electricity accounts.

3.6.7 SPACE

About 100 acres would be required at the new site for tankage. That site would also have the second dock for crude receipt and major product exports. This would be more area than at the current refinery, which would reflect the increased tankage and more liberal layout.

No specific site was defined, but it could be across a channel from the existing refinery. This would necessitate a special multi-pipeline harbour.

4.0 ESTIMATING BASES

Capital cost estimates were shown in the preceding tables.
The following tables outline the capital cost bases.

4.1 CAPITAL ESTIMATE EXTENSIONS

The various base costs were extended to site conditions.

U.S. Gulf Coast or Base: Basic estimate for particular factor

USGC to Jamaica: Where applicable, 7.5 percent added to USGC or base cost for:

- Freight and insurance
- Incremental costs of construction equipment rentals
- Extra costs for marine movement of modules
- Related extras

(In some licensed unit cases this also covered the conversion from third quarter 1990 costs to first quarter 1991.)

Contingency: Contingency was added to above to reflect items overlooked--e.g. added engineering for tie-ins. This contingency does not contain any allowances for any *force majeure* items. There may be a minor double counting in USGC/Jamaican and contingency accounts, especially as Jamaican labour is more cost efficient. But also note most process units based on late 1990 price and units may be slightly undersized compared to sizes after more detailed review.

The contingencies varied with the particular unit or cost element. Process unit contingencies were generally taken as 20 percent.

Foreign Exchange: Preliminary estimates of the foreign exchange portion of particular accounts were provided for financial analyses. The splits reflect Petrojam experience.

4.2 CAPITAL ESTIMATE BASES

First quarter 1991 base was assumed for all estimates, with the derivation of various accounts as follows:

Pre-engineering/Royalties	-	Petrojam estimates plus in-house estimates of added studies
Environmental Cleanup	-	Team estimates
Mothball	-	Team estimates
Revise Tank Farm Piping	-	Team estimates
Staff Redundancy	-	Team estimates
Existing Unit Costs	-	Desalter - Howe Baker USG module cost estimate x 2.5
	-	Miscellaneous - allowance for Atmospheric Distillate and Kerosene HT revisions
	-	Powerformer - Petrojam estimates advanced one year
Unleaded Gasoline	-	C_5C_6 Isomerization unit (for LVN) - contacts with 2 recent installers
Tankage Additions	-	Petrojam unit costs confirmed with tank vendor plus impervious dyke floor allowance
Instrument Upgrade	-	Petroja
Port Expansion	-	Petrojam discussion for Case III, in-house for Case IV
Inventory Changes	-	Team estimates
FCC Project	-	Process • Licensor estimates (to Petrojam) late 1990, not adjusted to 1991, not adjusted for minor size difference but prorated for Case III with 0.65 cost exponent. Note that l.p. shows slightly larger units may be best • Sulphur plant estimate from Canadian vendors • In Case, IV FCC/HCcomplex estimated on above bases plus in-house estimates for all other units
	-	Tankage - Petrojam and vendor information plus piping dyke floor allowances
	-	Utilities - team estimates

- Site development - T-118 move plus allowances
- Owner costs - team estimates

Sustaining Capital

- Sustaining capital represents cost of miscellaneous projects to maintain a fully viable refinery. It includes minor equipment/ system upgrades as well as tank and equipment replacement not covered by maintenance charges
- Business As Usual - $2.0 million from Petrojam discussions and current budget analysis, $0.5 million added by team later to reflect anticipated added product loading and tank repair items
- Other cases - above plus allowances for added needs starting in the year 2000 due to new facilities

4.3 OPERATING COST BASES

The operating cost estimates were based on recent Petrojam refinery operating statements, adjusted for the various cases.

The line of credit account has been left blank but is of major significance. With good Petrojam foreign exchange and credit positions, this account should be small.

To account for reducing tetraethyl lead purchases as unleaded gasoline is produced, the gasoline additive account has been reduced from 1994 on.

The variable electricity and water accounts have been adjusted to reflect the costs of fuel for onsite electrical generation, with only minor purchase from JPS.

5.0 ENVIRONMENTAL IMPACT ASSESSMENTS (EIAs)

5.1 GENERAL

All refinery projects should be checked for environmental impact at all stages of development and after startup. Small projects with minimal impact, such as new buildings, require only a brief review; while projects involving process, tankage, and loading areas should be reviewed in depth. Each project must be assessed for its impact on regional population, soils, vegetation, and waters.

The assessment process in developed countries usually involves the community and a number of government agencies. Community meetings are valuable for identifying specific environmental concerns, and this collaborative approach often leads to a more efficient assessment process.

The assessment process depends, of course, on the availability of baseline air and water quality data, and on a mechanism for dialogue between regulatory agencies and the refinery. As newer data become available and the dialogue evolves, the assessment specific to Petrojam will become more refined. The environmental impact assessment protocols suggested here are only a starting point. The Environment Impact Assessment Guidelines of the Canadian Province of Alberta, included at the end of this section, are an example of an evolving approach to EIAs. These Guidelines refer, however, to large projects, such as the catalytic cracking projects discussed above. Smaller projects would require a more streamlined approach.

5.2 COVERAGE

Project impact assessments relate only to specific capital projects, and do not extend to product specification changes.

5.3 ENVIRONMENTAL IMPACT MEASUREMENT

There is a wide range of scientific opinion on the impact of various pollutants on human health, soil, vegetation, and marine biota. In the absence of definite data, assessments in Jamaica are now based on limited special studies and reports. The consultant recommends that the Jamaican Natural Resources Conservation Authority undertake a long-term effort to develop data on the effects of specific pollutants and pollutant mixes.

5.4 ASSESSMENT

The assessment process for each pollutant is straightforward:

- Determine concentration profiles in surrounding air or water.
- Estimate potential emissions from the project.
- Add potential emission concentrations to current concentrations via dispersion and mixing models, noting peak concentrations under varying atmospheric and plant conditions.
- Compare resulting concentrations to established maxima criteria, or, if no standard exists, compare these concentrations to Jamaican or other studies to determine whether the new concentration is acceptable.
- Where there is concern about peak or long-term concentration, iterate through above steps with revised process or emission control schemes.
- Communicate results to regulatory agencies and the community to ensure that their concerns have been addressed. In large projects, this public exposure will generally occur at two stages.

In many cases, as with ozone (SO_2 plus NO_X), the mixture of pollutants will also need assessment.

A refinery has a variety of "fugitive" sources that have varying rates of release, e.g. gasoline vapours from truck loading and storage tanks. Such sources are difficult to estimate, so standard factors, e.g. those of the USEPA (United States Environmental Protection Agency) must be used.

Emergency scenarios like fires and power failures must be simulated at the design stage to determine the worst case emission rates of some pollutants. These scenarios will also help protect workers and the local population.

5.5 REFINERY-SPECIFIC COMPOUNDS

Some pollutants which should be assessed are:

Atmospheric

SO_2, NO_X, Particulates, H_2S, Odours, Hydrocarbons, CO, CO_2, Hydrochloric Acid.

Water

Oils, sulphur compounds, nitrogen compounds, oxygenated compounds, salts, sanitary wastes, chemical wastes, laboratory wastes.

Land

Fresh and spent catalysts, wastes from tanks, wastes contaminated with lead, maintenance wastes, office wastes.

5.6 OPERATIONS PHASE

All projects must be designed to meet or exceed environmental standards set during the environmental assessment. The refinery must therefore continually monitor its emissions, and regularly report to the regulatory agencies and to the public.

CRUDE AND PRODUCT PRICE FORECAST

1. The following is a printout of a spreadsheet which comprises the integrated crude oil and product price forecast, an essential input to our product supply/refining investment analysis. Since this product-crude relationship implicitly an inherent refinery margin assumption, it is probably the single most important body of input data relevant to determing the economics of refining compared with direct product importation. The product and crude price forecast is based on the assumption of a return to pre-crisis crude supply/demand balances and price levels after the Iraq/Gulf conflict; this conforms to the World Bank scenario "rapid return to normalcy," which was prepared in the fall of 1990. The actual crude price forecast was prepared by World Bank Commodities Division and dated November 29, 1990. It was quoted in terms of the OPEC average crude price and is shown as the first row in the crude and product price spreadsheet. The complete documentation of this spreadsheet is provided below. Using a variety of industry sources, with the participation of Lagoven projections of refining margin, product prices were derived. The refinery margins are then summarized with reference to BCF 17 yields since this crude is the major crude used by Petrojam. Inherent in the base product price forecast are gross refining margins that are slightly higher than the average experienced in the US Gulf Cost between 1988 and mid 1990. Table A6.2.1 illustrates this comparison. As indicated in Table A6.2.1, the US Gulf Coast cracking margin for BCF 17 crude inherent in the base forecast is $4.58/barrel, compared with an estimated average of $4.21/barrel for actual USGC cracking margins over the 1988-1990 period. The base forecast represents a real increase on average of only 9% over the 20-year period, compared with the average for 1988-90. A comparison with the 1986-90 average margin indicates an assumed increase of 32% over the average $3.48/barrel margin which prevailed. Margins are expected, if anything, to increase to levels well beyond $4.58/barrel; to put this in perspective, a gross margin of roughly $7.00/barrel would have to be earned in order to amortize the capital and pay operating costs on a new cracking refinery, assuming a USGC location and 1991 cost levels.

2. For easy reference, the subsections of the spreadsheet are labelled A, B, etc. The starting point was an integrated forecast for several base crude oils, FOB source (A). This was developed from the World Bank forecast for "OPEC Average" by using the recent historical relationship that existed between components of the average and the average itself. For non-OPEC crudes, historical differentials were used to derive the prices of individual grades over the period.

3. The assumed marine freight for crude from FOB source to Kingston, Jamaica (B) is added to the FOB price, resulting in a CIF Kingston price for the selection of crudes (C). The base 1991 marine freight is assumed to be 1990 WORLDSCALE x 1.70 for Venezuelan and Mexican crudes, x 1.50 for Brent and Nigerian, and x 0.55 plus transshipment in the Caribbean for Arab Light. The base 1991 freight for Oriente was assumed to be $US 1.40/barrel. The marine freight is escalated at 3.0% p.a. real to 1997, and held constant beyond this over the forecast period. This escalation is based on a continued shortage of tankers with rates, therefore, in the short-medium term, based on costs of new construction. These crude prices are used as the basis for our refinery feedstock costs in the investment analysis.

4. The forecast USGC SPOT prices are derived from the base crude forecast by using the gross cracking refinery margin of $4.58 per barrel for BCF 17 crude combined with typical product

yields and inter-product price relationships. The latter relationships are derived from a combination of historical and forecast data.

Petroleum

5. The standard USGC products (D) deviate from the Jamaican quality in some instances; the differences require some slight price adjustments, as documented in (E). Jamaican 95RON leaded gasoline is assumed to be the same price as USGC unleaded regular. The more stringent Jamaican DERD kero/turbo is assumed to cost 2 cents/USgal more than the standard USGC material.

6. Although the USGC is used as the marker basis for product pricing relevant to the Kingston refinery, the products would not necessarily be sourced from there as an alternative to domestic refining. The key is the most likely pricing basis that a cargo purchaser in Kingston could negotiate, taking into account the opportunity value that other suppliers, e.g. PDVSA, would see for each product type. Subsection (F) documents the assumed differentials for the various products.

7. The basis and resultant forecast for marine freight from USGC to Kingston is provided as (G). The base 1991 rates are assumed to be 1990 WORLDSCALE x 2.00 for medium-range dirty vessels; and x 2.50 for medium-range clean vessels.

8. The CIF Kingston price for product imports (H) results from combining (D), (E), (F), and (G).

9. The export price forecast for each product combines assumptions (J) with (D) and (G). It is assumed that the logical export market for white products from the Kingston refinery would not be the USGC, which is surplus in refining. Rather, the logical market would be the SE coast of the US, which is in refining deficit. This results in a slightly higher netback than USGC, less the complete freight. As indicated, there are two cases for high sulphur fuel oil (HSFO, depending on whether the refinery continues to be a simple hydroskimmer (alt cast I) or has cracking facilities (II). In both cases, the potential export market is assumed to be the Jamaican bauxite/alumina industry, which has a forecast demand well in excess of the highest HSFO production cases for Kingston refinery. In case I, the refinery could either sell to the bauxite industry and incur a debit for low heating value, or sell into the USGC cracker feed market and capture a straight-run credit; it was estimated that the netback on these two dispositions would out roughly the same (USGC cracked HSFO, less one half freight). In case II, with cracking, we assume a sale to bauxite in competition with USGC, with the netback assuming handling and freight Kingston-bauxite at one half USGC-Kingston freight.

10. The prices for product spikes, FOB Venezuela, are based on discussions with Lagoven relevant to their pricing mechanism for each product. These spike prices are realistic estimates of the opportunity values that Venezuela sees for each spiked product if sold alternately as a finished product. They are all related to USGC SPOT prices. Butane spike will be USGC+$.80/barrel; naphtha USGC Full-Range naphtha flat; kerosene USGC+$1.00/barrel; gasoil USGC-$1.00/barrel.

TABLE A6.2.1

LEVEL OF USGC REFINERY MARGIN BUILT INTO BASE CASE
PRODUCT/CRUDE PRICE RELATIONSHIP

	YIELD USGC CRACKING PIW	BASE CASE SPOT PRODUCT PRICES US	GROSS PRODUCT WORTH
ULR MOGAS	22.4%	29.69	6.65
LR MOGAS	9.7%	28.74	2.79
#2FO	12.9%	28.34	3.66
HSFO	50.8%	14.73	7.49
TOTAL	95.8%		20.58
BCF 17 PRICE			16.00
GROSS MARGIN			4.58

WRIGHT - KILLEN GROSS MARGINS USGC,
AVERAGE CRACKING, $/BARREL

1986	1 86	1.50
	2	4.30
	3	2.60
	4	2.40
1987	1 87	2.20
	2	2.10
	3	1.70
	4	2.30
1988	1 88	2.70
	2	4.00
	3	4.80
	4	5.60
1989	1 89	3.50
	2	4.30
	3	3.10
	4	3.70
1990	1 90	4.20
	2	5.30
	3	5.50
	4	3.80
AVERAGE	86-90	3.48
	88-90	4.21

FORECAST OF INTERNATIONAL CRUDE OIL AND PRODUCT PRICES
US$/BARREL (1990 CONSTANT PRICES)

(2) WBK CRUDE FCAST/STIMULATED DEMAND -PRODUCTS

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
CONST 1990$																				
WORLD BANK																				
NOV29/90 IHRAN																				
"OPEC AVERAGE"	22.49	18.94	16.69	17.16	17.76	18.68	19.64	20.65	21.72	22.84	22.77	22.70	22.63	22.56	22.49	22.49	22.49	22.49	22.49	22.49
CRUDES																				
(A)FOB SOURCE																				
WTI	24.60	20.79	18.38	18.88	19.52	20.51	21.54	22.63	23.78	24.98	24.90	24.83	24.75	24.68	24.60	24.60	24.60	24.60	24.60	24.60
ARB CIF USGC	22.74	19.15	16.87	17.34	17.95	18.88	19.86	20.88	21.96	23.10	23.03	22.95	22.88	22.81	22.74	22.74	22.74	22.74	22.74	22.74
BRENT	23.52	19.71	17.30	17.80	18.44	19.43	20.46	21.55	22.70	23.90	23.82	23.75	23.67	23.60	23.52	23.52	23.52	23.52	23.52	23.52
ARAB LT.	21.03	17.71	15.61	16.04	16.61	17.46	18.36	19.31	20.31	21.36	21.29	21.22	21.16	21.09	21.03	21.03	21.03	21.03	21.03	21.03
LAGOTRECO 31	21.84	18.39	16.21	16.66	17.26	18.13	19.07	20.05	21.09	22.18	22.11	22.04	21.97	21.91	21.84	21.84	21.84	21.84	21.84	21.84
FURRIAL	21.14	17.84	15.75	16.20	16.78	17.64	18.55	19.50	20.51	21.54	21.44	21.34	21.27	21.21	21.11	21.14	21.14	21.17	21.20	21.23
BCF 24	19.74	16.64	14.67	15.12	15.70	16.52	17.39	18.30	19.27	20.22	20.08	19.94	19.87	19.81	19.67	19.74	19.74	19.81	19.88	19.95
BCF 17	16.94	14.19	12.57	13.02	13.62	14.31	15.04	15.84	16.70	17.54	17.36	17.17	17.05	16.93	16.74	16.87	16.93	17.07	17.20	17.33
ISTHMUS	22.78	19.19	16.91	17.38	17.99	18.92	19.90	20.92	22.00	23.14	23.07	22.99	22.92	22.85	22.78	22.78	22.78	22.78	22.78	22.78
MAYA	18.94	15.94	14.07	14.52	15.11	15.89	16.72	17.60	18.53	19.45	19.30	19.15	19.07	18.98	18.83	18.92	18.94	19.02	19.11	19.20
FORCADOS	23.85	20.04	17.63	18.13	18.77	19.76	20.79	21.88	23.03	24.23	24.15	24.08	24.00	23.93	23.85	23.85	23.85	23.85	23.85	23.85
ORIENTE	21.41	17.72	15.39	15.88	16.50	17.45	18.45	19.50	20.61	21.77	21.70	21.62	21.55	21.48	21.41	21.41	21.41	21.41	21.41	21.41
(B)MARINE FREIGHT, FOB SOURCE TO KINGSTON																				
3.0% ESCALATION TO 1997, 0.0%THEREAFTER																				
BRENT	1.62	1.67	1.72	1.77	1.82	1.88	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93
ARAB LT.	1.85	1.91	1.96	2.02	2.08	2.14	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21
LAGOTRECO 31	0.51	0.53	0.54	0.56	0.57	0.59	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61
FURRIAL	0.56	0.58	0.59	0.61	0.63	0.65	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
BCF 24	0.54	0.56	0.57	0.59	0.61	0.63	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64
BCF 17	0.56	0.58	0.59	0.61	0.63	0.65	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
ISTHMUS	0.65	0.67	0.69	0.71	0.73	0.75	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
MAYA	0.70	0.72	0.74	0.76	0.79	0.81	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
FORCADOS	1.61	1.66	1.71	1.76	1.81	1.87	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92
ORIENTE	1.40	1.44	1.49	1.53	1.58	1.62	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67
(C)CIF KINGSTON																				
BRENT	25.14	21.38	19.01	19.57	20.27	21.31	22.40	23.49	24.63	25.83	25.76	25.68	25.61	25.53	25.46	25.46	25.46	25.46	25.46	25.46
ARAB LT.	22.88	19.61	17.57	18.07	18.69	19.61	20.57	21.52	22.52	23.56	23.50	23.43	23.37	23.30	23.24	23.24	23.24	23.24	23.24	23.24
LAGOTRECO	22.35	18.92	16.75	17.22	17.82	18.73	19.68	20.66	21.70	22.79	22.72	22.65	22.58	22.51	22.45	22.45	22.45	22.45	22.45	22.45
FURRIAL	21.70	18.42	16.34	16.81	17.42	18.29	19.22	20.17	21.18	22.21	22.11	22.01	21.94	21.87	21.78	21.81	21.81	21.84	21.87	21.90
BCF 24	20.28	17.20	15.24	15.71	16.31	17.15	18.04	18.95	19.91	20.86	20.72	20.59	20.52	20.45	20.31	20.38	20.38	20.45	20.52	20.59
BCF 17	17.50	14.77	13.16	13.63	14.25	14.95	15.71	16.51	17.36	18.21	18.03	17.84	17.72	17.60	17.41	17.54	17.60	17.74	17.87	18.00
ISTHMUS	23.43	19.86	17.60	18.09	18.72	19.67	20.67	21.70	22.78	23.91	23.84	23.77	23.70	23.63	23.56	23.56	23.56	23.56	23.56	23.56
MAYA	19.64	16.66	14.81	15.29	15.90	16.70	17.56	18.44	19.37	20.29	20.14	19.98	19.90	19.82	19.67	19.75	19.77	19.86	19.95	20.04
FORCADOS	25.66	21.70	19.33	19.89	20.59	21.62	22.72	23.80	24.95	26.15	26.08	26.00	25.93	25.85	25.78	25.78	25.78	25.78	25.78	25.78
ORIENTE	22.81	19.17	16.88	17.41	18.08	19.07	20.12	21.17	22.28	23.44	23.37	23.30	23.22	23.15	23.08	23.08	23.08	23.08	23.08	23.08

PRODUCTS

(D) USGC SPOT

PROPANE	16.01	13.41	11.88	12.31	12.88	13.52	14.22	14.97	15.78	16.58	16.40	16.23	16.11	16.00	15.82	15.95	16.01	16.13	16.26	16.38
BUTANE	19.92	16.69	14.78	15.31	16.02	16.82	17.69	18.63	19.63	20.63	20.41	20.19	20.05	19.91	19.69	19.84	19.91	20.07	20.23	20.38
FR NAPHTHA	26.40	22.12	19.58	20.30	21.23	22.30	23.45	24.69	26.02	27.34	27.05	26.76	26.57	26.39	26.09	26.30	26.39	26.60	26.81	27.01
ULR MOGAS	31.43	26.34	23.32	24.17	25.28	26.55	27.92	29.39	30.98	32.56	32.21	31.86	31.64	31.42	31.07	31.31	31.43	31.67	31.92	32.17
LR MOGAS	30.43	25.49	22.57	23.39	24.47	25.70	27.02	28.45	29.99	31.52	31.18	30.84	30.63	30.41	30.07	30.31	30.42	30.66	30.90	31.13
JET/KERO	31.63	26.50	23.47	24.32	25.44	26.72	28.09	29.58	31.18	32.77	32.41	32.06	31.84	31.62	31.26	31.51	31.63	31.87	32.12	32.37
NO.2 GASOIL	30.00	25.13	22.25	23.06	24.13	25.33	26.64	28.05	29.57	31.07	30.74	30.40	30.19	29.98	29.65	29.88	29.99	30.23	30.46	30.70
VGO 1%S	28.01	23.47	20.78	21.53	22.53	23.66	24.88	26.19	27.61	29.01	28.70	28.39	28.19	28.00	27.68	27.90	28.00	28.22	28.44	28.66
MDO	29.00	24.30	21.52	22.30	23.33	24.50	25.76	27.12	28.59	30.06	29.72	29.40	29.19	28.99	28.67	28.89	29.00	29.22	29.45	29.68
HSFO	15.60	13.07	11.57	11.99	12.55	13.17	13.85	14.59	15.38	16.16	15.98	15.81	15.70	15.59	15.42	15.54	15.60	15.72	15.84	15.96

(E)QUALITY DIFFERENTIALS vs. USGC

PROPANE	SAME
BUTANE	SAME
LR MOGAS	SAME AS ULR
JET/KERO	JAMAICA DERD SPEC USGC + 0.84 /BBL
NO.2 GASOIL	SAME
MDO	50% NO. 2 GASOIL, 50% VGO 1%S.
HSFO	SAME

(F)FREIGHT DIFFERENTIALS

ALL PRODUCTS EXCEPT MOGAS USGC(Quality-adjusted) plus USGC freight; for all cases.
MOGAS 2 CASES: I FULL TERMINALLING, LARGE (MR)CARGOES from south Carib; USGC flat.
II REFINING, SMALL CARGOES ex-USGC; USGC plus freight.
ASPHALT SPECIAL CASE: PRICED AT 10.0%ABOVE HFO LANDED PLUS $8.00 FREIGHT/HANDLING

(G)MARINE FREIGHT

USGC-KINGSTON
WSCALE (1990) 2.80 $/Tonne
MR DIRTY 1991 200% WSCALE
MR CLEAN 1991 250% WSCALE
ESCAL REAL 3.0% P.A. TIL 1997 0.0%THEREAFTER

PROPANE	4.40	4.53	4.67	4.81	4.95	5.10	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25
BUTANE	5.10	5.25	5.41	5.57	5.74	5.91	6.09	6.09	6.09	6.09	6.09	6.09	6.09	6.09	6.09	6.09	6.09	6.09	6.09	6.09
LR MOGAS	1.50	1.55	1.60	1.64	1.69	1.74	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80
JET/KERO	1.39	1.43	1.48	1.52	1.57	1.61	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66
NO.2 GASOIL	1.32	1.36	1.41	1.45	1.49	1.54	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58
MDO	1.29	1.33	1.37	1.41	1.46	1.50	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55
HSFO	0.93	0.96	0.98	1.01	1.04	1.08	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11

(K)CIF KINGSTON - [illegible]

PROPANE	20.41	17.94	16.54	17.12	17.83	18.62	19.47	20.22	21.03	21.84	21.66	21.48	21.37	21.25	21.08	21.20	21.26	21.38	21.51	21.63
BUTANE	25.02	21.94	20.19	20.89	21.76	22.73	23.78	24.72	25.72	26.72	26.50	26.28	26.14	26.00	25.78	25.93	26.00	26.16	26.32	26.47
LR MOGAS I	31.43	26.34	23.32	24.17	25.28	26.55	27.92	29.39	30.98	32.56	32.21	31.86	31.64	31.42	31.07	31.31	31.43	31.67	31.92	32.17
LR MOGAS II	32.94	27.88	24.92	25.81	26.98	28.29	29.71	31.19	32.78	34.36	34.01	33.66	33.44	33.21	32.86	33.11	33.22	33.47	33.71	33.96
ULR MOGAS I	31.43	26.34	23.32	24.17	25.28	26.55	27.92	29.39	30.98	32.56	32.21	31.86	31.64	31.42	31.07	31.31	31.43	31.67	31.92	32.17
ULR MOGAS II	32.94	27.88	24.92	25.81	26.98	28.29	29.71	31.19	32.78	34.36	34.01	33.66	33.44	33.21	32.86	33.11	33.22	33.47	33.71	33.96
JET/KERO	33.86	28.77	25.78	26.68	27.85	29.17	30.60	32.08	33.68	35.27	34.92	34.56	34.34	34.12	33.76	34.01	34.13	34.37	34.62	34.87
NO.2 GASOIL	31.32	26.50	23.66	24.51	25.62	26.87	28.22	29.63	31.15	32.65	32.32	31.99	31.78	31.56	31.23	31.46	31.57	31.81	32.04	32.28
MDO	30.30	25.63	22.89	23.71	24.79	26.00	27.30	28.67	30.13	31.59	31.27	30.94	30.74	30.53	30.21	30.44	30.54	30.77	31.00	31.22
HSFO	16.53	14.02	12.56	13.01	13.59	14.25	14.96	15.69	16.48	17.26	17.09	16.92	16.81	16.70	16.52	16.65	16.70	16.82	16.95	17.07
ASPHALT	26.18	23.43	21.81	22.31	22.95	23.67	24.46	25.26	26.13	26.99	26.80	26.61	26.49	26.37	26.18	26.31	26.37	26.51	26.64	26.78

(J)EXPORT PRICE BASES:

PROPANE, BUTANE USGC LESS FREIGHT
WHITE PRODUCTS, USGC LESS 1/2 FREIGHT.
HSFO I REFINING MIN INVESTMENT, USGC LESS 1/2 FREIGHT(1/2 FRT IS SR CREDIT)
HSFO II REFINING CONVERSION, USGC PLUS 1/2 FRT.(BAUXITE)

(K)FOB KINGSTON - EXPORT PRICE

PROPANE	11.61	8.88	7.21	7.50	7.92	8.42	8.96	9.72	10.53	11.33	11.15	10.97	10.86	10.75	10.57	10.69	10.75	10.88	11.00	11.13
BUTANE	14.82	11.43	9.37	9.74	10.28	10.91	11.60	12.56	13.54	14.54	14.32	14.10	13.96	13.82	13.60	13.75	13.82	13.98	14.14	14.29
MOGAS	30.68	25.56	22.52	23.35	24.44	25.68	27.02	28.50	30.09	31.66	31.31	30.96	30.74	30.52	30.17	30.41	30.53	30.77	31.02	31.27
JET/KERO	30.94	25.79	22.73	23.56	24.66	25.91	27.26	28.75	30.35	31.94	31.58	31.23	31.01	30.79	30.43	30.68	30.80	31.04	31.29	31.54
NO.2 GASOIL	29.33	24.45	21.55	22.34	23.38	24.57	25.85	27.26	28.78	30.28	29.95	29.61	29.40	29.19	28.86	29.09	29.20	29.43	29.67	29.90
MDO	28.36	23.63	20.83	21.59	22.60	23.75	24.99	26.35	27.82	29.27	28.95	28.62	28.42	28.22	27.89	28.12	28.22	28.45	28.68	28.91
HSFO I	15.13	12.59	11.08	11.49	12.02	12.64	13.30	14.03	14.82	15.60	15.43	15.26	15.15	15.04	14.86	14.98	15.04	15.16	15.29	15.41
HSFO II	16.06	13.55	12.06	12.50	13.07	13.71	14.41	15.14	15.93	16.71	16.54	16.36	16.25	16.14	15.97	16.09	16.15	16.27	16.39	16.52

(L)SPIKES - CIF KINGSTON

C4SPK	20.72	17.49	15.58	16.11	16.82	17.62	18.49	19.43	20.43	21.43	21.21	20.99	20.85	20.71	20.69	20.64	20.71	20.87	21.03	21.18
MPSPK	26.40	22.12	19.58	20.30	21.23	22.30	23.45	24.69	26.02	27.34	27.05	26.76	26.57	26.39	26.09	26.30	26.39	26.60	26.81	27.01
KRSPK	32.43	27.50	24.47	25.32	26.44	27.72	29.09	30.58	32.18	33.77	33.41	33.06	32.84	32.62	32.26	32.51	32.63	32.87	33.12	33.37
GOSPK	29.00	24.13	21.25	22.06	23.13	24.33	25.64	27.05	28.57	30.07	29.74	29.40	29.19	28.98	28.65	28.88	28.99	29.23	29.46	29.70

COSTS FOR LP																					
BCF26	20.28	17.20	15.24	15.71	16.31	17.15	18.04	18.95	19.91	20.86	20.72	20.59	20.52	20.45	20.31	20.38	20.38	20.45	20.52	20.59
BCF17	17.50	14.77	13.16	13.63	14.25	14.95	15.71	16.51	17.36	18.21	18.03	17.84	17.72	17.60	17.41	17.54	17.60	17.74	17.87	18.00
ISTHMUS	23.43	19.86	17.60	18.09	18.72	19.67	20.67	21.70	22.78	23.91	23.84	23.77	23.70	23.63	23.56	23.56	23.56	23.56	23.56	23.56
MAYA	19.64	16.66	14.81	15.29	15.90	16.70	17.56	18.44	19.37	20.29	20.14	19.98	19.90	19.82	19.67	19.75	19.77	19.86	19.95	20.04
FORCADOS	25.46	21.70	19.33	19.89	20.59	21.62	22.72	23.80	24.95	26.15	26.08	26.00	25.93	25.85	25.78	25.78	25.78	25.78	25.78	25.78
ORIENTE	22.81	19.17	16.88	17.41	18.08	19.07	20.12	21.17	22.28	23.44	23.37	23.30	23.22	23.15	23.08	23.08	23.08	23.08	23.08	23.08
CASPK	20.72	17.49	15.58	16.11	16.82	17.62	18.49	19.43	20.43	21.43	21.21	20.99	20.85	20.71	20.49	20.64	20.71	20.87	21.03	21.18
MPSPK	26.40	22.12	19.58	20.30	21.23	22.30	23.45	24.69	26.02	27.34	27.05	26.76	26.57	26.39	26.09	26.30	26.39	26.60	26.81	27.01
KRSPK	32.63	27.50	24.47	25.32	26.44	27.72	29.09	30.58	32.18	33.77	33.41	33.06	32.84	32.62	32.26	32.51	32.63	32.87	33.12	33.37
GOSPK	29.00	24.13	21.25	22.06	23.13	24.33	25.64	27.05	28.57	30.07	29.74	29.40	29.19	28.98	28.65	28.88	28.99	29.23	29.46	29.70
C3IMP	20.41	17.94	16.54	17.12	17.83	18.62	19.47	20.22	21.03	21.86	21.66	21.48	21.37	21.25	21.08	21.20	21.26	21.38	21.51	21.63
C4IMP	25.02	21.94	20.19	20.89	21.76	22.73	23.78	24.72	25.72	26.72	26.50	26.28	26.14	26.00	25.78	25.93	26.00	26.16	26.32	26.47
PRIMP	32.94	27.88	24.92	25.81	26.98	28.29	29.71	31.19	32.78	34.36	34.01	33.66	33.44	33.21	32.86	33.11	33.22	33.47	33.71	33.96
TBIMP	33.86	28.77	25.78	26.68	27.85	29.17	30.60	32.08	33.68	35.27	34.92	34.56	34.34	34.12	33.76	34.01	34.13	34.37	34.62	34.87
ADIMP	31.32	26.50	23.66	24.51	25.62	26.87	28.22	29.63	31.15	32.65	32.32	31.99	31.78	31.56	31.23	31.46	31.57	31.81	32.04	32.28
MDIMP	30.30	25.63	22.89	23.71	24.79	26.00	27.30	28.67	30.13	31.59	31.27	30.94	30.74	30.53	30.21	30.44	30.54	30.77	31.00	31.22
RFIMP	16.53	14.02	12.56	13.01	13.59	14.25	14.96	15.69	16.48	17.26	17.09	16.92	16.81	16.70	16.52	16.65	16.70	16.82	16.95	17.07
C3EXP	-11.61	-8.88	-7.21	-7.50	-7.92	-8.42	-8.96	-9.72	-10.53	-11.33	-11.15	-10.97	-10.86	-10.75	-10.57	-10.69	-10.75	-10.88	-11.00	-11.13
C4EXP	-14.82	-11.43	-9.37	-9.74	-10.28	-10.91	-11.60	-12.54	-13.54	-14.54	-14.32	-14.10	-13.96	-13.82	-13.60	-13.75	-13.82	-13.98	-14.14	-14.29
PREXP	-30.68	-25.56	-22.52	-23.35	-24.44	-25.68	-27.02	-28.50	-30.09	-31.66	-31.31	-30.96	-30.74	-30.52	-30.17	-30.41	-30.53	-30.77	-31.02	-31.27
TBEXP	-30.94	-25.79	-22.73	-23.56	-24.66	-25.91	-27.26	-28.75	-30.35	-31.94	-31.58	-31.23	-31.01	-30.79	-30.43	-30.68	-30.80	-31.04	-31.29	-31.54
ADEXP	-29.33	-24.45	-21.55	-22.34	-23.38	-24.57	-25.85	-27.26	-28.78	-30.28	-29.95	-29.61	-29.40	-29.19	-28.86	-29.09	-29.20	-29.43	-29.67	-29.90
MDEXP	-28.36	-23.63	-20.83	-21.59	-22.60	-23.75	-24.99	-26.35	-27.82	-29.27	-28.95	-28.62	-28.42	-28.22	-27.89	-28.12	-28.22	-28.45	-28.68	-28.91
RFEXP	-15.13	-12.59	-11.08	-11.49	-12.02	-12.64	-13.30	-14.03	-14.82	-15.60	-15.43	-15.26	-15.15	-15.04	-14.86	-14.98	-15.04	-15.16	-15.29	-15.41
FOR REFPLAN																				
INTERNATIONAL CRUDE AND PRODUCT PRICES																				
BCF 26	20.28	17.20	15.24	15.71	16.31	17.15	18.04	18.95	19.91	20.86	20.72	20.59	20.52	20.45	20.31	20.38	20.38	20.45	20.52	20.59
BCF 17	17.50	14.77	13.16	13.63	14.25	14.95	15.71	16.51	17.36	18.21	18.03	17.84	17.72	17.60	17.41	17.54	17.60	17.74	17.87	18.00
ISTHMUS	23.43	19.86	17.60	18.09	18.72	19.67	20.67	21.70	22.78	23.91	23.84	23.77	23.70	23.63	23.56	23.56	23.56	23.56	23.56	23.56
MAYA	19.64	16.66	14.81	15.29	15.90	16.70	17.56	18.44	19.37	20.29	20.14	19.98	19.90	19.82	19.67	19.75	19.77	19.86	19.95	20.04
FORCADOS	25.46	21.70	19.33	19.89	20.59	21.62	22.72	23.80	24.95	26.15	26.08	26.00	25.93	25.85	25.78	25.78	25.78	25.78	25.78	25.78
ORIENTE	22.81	19.17	16.88	17.41	18.08	19.07	20.12	21.17	22.28	23.44	23.37	23.30	23.22	23.15	23.08	23.08	23.08	23.08	23.08	23.08
SPIKES																				
BUTANE	20.72	17.49	15.58	16.11	16.82	17.62	18.49	19.43	20.43	21.43	21.21	20.99	20.85	20.71	20.49	20.64	20.71	20.87	21.03	21.18
NAPHTHA	26.40	22.12	19.58	20.30	21.23	22.30	23.45	24.69	26.02	27.34	27.05	26.76	26.57	26.39	26.09	26.30	26.39	26.60	26.81	27.01
KERO	32.63	27.50	24.47	25.32	26.44	27.72	29.09	30.58	32.18	33.77	33.41	33.06	32.84	32.62	32.26	32.51	32.63	32.87	33.12	33.37
GAS OIL	29.00	24.13	21.25	22.06	23.13	24.33	25.64	27.05	28.57	30.07	29.74	29.40	29.19	28.98	28.65	28.88	28.99	29.23	29.46	29.70
PRODUCT IMPORTS																				
PROPANE	20.41	17.94	16.54	17.12	17.83	18.62	19.47	20.22	21.03	21.86	21.66	21.48	21.37	21.25	21.08	21.20	21.26	21.38	21.51	21.63
BUTANE	25.02	21.94	20.19	20.89	21.76	22.73	23.78	24.72	25.72	26.72	26.50	26.28	26.14	26.00	25.78	25.93	26.00	26.16	26.32	26.47
LR NOGAS I	31.43	26.34	23.32	24.17	25.28	26.55	27.92	29.39	30.98	32.56	32.21	31.86	31.64	31.42	31.07	31.31	31.43	31.67	31.92	32.17
LR NOGAS II	32.94	27.88	24.92	25.81	26.98	28.29	29.71	31.19	32.78	34.36	34.01	33.66	33.44	33.21	32.86	33.11	33.22	33.47	33.71	33.96
ULR NOGAS I	31.43	26.34	23.32	24.17	25.28	26.55	27.92	29.39	30.98	32.56	32.21	31.86	31.64	31.42	31.07	31.31	31.43	31.67	31.92	32.17
ULR NOGAS II	32.94	27.88	24.92	25.81	26.98	28.29	29.71	31.19	32.78	34.36	34.01	33.66	33.44	33.21	32.86	33.11	33.22	33.47	33.71	33.96
JET/KERO	33.86	28.77	25.78	26.68	27.85	29.17	30.60	32.08	33.68	35.27	34.92	34.56	34.34	34.12	33.76	34.01	34.13	34.37	34.62	34.87
NO.2 GASOIL	31.32	26.50	23.66	24.51	25.62	26.87	28.22	29.63	31.15	32.65	32.32	31.99	31.78	31.56	31.23	31.46	31.57	31.81	32.04	32.28
MDO	30.30	25.63	22.89	23.71	24.79	26.00	27.30	28.67	30.13	31.59	31.27	30.94	30.74	30.53	30.21	30.44	30.54	30.77	31.00	31.22
8SFO	16.53	14.02	12.56	13.01	13.59	14.25	14.96	15.69	16.48	17.26	17.09	16.92	16.81	16.70	16.52	16.65	16.70	16.82	16.95	17.07
ASPHALT	26.18	23.43	21.81	22.31	22.95	23.67	24.46	25.26	26.13	26.99	26.80	26.61	26.69	26.37	26.18	26.31	26.37	26.51	26.64	26.78

204																					
205	PRODUCT EXPORTS																				
206	-------------																				
207	PROPANE	11.61	8.88	7.21	7.50	7.92	8.42	8.96	9.72	10.53	11.33	11.15	10.97	10.86	10.75	10.57	10.69	10.75	10.88	11.00	11.13
208	BUTANE	14.82	11.43	9.37	9.74	10.28	10.91	11.60	12.54	13.54	14.54	14.32	14.10	13.96	13.82	13.60	13.75	13.82	13.98	14.14	14.29
209	MOGAS	30.68	25.56	22.52	23.35	24.44	25.68	27.02	28.50	30.09	31.66	31.31	30.96	30.74	30.52	30.17	30.41	30.53	30.77	31.02	31.27
210	JET/KERO	30.94	25.79	22.73	23.56	24.66	25.91	27.26	28.75	30.35	31.94	31.58	31.23	31.01	30.79	30.43	30.68	30.80	31.04	31.29	31.54
211	NO.2 GASOIL	29.33	24.45	21.55	22.34	23.38	24.57	25.85	27.26	28.78	30.28	29.95	29.61	29.40	29.19	28.86	29.09	29.20	29.43	29.67	29.90
212	MDO	28.36	23.63	20.83	21.59	22.60	23.75	24.99	26.35	27.82	29.27	28.95	28.62	28.42	28.22	27.89	28.12	28.22	28.45	28.68	28.91
213	MSFO I	15.13	12.59	11.08	11.49	12.02	12.64	13.30	14.03	14.82	15.60	15.43	15.26	15.15	15.04	14.86	14.98	15.04	15.16	15.29	15.41
214	MSFO II	16.06	13.55	12.06	12.50	13.07	13.71	14.41	15.14	15.93	16.71	16.54	16.36	16.25	16.14	15.97	16.09	16.15	16.27	16.39	16.52

CASH FLOW MODEL - JAMAICA PETROLEUM PRODUCT SUPPLY/REFINING INVESTMENT CASES

1. The objective of the cashflow modelling is to examine a number of product supply/refining configuration options for Jamaica in order to determine which configuration provides Jamaica's finished product needs over the next 20 years at the lowest total net cost.

2. The following pages are a printout of the cash flow spreadsheet model (REFPLAN.WK1) runs which were correspond to the base case inputs on demand, price, capital investment and operating costs. The spreadsheet row numbers are shown and used below as identifiers in the documentation.

3. The first component comprises a Jamaican product demand forecast(11-19), which is input from DEMAND.WK1. This forecast is a common input to all supply cases - BASE terminal and the three alternate refining cases I,II and III. It should be noted that alternate refining case IV, involving an expansion of facilities which would exceed the spare land at existing site, was developed and estimated to conceptual quality only. It was evaluated based on one set of yields and margins prevailing over a 15 year period and was not incorporated into the detailed yearly cash flow evaluation.

4. As indicated there are three refinery balance/operations data sets, one for each of the three refining alternates. By way of illustration for case I, the crude run volumes are rows 32-37, spikes run 43-46, total runs to still row 50, capacity utilization row 53, production 57-64, individual product yields rows 71-78, total recovery row 80, product imports rows 84-90 and product exports rows 96-102. The same data sets for cases II and III follow those described for case I. The crude and spike imports, product imports and product exports are all data linked from REFTRAD.WK1 which in turn is generated from the raw LP outputs for each set of cases.

5. The refinery LP was run on the basis of minimizing the net marginal cost of supplying the Jamaican product demand, with freedom to import several crudes, spikes, finished products as well as to export product all at the prices documented in ANNEX 6.2. In cases II and III it had the freedom to select the catalytic cracking capacity it wanted based on this cost minimization objective. The LP objective function incorporated crude and product import costs plus marginal operating costs of the refinery less any revenues on product exports.

6. Rows 281 through 320 comprise a complete data range linkage with PRICE.WK1, the international crude and product price forecast spreadsheet as documented in ANNEX 6.2.

7. Rows 328 through 358 comprise the cash flow summary for the BASE terminal case. The product costs are derived from a multiple of demands and product import prices. The fixed and variable operating costs are input through a linkage with OPCOST.WK1. The capital investment is input through a linkage with CAPITAL.WK1. The total cost cash flow for this case is summed as row 358.

8. In the refining cases, illustrating with case I, the total cash flow summary section is row 365 through 423. The total cost cash flow summed for this case is row 419. This is subtracted from row 358 to derive the incremental cash flow benefit of refining I over terminalling. This is shown as row 420. The internal rate of return and net present value of the cash flow at 15% are shown in rows 422 and 423 respectively.

91-04-25
04:03 PM JAMAICA: ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
PETROLEUM SECTOR ANALYSIS

LOW DEMAND ON REFINERY CASH FLOW MODEL - JAMAICA PETROLEUM PRODUCT SUPPLY/REFINING INVESTMENT CASES
VOLUMETRIC DATA(DEMAND,PRODUCTION,IMPORTS,EXPORTS) IN MILLIONS BARRELS

REFINERY DEMAND	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
PROPANE	0.10	0.11	0.11	0.12	0.13	0.13	0.14	0.15	0.15	0.16	0.17	0.18	0.19	0.20	0.21	0.22	0.23	0.24	0.25	0.26
BUTANE	0.42	0.44	0.46	0.48	0.51	0.53	0.56	0.59	0.62	0.65	0.68	0.71	0.75	0.79	0.83	0.87	0.91	0.96	1.00	1.05
MOGAS, LEADED	0.93	0.85	0.77	0.68	0.58	0.48	0.37	0.25	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MOGAS, UNLEADED	0.10	0.21	0.33	0.45	0.58	0.72	0.86	1.02	1.18	1.35	1.39	1.43	1.47	1.52	1.56	1.61	1.66	1.71	1.76	1.81
KERO/TURBO	0.84	0.86	0.89	0.92	0.95	0.98	1.02	1.05	1.09	1.12	1.16	1.20	1.24	1.29	1.33	1.38	1.42	1.47	1.53	1.58
AUTO DIESEL	1.35	1.51	1.65	2.14	1.69	1.68	1.71	1.62	1.69	1.70	1.81	1.93	2.06	2.11	2.15	2.31	2.48	2.54	2.60	2.67
MARINE DIESEL	0.35	0.36	0.38	0.41	0.42	0.43	0.44	0.45	0.46	0.47	0.48	0.49	0.51	0.52	0.53	0.54	0.56	0.57	0.59	0.60
HEAVY FUEL OIL	4.55	4.71	4.85	4.56	5.10	5.13	5.32	4.74	4.62	4.00	4.11	3.46	3.57	3.73	3.90	3.27	3.35	3.54	3.74	3.91
ASPHALT	0.11	0.12	0.12	0.13	0.14	0.15	0.16	0.16	0.17	0.18	0.20	0.21	0.22	0.23	0.25	0.26	0.28	0.29	0.31	0.33
TOTAL	8.75	9.18	9.58	9.90	10.10	10.24	10.58	10.03	10.11	9.63	10.00	9.62	10.01	10.38	10.76	10.46	10.88	11.33	11.78	12.23

BASE CASE: IMPORT ALL THROUGH REFINERY TANKS AS TERMINAL

91-04-25
04:03 PM
ALT CASE I -REFINING, MINIMUM INVESTMENT - BUSINESS AS USUAL

CRUDE RUN	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
BCF 24	5.82	0.00	0.00	6.37	8.34	8.40	8.72	7.79	5.47	4.97	6.95	5.91	5.60	0.00	0.00	0.20	4.30	6.16	6.53	6.38
BCF 17	0.00	2.59	2.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.38	4.30	3.96	0.58	0.00	0.00	0.00
ISTHMUS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.38	2.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.83
MAYA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FORCADOS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ORIENTE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOT WHOLE CRUDE	5.82	2.59	2.74	6.37	8.34	8.40	8.72	7.79	8.85	7.54	6.95	5.91	5.60	4.38	4.30	4.16	4.88	6.16	6.53	7.21

41 SPIKES RUN																				
42 ----------																				
43 BUTANE	0.09	0.06	0.07	0.09	0.11	0.11	0.11	0.11	0.07	0.08	0.11	0.10	0.10	0.10	0.10	0.10	0.10	0.11	0.11	0.10
44 NAPHTHA	2.04	1.46	1.50	0.79	0.97	0.97	1.48	1.66	1.15	1.47	1.82	2.01	2.07	2.74	2.72	2.65	2.12	1.75	1.71	1.66
45 KERO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
46 GAS OIL	1.24	2.36	2.54	2.31	1.33	1.33	1.31	1.39	0.94	1.31	1.86	2.24	2.58	3.18	3.28	3.49	3.29	3.15	2.95	2.26
47	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
48 TOTAL SPIKES	3.37	3.88	4.11	3.19	2.41	2.41	2.91	3.16	2.16	2.86	3.78	4.35	4.67	6.02	6.10	6.24	5.52	5.00	4.77	4.02
49	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
50 TOT RUN TO STILL	9.19	6.48	6.86	9.56	10.75	10.81	11.63	10.94	11.02	10.40	10.73	10.26	10.27	10.40	10.40	10.40	10.40	11.17	11.30	11.23
51 CAPACITY	12.96	12.96	12.96	12.96	12.96	12.96	12.96	12.96	12.96	12.96	12.96	12.96	12.96	12.96	12.96	12.96	12.96	12.96	12.96	12.96
52 UTILIZATION	70.9%	50.0%	52.9%	73.8%	82.9%	83.4%	89.7%	84.5%	85.0%	80.3%	82.8%	79.2%	79.2%	80.3%	80.2%	80.3%	80.2%	86.2%	87.2%	86.6%
53																				
54																				
55 PRODUCTION																				
56 ----------																				
57 PROPANE	0.06	0.02	0.02	0.04	0.05	0.06	0.06	0.06	0.07	0.06	0.06	0.05	0.06	0.04	0.03	0.04	0.05	0.05	0.05	0.06
58 BUTANE	0.27	0.14	0.14	0.25	0.29	0.30	0.33	0.31	0.23	0.23	0.30	0.29	0.29	0.23	0.23	0.23	0.27	0.30	0.30	0.29
59 MOGAS	2.01	1.07	1.10	1.13	1.49	1.50	1.90	1.93	1.90	1.96	1.93	1.95	1.95	2.02	1.99	1.95	1.86	1.75	1.76	1.87
60 KERO/TURBO	1.14	0.86	0.89	1.22	1.17	1.17	1.28	1.26	1.48	1.45	1.39	1.44	1.49	1.29	1.33	1.38	1.58	1.69	1.65	1.58
61 AUTO DIESEL	1.35	1.51	1.65	2.14	1.69	1.68	1.71	1.62	1.69	1.70	1.81	1.93	2.06	2.11	2.15	2.31	2.48	2.54	2.60	2.67
62 MARINE DIESEL	0.35	0.36	0.38	0.41	0.42	0.43	0.44	0.45	0.46	0.47	0.48	0.49	0.51	0.52	0.53	0.54	0.56	0.57	0.44	0.06
63 HEAVY FUEL OIL	3.49	2.15	2.28	3.92	5.10	5.13	5.32	4.74	4.62	4.00	4.11	3.46	3.26	3.52	3.43	3.25	2.89	3.54	3.74	3.91
64 ASPHALT	0.11	0.12	0.12	0.13	0.14	0.15	0.16	0.16	0.17	0.18	0.20	0.21	0.22	0.23	0.25	0.26	0.28	0.29	0.31	0.33
65	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
66 TOTAL	8.77	6.23	6.60	9.23	10.35	10.42	11.20	10.54	10.62	10.03	10.28	9.83	9.83	9.96	9.96	9.96	9.97	10.73	10.86	10.77
67																				
68																				
69 YIELDS																				
70 -------																				
71 PROPANE	0.6%	0.3%	0.3%	0.4%	0.5%	0.5%	0.5%	0.6%	0.6%	0.6%	0.5%	0.5%	0.5%	0.3%	0.3%	0.4%	0.5%	0.5%	0.4%	0.5%
72 BUTANE	3.0%	2.1%	2.1%	2.6%	2.7%	2.7%	2.8%	2.8%	2.1%	2.3%	2.8%	2.8%	2.8%	2.2%	2.2%	2.2%	2.6%	2.6%	2.7%	2.6%
73 MOGAS	21.9%	16.4%	16.0%	11.8%	13.9%	13.9%	16.4%	17.7%	17.3%	18.6%	18.0%	19.0%	19.0%	19.4%	19.2%	18.8%	17.9%	15.6%	15.6%	16.6%
74 KERO/TURBO	12.4%	13.4%	13.0%	12.7%	10.9%	10.9%	11.0%	11.5%	13.4%	13.9%	12.9%	14.1%	14.6%	12.4%	12.8%	13.2%	15.2%	15.1%	14.6%	14.1%
75 AUTO DIESEL	14.7%	23.3%	24.1%	22.4%	15.7%	15.6%	14.7%	14.8%	15.3%	16.3%	16.8%	18.8%	20.0%	20.3%	20.7%	22.2%	23.8%	22.7%	23.0%	23.8%
76 MARINE DIESEL	3.8%	5.6%	5.6%	4.3%	3.9%	4.0%	3.8%	4.1%	4.2%	4.5%	4.7%	4.8%	4.9%	5.0%	5.1%	5.2%	5.4%	5.1%	3.9%	0.6%
77 HEAVY FUEL OIL	38.0%	33.2%	33.3%	41.0%	47.4%	47.5%	45.8%	43.3%	41.9%	38.4%	38.3%	33.7%	31.8%	33.9%	33.0%	31.3%	27.8%	31.7%	33.1%	34.8%
78 ASPHALT	1.2%	1.8%	1.8%	1.4%	1.3%	1.4%	1.3%	1.5%	1.6%	1.8%	1.8%	2.0%	2.1%	2.2%	2.4%	2.5%	2.7%	2.6%	2.8%	2.9%
79	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
80 TOTAL RECOVERY	95.4%	96.2%	96.2%	96.6%	96.3%	96.4%	96.3%	96.3%	96.4%	96.4%	95.8%	95.8%	95.8%	95.7%	95.8%	95.8%	95.9%	96.1%	96.1%	95.9%

		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
82	IMPORTS																				
84	PROPANE	0.05	0.09	0.09	0.08	0.08	0.08	0.08	0.08	0.09	0.10	0.11	0.12	0.13	0.16	0.17	0.18	0.18	0.19	0.20	0.20
85	BUTANE	0.15	0.30	0.32	0.24	0.22	0.24	0.23	0.28	0.39	0.41	0.38	0.42	0.46	0.55	0.59	0.64	0.64	0.66	0.70	0.77
86	MOGAS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
87	KERO/TURBO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
88	AUTO DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
89	MARINE DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.54
90	HEAVY FUEL OIL	1.07	2.56	2.57	0.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.31	0.21	0.46	0.02	0.46	0.00	0.00	0.00
92	TOTAL	1.26	2.95	2.98	0.96	0.29	0.31	0.31	0.36	0.47	0.51	0.49	0.55	0.90	0.92	1.23	0.84	1.27	0.85	1.05	1.51
94	EXPORTS																				
96	PROPANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
97	BUTANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
98	MOGAS	0.98	0.00	0.00	0.00	0.32	0.30	0.67	0.66	0.59	0.59	0.54	0.52	0.47	0.50	0.43	0.34	0.20	0.04	0.00	0.05
99	KERO/TURBO	0.30	0.00	0.00	0.30	0.22	0.19	0.26	0.21	0.39	0.32	0.23	0.24	0.25	0.00	0.00	0.00	0.16	0.21	0.13	0.00
100	AUTO DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
101	MARINE DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
102	HEAVY FUEL OIL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
104	TOTAL	1.28	0.00	0.00	0.30	0.54	0.49	0.93	0.87	0.98	0.91	0.77	0.76	0.73	0.50	0.43	0.34	0.36	0.25	0.13	0.05

108 91-04-25 ALT CASE II -REFINING, INTERMEDIATE INVESTMENT, FCC BUT NO CRUDE EXPANSION
109 04:03 PM **********
110

111 CRUDE RUN	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
112 ----------	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
113 BCF 26	5.82	0.00	0.00	6.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
114 BCF 17	0.00	2.59	2.74	0.00	5.08	5.39	5.39	4.64	4.16	4.16	4.16	4.96	4.69	4.56	6.85	4.16	4.16	3.85	4.16	3.65
115 ISTHMUS	0.00	0.00	0.00	0.00	4.56	6.72	6.72	7.96	8.76	8.76	8.76	7.43	7.88	8.09	4.06	8.76	8.76	9.07	8.76	9.27
116 MAYA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
117 FORCADOS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
118 ORIENTE	0.00	0.00	0.00	0.00	2.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
119	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
120 TOT WHOLE CRUDE	5.82	2.59	2.74	6.37	11.89	12.11	12.11	12.60	12.91	12.91	12.91	12.39	12.57	12.65	10.91	12.91	12.91	12.92	12.91	12.92
121																				
122 SPIKES RUN																				
123 ----------																				
124 BUTANE	0.09	0.06	0.07	0.09	0.06	0.06	0.06	0.05	0.04	0.04	0.04	0.05	0.05	0.05	0.09	0.04	0.04	0.04	0.04	0.04
125 NAPHTHA	2.04	1.46	1.50	0.79	1.00	0.78	0.78	0.30	0.00	0.00	0.00	0.50	0.34	0.25	0.78	0.00	0.00	0.00	0.00	0.00
126 KERO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
127 GAS OIL	1.24	2.36	2.54	2.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.18	0.00	0.00	0.00	0.00	0.00
128	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
129 TOTAL SPIKES	3.37	3.88	4.11	3.19	1.05	0.84	0.84	0.35	0.04	0.04	0.04	0.56	0.38	0.30	2.04	0.04	0.04	0.04	0.04	0.04
130	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
131 TOT RUN TO STILL	9.19	6.48	6.86	9.56	12.95	12.95	12.95	12.95	12.95	12.95	12.95	12.95	12.95	12.95	12.95	12.95	12.95	12.95	12.95	12.95
132 CAPACITY	12.96	12.96	12.96	12.96	12.96	12.96	12.96	12.96	12.96	12.96	12.96	12.96	12.96	12.96	12.96	12.96	12.96	12.96	12.96	12.96
133 UTILIZATION	70.9%	50.0%	52.9%	73.8%	99.9%	99.9%	99.9%	99.9%	100.0%	100.0%	100.0%	99.9%	99.9%	99.9%	99.9%	100.0%	100.0%	100.0%	100.0%	100.0%
134 FCC CAP MBSD																				
135																				
136 PRODUCTION																				
137 ----------																				
138 PROPANE	0.06	0.02	0.02	0.04	0.12	0.12	0.12	0.12	0.13	0.13	0.13	0.12	0.13	0.12	0.09	0.13	0.13	0.13	0.13	0.13
139 BUTANE	0.27	0.14	0.14	0.25	0.20	0.21	0.21	0.18	0.16	0.16	0.16	0.20	0.18	0.18	0.25	0.16	0.16	0.15	0.16	0.15
140 NOGAS	2.01	1.07	1.10	1.13	3.82	3.81	3.81	3.72	3.67	3.67	3.67	3.77	3.74	3.72	3.28	3.68	3.68	3.73	3.69	3.76
141 KERO/TURBO	1.14	0.86	0.89	1.22	1.56	1.36	1.36	1.41	1.41	1.42	1.41	1.41	1.41	1.42	1.33	1.41	1.41	1.42	1.40	1.43
142 AUTO DIESEL	1.35	1.51	1.65	2.14	1.69	1.85	1.84	2.09	2.28	2.26	2.29	1.96	2.06	2.11	2.15	2.31	2.48	2.54	2.59	2.45
143 MARINE DIESEL	0.35	0.36	0.38	0.41	0.42	0.43	0.44	0.45	0.46	0.47	0.48	0.49	0.51	0.52	0.49	0.50	0.35	0.37	0.25	0.51
144 HEAVY FUEL OIL	3.49	2.15	2.28	3.92	4.72	4.75	4.75	4.56	4.44	4.43	4.31	4.50	4.41	4.36	4.83	4.21	4.19	4.04	4.14	3.91
145 ASPHALT	0.11	0.12	0.12	0.13	0.14	0.15	0.16	0.16	0.17	0.18	0.20	0.21	0.22	0.23	0.25	0.26	0.28	0.29	0.31	0.33
146	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
147 TOTAL	8.77	6.23	6.60	9.23	12.67	12.68	12.69	12.71	12.72	12.73	12.66	12.65	12.65	12.66	12.67	12.67	12.67	12.67	12.67	12.66

149																				
150	YIELDS																			
151	------																			
152	PROPANE	0.6%	0.3%	0.3%	0.4%	0.9%	0.9%	0.9%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	0.7%	1.0%	1.0%	1.0%	1.0%	1.0%
153	BUTANE	3.0%	2.1%	2.1%	2.6%	1.5%	1.6%	1.6%	1.4%	1.2%	1.2%	1.2%	1.5%	1.4%	1.4%	1.9%	1.2%	1.3%	1.2%	1.2%	1.1%
154	MOGAS	21.9%	16.4%	16.0%	11.8%	29.5%	29.4%	29.4%	28.8%	28.3%	28.3%	28.4%	29.1%	28.9%	28.7%	25.3%	28.4%	28.4%	28.8%	28.5%	29.0%
155	KERO/TURBO	12.4%	13.4%	13.0%	12.7%	12.0%	10.5%	10.5%	10.9%	10.9%	10.9%	10.9%	10.9%	10.9%	10.9%	10.3%	10.9%	10.9%	10.9%	10.8%	11.0%
156	AUTO DIESEL	14.7%	23.3%	24.1%	22.4%	13.1%	14.3%	14.3%	16.1%	17.6%	17.5%	17.7%	15.1%	15.9%	16.3%	16.6%	17.8%	19.1%	19.6%	20.0%	18.9%
157	MARINE DIESEL	3.8%	5.6%	5.6%	4.3%	3.2%	3.3%	3.4%	3.5%	3.5%	3.6%	3.7%	3.8%	3.9%	4.0%	3.8%	3.9%	2.7%	2.8%	2.0%	3.9%
158	HEAVY FUEL OIL	38.0%	33.2%	33.3%	41.0%	36.5%	36.7%	36.7%	35.2%	34.3%	34.2%	33.3%	34.7%	34.1%	33.7%	37.3%	32.5%	32.3%	31.2%	31.9%	30.2%
159	ASPHALT	1.2%	1.8%	1.8%	1.4%	1.1%	1.1%	1.2%	1.3%	1.3%	1.4%	1.5%	1.6%	1.7%	1.8%	1.9%	2.0%	2.1%	2.3%	2.4%	2.6%
160		------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
161	TOTAL RECOVERY	95.4%	96.2%	96.2%	96.6%	97.9%	97.9%	98.0%	98.1%	98.2%	98.3%	97.7%	97.7%	97.7%	97.8%	97.8%	97.8%	97.8%	97.8%	97.8%	97.7%
162																					
163																					
164	IMPORTS	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
165	--------	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
166	PROPANE	0.05	0.09	0.09	0.08	0.01	0.01	0.02	0.02	0.03	0.03	0.04	0.05	0.06	0.07	0.11	0.09	0.10	0.11	0.12	0.13
167	BUTANE	0.15	0.30	0.32	0.24	0.31	0.32	0.35	0.41	0.46	0.49	0.52	0.52	0.57	0.61	0.58	0.71	0.75	0.80	0.84	0.91
168	MOGAS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
169	KERO/TURBO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.06	0.13	0.15
170	AUTO DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.23
171	MARINE DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.04	0.21	0.21	0.36	0.10
172	HEAVY FUEL OIL	1.07	2.56	2.57	0.64	0.38	0.39	0.57	0.18	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
173		------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
174	TOTAL	1.26	2.95	2.98	0.96	0.69	0.72	0.94	0.61	0.66	0.52	0.56	0.57	0.63	0.68	0.73	0.84	1.08	1.18	1.44	1.51
175																					
176	EXPORTS																				
177	-------																				
178	PROPANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
179	BUTANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
180	MOGAS	0.98	0.00	0.00	0.00	2.66	2.61	2.58	2.45	2.36	2.32	2.28	2.34	2.26	2.20	1.72	2.07	2.02	2.02	1.93	1.94
181	KERO/TURBO	0.30	0.00	0.00	0.30	0.61	0.37	0.34	0.36	0.32	0.29	0.25	0.21	0.17	0.13	0.00	0.04	0.00	0.00	0.00	0.00
182	AUTO DIESEL	0.00	0.00	0.00	0.00	0.00	0.17	0.14	0.47	0.59	0.57	0.49	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
183	MARINE DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
184	HEAVY FUEL OIL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.44	0.20	1.03	0.84	0.63	0.93	0.94	0.84	0.50	0.40	0.00
185		------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
186	TOTAL	1.28	0.00	0.00	0.30	3.27	3.16	3.05	3.28	3.28	3.62	3.22	3.61	3.27	2.96	2.65	3.05	2.86	2.52	2.33	1.94
187																					

91-04-25 ALT CASE III -REFINING, MAXIMUM INVESTMENT, LARGER FCC PLUS CRUDE DEBOTTLENECK/EXPANSION
04:03 PM

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
CRUDE RUN																				
BCF 26	7.42	0.00	7.89	7.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BCF 17	0.00	5.55	0.00	0.00	10.07	10.07	12.40	10.19	7.10	7.15	10.71	12.14	12.36	12.14	14.13	11.29	10.61	7.40	5.41	5.33
ISTHMUS	0.00	0.00	0.00	0.00	0.00	0.00	0.61	2.17	7.89	6.81	0.87	5.99	5.77	5.99	3.97	6.84	7.53	4.34	1.40	2.43
MAYA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FORCADOS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ORIENTE	0.00	0.00	0.00	0.00	8.07	8.07	5.12	5.79	3.19	4.21	6.56	0.00	0.00	0.00	0.00	0.00	0.00	6.43	11.38	10.42
TOT WHOLE CRUDE	7.42	5.55	7.89	7.41	18.14	18.14	18.12	18.14	18.18	18.17	18.14	18.13	18.12	18.13	18.10	18.13	18.14	18.17	18.19	18.19
SPIKES RUN																				
BUTANE	0.10	0.11	0.11	0.11	0.10	0.10	0.12	0.10	0.07	0.07	0.11	0.12	0.12	0.12	0.14	0.11	0.11	0.07	0.05	0.05
NAPHTHA	1.73	2.64	1.64	1.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
KERO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GAS OIL	1.31	2.44	1.69	2.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL SPIKES	3.15	5.19	3.44	4.16	0.10	0.10	0.12	0.10	0.07	0.07	0.11	0.12	0.12	0.12	0.14	0.11	0.11	0.07	0.05	0.05
TOT RUN TO STILL	10.57	10.74	11.33	11.57	18.24	18.24	18.25	18.24	18.25	18.24	18.24	18.25	18.24	18.25	18.24	18.24	18.25	18.25	18.24	18.24
CAPACITY	12.96	12.96	12.96	12.96	18.25	18.25	18.25	18.25	18.25	18.25	18.25	18.25	18.25	18.25	18.25	18.25	18.25	18.25	18.25	18.25
UTILIZATION	81.5%	82.9%	87.4%	89.3%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	100.0%
FCC CAP MBSD																				

PRODUCTION	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
PROPANE	0.05	0.03	0.06	0.06	0.12	0.13	0.14	0.14	0.15	0.16	0.17	0.17	0.18	0.19	0.11	0.13	0.14	0.15	0.15	0.16
BUTANE	0.31	0.24	0.32	0.32	0.25	0.25	0.31	0.26	0.23	0.22	0.27	0.34	0.34	0.33	0.37	0.32	0.31	0.21	0.15	0.15
MOGAS	1.85	1.93	1.81	1.77	4.21	4.21	4.05	4.31	4.85	4.80	4.20	4.33	4.31	4.34	4.07	4.46	4.55	4.65	4.67	4.73
KERO/TURBO	1.56	1.39	1.68	1.73	2.28	2.28	2.04	2.10	2.17	2.25	2.32	1.81	1.65	1.64	1.56	1.66	1.66	2.41	2.82	2.76
AUTO DIESEL	1.35	1.51	1.65	2.14	2.12	2.11	1.71	2.24	2.97	2.87	1.81	1.93	2.06	2.11	2.15	2.31	2.48	2.54	2.60	2.67
MARINE DIESEL	0.35	0.36	0.38	0.41	0.42	0.43	0.44	0.45	0.46	0.47	0.48	0.49	0.51	0.52	-0.00	0.54	0.56	0.57	0.59	0.60
HEAVY FUEL OIL	4.55	4.71	4.85	4.56	8.18	8.18	8.95	8.08	6.69	6.78	8.38	8.54	8.58	8.49	9.32	8.14	7.86	7.02	6.57	6.48
ASPHALT	0.11	0.12	0.12	0.13	0.14	0.15	0.16	0.16	0.17	0.18	0.20	0.21	0.22	0.23	0.25	0.26	0.28	0.29	0.31	0.33
TOTAL	10.13	10.29	10.88	11.12	17.72	17.73	17.78	17.75	17.70	17.73	17.83	17.82	17.85	17.86	17.83	17.82	17.83	17.86	17.87	17.88

234																				
235	YIELDS																			
236	------																			
237	PROPANE	0.5%	0.3%	0.5%	0.5%	0.7%	0.7%	0.7%	0.8%	0.8%	0.9%	0.9%	1.0%	1.0%	1.1%	0.6%	0.7%	0.8%	0.8%	0.8%	0.9%
238	BUTANE	2.9%	2.2%	2.9%	2.8%	1.4%	1.4%	1.7%	1.4%	1.2%	1.2%	1.5%	1.8%	1.9%	1.8%	2.0%	1.8%	1.7%	1.2%	0.8%	0.8%
239	MOGAS	17.5%	17.9%	16.0%	15.3%	23.1%	23.1%	22.2%	23.6%	26.6%	26.3%	23.0%	23.8%	23.6%	23.8%	22.3%	24.4%	24.9%	25.5%	25.6%	25.9%
240	KERO/TURBO	14.8%	12.9%	14.8%	14.9%	12.5%	12.5%	11.2%	11.5%	11.9%	12.3%	12.7%	9.9%	9.0%	9.0%	8.5%	9.1%	9.1%	13.2%	15.5%	15.1%
241	AUTO DIESEL	12.8%	14.1%	14.6%	16.5%	11.6%	11.5%	9.4%	12.3%	16.3%	15.7%	9.9%	10.6%	11.3%	11.5%	11.8%	12.6%	13.6%	13.9%	14.3%	14.7%
242	MARINE DIESEL	3.3%	3.4%	3.4%	3.5%	2.3%	2.4%	2.4%	2.5%	2.5%	2.6%	2.6%	2.7%	2.8%	2.8%	-0.0%	3.0%	3.1%	3.1%	3.2%	3.3%
243	HEAVY FUEL OIL	43.1%	43.8%	42.8%	39.4%	44.9%	44.8%	49.0%	44.3%	36.7%	37.2%	46.0%	46.8%	47.1%	46.6%	51.1%	44.6%	43.1%	38.5%	36.0%	35.5%
244	ASPHALT	1.0%	1.1%	1.1%	1.1%	0.8%	0.8%	0.9%	0.9%	1.0%	1.0%	1.1%	1.1%	1.2%	1.3%	1.4%	1.4%	1.5%	1.6%	1.7%	1.8%
245		------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
246	TOTAL RECOVERY	95.8%	95.8%	96.0%	96.1%	97.2%	97.2%	97.4%	97.3%	97.0%	97.2%	97.7%	97.7%	97.8%	97.9%	97.7%	97.7%	97.7%	97.9%	98.0%	98.0%
247																					
248	91-04-25																				
249	04:03 PM																				
250	IMPORTS	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
251	-------	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
252	PROPANE	0.05	0.08	0.06	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.08	0.09	0.09	0.10	0.11
253	BUTANE	0.11	0.20	0.14	0.16	0.26	0.28	0.25	0.32	0.39	0.42	0.41	0.38	0.41	0.45	0.46	0.55	0.60	0.74	0.86	0.91
254	MOGAS	0.22	0.20	0.38	0.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
255	KERO/TURBO	0.11	0.34	0.11	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.59	0.84	0.93	1.10	1.10	1.19	0.53	0.23	0.40
256	AUTO DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
257	MARINE DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.53	0.00	0.00	0.00	0.00	0.00
258	HEAVY FUEL OIL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
259		------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
260	TOTAL	0.49	0.82	0.69	0.83	0.26	0.29	0.26	0.33	0.39	0.43	0.42	0.97	1.25	1.38	2.19	1.73	1.88	1.37	1.18	1.41
261																					
262	EXPORTS																				
263	-------																				
264	PROPANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
265	BUTANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
266	MOGAS	0.00	0.00	0.00	0.00	1.88	1.81	1.58	1.77	2.23	2.10	1.42	1.47	1.36	1.30	0.95	1.23	1.23	1.23	1.15	1.10
267	KERO/TURBO	0.00	0.00	0.00	0.00	0.37	0.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
268	AUTO DIESEL	0.00	0.00	0.00	0.00	0.43	0.42	0.00	0.62	1.28	1.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
269	MARINE DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
270	HEAVY FUEL OIL	0.00	0.00	0.00	0.00	3.08	3.05	3.62	3.34	2.07	2.78	4.27	5.07	5.02	4.76	5.42	4.87	4.51	3.48	2.83	2.57
271		------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
272	TOTAL	0.00	0.00	0.00	0.00	5.77	5.60	5.20	5.73	5.58	6.05	5.69	6.56	6.38	6.07	6.37	6.10	5.74	4.71	3.98	3.67
273																					
274	----------																				
275																					

277 INTERNATIONAL CRUDE AND PRODUCT PRICES, $/BBL

278 ----------

279 91-04-25	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
280 04:03 PM	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
281 BCF 24	20.28	17.20	15.24	15.71	16.31	17.15	18.04	18.95	19.91	20.86	20.72	20.59	20.52	20.45	20.31	20.38	20.38	20.45	20.52	20.59
282 BCF 17	17.50	14.77	13.16	13.63	14.25	14.95	15.71	16.51	17.36	18.21	18.03	17.84	17.72	17.60	17.41	17.54	17.60	17.74	17.87	18.00
283 ISTHMUS	23.43	19.86	17.60	18.09	18.72	19.67	20.67	21.70	22.78	23.91	23.84	23.77	23.70	23.63	23.56	23.56	23.56	23.56	23.56	23.56
284 MAYA	19.64	16.66	14.81	15.29	15.90	16.70	17.56	18.46	19.37	20.29	20.14	19.98	19.90	19.82	19.67	19.75	19.77	19.86	19.95	20.04
285 FORCADOS	25.46	21.70	19.33	19.89	20.59	21.62	22.72	23.80	24.95	26.15	26.08	26.00	25.93	25.85	25.78	25.78	25.78	25.78	25.78	25.78
286 ORIENTE	22.81	19.17	16.88	17.41	18.08	19.07	20.12	21.17	22.28	23.44	23.37	23.30	23.22	23.15	23.08	23.08	23.08	23.08	23.08	23.08
287	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
288 SPIKES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
289 ------	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
290 BUTANE	20.72	17.49	15.58	16.11	16.82	17.62	18.49	19.43	20.43	21.43	21.21	20.99	20.85	20.71	20.49	20.64	20.71	20.87	21.03	21.18
291 NAPHTHA	26.40	22.12	19.58	20.30	21.23	22.30	23.45	24.69	26.02	27.34	27.05	26.76	26.57	26.39	26.09	26.30	26.39	26.60	26.81	27.01
292 KERO	32.63	27.50	24.47	25.32	26.44	27.72	29.09	30.58	32.18	33.77	33.41	33.06	32.84	32.62	32.26	32.51	32.63	32.87	33.12	33.37
293 GAS OIL	29.00	24.13	21.25	22.06	23.13	24.33	25.64	27.05	28.57	30.07	29.74	29.40	29.19	28.98	28.65	28.88	28.99	29.23	29.46	29.70
294	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
295	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
296 PRODUCT IMPORTS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
297 ----------	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
298 PROPANE	20.41	17.94	16.54	17.12	17.83	18.62	19.47	20.22	21.03	21.86	21.66	21.48	21.37	21.25	21.08	21.20	21.26	21.38	21.51	21.63
299 BUTANE	25.02	21.96	20.19	20.89	21.76	22.73	23.78	24.72	25.72	26.72	26.50	26.28	26.14	26.00	25.78	25.93	26.00	26.16	26.32	26.47
300 MOGAS,LEADED I	31.43	26.34	23.32	24.17	25.28	26.55	27.92	29.39	30.98	32.56	32.21	31.86	31.64	31.42	31.07	31.31	31.43	31.67	31.92	32.17
301 MOGAS,LEADED II	32.94	27.88	24.92	25.81	26.98	28.29	29.71	31.19	32.78	34.36	34.01	33.66	33.44	33.21	32.86	33.11	33.22	33.47	33.71	33.96
302 MOGAS, UNLEAD I	31.43	26.34	23.32	24.17	25.28	26.55	27.92	29.39	30.98	32.56	32.21	31.86	31.64	31.42	31.07	31.31	31.43	31.67	31.92	32.17
303 MOGAS, UNLEAD II	32.94	27.88	24.92	25.81	26.98	28.29	29.71	31.19	32.78	34.36	34.01	33.66	33.44	33.21	32.86	33.11	33.22	33.47	33.71	33.96
304 KERO/TURBO	33.86	28.77	25.78	26.68	27.85	29.17	30.60	32.08	33.68	35.27	34.92	34.56	34.34	34.12	33.76	34.01	34.13	34.37	34.62	34.87
305 AUTO DIESEL	31.32	26.50	23.66	24.51	25.62	26.87	28.22	29.63	31.15	32.65	32.32	31.99	31.78	31.56	31.23	31.46	31.57	31.81	32.04	32.28
306 MARINE DIESEL	30.30	25.63	22.89	23.71	24.79	26.00	27.30	28.67	30.13	31.59	31.27	30.94	30.74	30.53	30.21	30.44	30.54	30.77	31.00	31.22
307 HEAVY FUEL OIL	16.53	14.02	12.56	13.01	13.59	14.25	14.96	15.69	16.48	17.26	17.09	16.92	16.81	16.70	16.52	16.65	16.70	16.82	16.95	17.07
308 ASPHALT	26.18	23.43	21.81	22.31	22.95	23.67	24.46	25.26	26.13	26.99	26.80	26.61	26.49	26.37	26.18	26.31	26.37	26.51	26.64	26.78
309	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
310	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
311 PRODUCT EXPORTS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
312 ----------	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
313 PROPANE	11.61	8.88	7.21	7.50	7.92	8.42	8.96	9.72	10.53	11.33	11.15	10.97	10.86	10.75	10.57	10.69	10.75	10.88	11.00	11.13
314 BUTANE	14.82	11.43	9.37	9.74	10.28	10.91	11.60	12.54	13.54	14.54	14.32	14.10	13.96	13.82	13.60	13.75	13.82	13.98	14.16	14.29
315 MOGAS	30.68	25.56	22.52	23.35	24.44	25.68	27.02	28.50	30.09	31.66	31.31	30.96	30.74	30.52	30.17	30.41	30.53	30.77	31.02	31.27
316 KERO/TURBO	30.96	25.79	22.73	23.56	24.66	25.91	27.26	28.75	30.35	31.96	31.58	31.23	31.01	30.79	30.43	30.68	30.80	31.06	31.29	31.56
317 AUTO DIESEL	29.33	24.45	21.55	22.34	23.38	24.57	25.85	27.26	28.78	30.28	29.95	29.61	29.40	29.19	28.86	29.09	29.20	29.43	29.67	29.90
318 MARINE DIESEL	28.36	23.63	20.83	21.59	22.60	23.75	24.99	26.35	27.82	29.27	28.95	28.62	28.42	28.22	27.89	28.12	28.22	28.45	28.68	28.91
319 HVY FUEL OIL I	15.13	12.59	11.08	11.49	12.02	12.64	13.30	14.03	14.82	[illegible]	15.43	15.26	15.15	15.04	14.86	14.98	15.04	15.16	15.29	15.41
320 HVY FUEL OIL II	16.06	13.55	12.06	12.50	13.07	13.71	14.41	15.14	15.93	[illegible]	16.54	16.36	16.25	16.14	15.97	16.09	16.15	16.27	16.39	16.52

91-04-25
04:03 PM

BASE CASE COSTS

HANDLING, EVAP, SPILLAGE LOSSES

LPG	0.0%
MOGAS	0.8%
OTHERS	0.4%

PRODUCT FOB COST $/BBL

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
PROPANE	2.1	2.0	1.9	2.1	2.3	2.5	2.7	3.0	3.2	3.5	3.7	3.8	4.0	4.2	4.4	4.6	4.8	5.1	5.4	5.7
BUTANE	10.4	9.6	9.3	10.1	11.0	12.1	13.3	14.5	15.9	17.3	18.0	18.7	19.6	20.6	21.3	22.5	23.7	25.0	26.4	27.9
MOGAS, LEADED	29.5	22.6	18.1	16.5	14.8	12.8	10.4	7.5	4.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MOGAS, UNLEADED	3.3	5.7	7.7	11.0	14.8	19.2	24.3	30.1	36.8	44.3	45.1	46.0	47.0	48.1	49.0	50.8	52.6	54.6	56.6	58.8
KERO/TURBO	28.5	25.0	23.1	24.7	26.6	28.8	31.3	33.9	36.8	39.8	40.7	41.7	42.9	44.0	45.1	47.0	48.8	50.9	53.0	55.3
AUTO DIESEL	42.4	40.2	39.3	52.8	43.5	45.4	48.5	48.2	52.8	55.7	58.7	61.9	65.7	66.7	67.6	72.9	78.5	81.1	83.8	86.6
MARINE DIESEL	10.5	9.4	8.8	9.7	10.5	11.2	12.0	12.9	13.9	14.9	15.1	15.3	15.6	15.9	16.1	16.6	17.1	17.7	18.3	19.0
HEAVY FUEL OIL	75.6	66.3	61.1	59.6	69.6	73.4	80.0	74.7	76.5	69.3	70.6	58.8	60.2	62.6	64.6	54.7	56.2	59.8	63.6	67.0
ASPHALT	2.9	2.7	2.7	2.9	3.2	3.5	3.8	4.2	4.6	5.0	5.3	5.5	5.9	6.2	6.5	6.9	7.4	7.8	8.3	8.9
TOTAL	205.1	183.4	172.1	189.3	196.3	209.0	226.3	229.0	244.5	249.8	257.2	251.9	260.8	268.1	274.5	276.1	289.0	302.0	315.5	329.2
TERMINAL OP.COSTS																				
FIXED MM$/YR	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74
VARIABLE $/BBL	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
TOT OPCOS MM$/YR	6.26	6.29	6.31	6.33	6.35	6.35	6.37	6.34	6.35	6.32	6.34	6.32	6.34	6.36	6.39	6.37	6.39	6.42	6.45	6.47
CAPITAL -PROJECT	0.00	2.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-SUSTAINING	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
TOTAL COST CF	211.8	192.7	178.8	196.0	203.1	215.8	233.1	235.7	251.2	256.5	263.9	258.6	267.6	274.9	281.3	282.8	295.8	308.8	322.4	336.0

91-04-25 CASHFLOWS -- REFINING ALTERNATIVE 1
04:03 PM

FEEDSTOCK COSTS	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
BCF 24	118.0	0.0	0.0	100.0	136.1	144.0	157.2	147.5	108.9	103.8	144.0	121.7	114.8	0.0	0.0	4.2	87.6	126.0	134.1	131.3
BCF 17	0.0	38.3	36.1	?.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	77.1	74.8	69.4	10.2	0.0	0.0	0.0
ISTHMUS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	77.1	61.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.6
MAYA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FORCADOS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ORIENTE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL CRUDE	118.0	38.3	36.1	100.0	136.1	144.0	157.2	147.5	186.0	165.1	144.0	121.7	114.8	77.1	74.8	73.6	97.8	126.0	134.1	150.9
SPIKES																				
BUTANE	1.8	1.1	1.0	1.5	1.8	1.9	2.1	2.1	1.5	1.6	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.3	2.3	2.2
NAPHTHA	53.9	32.4	29.5	16.1	20.5	21.7	34.7	41.0	30.0	40.3	49.2	53.8	55.0	72.2	70.9	69.7	56.1	46.5	45.8	44.9
KERO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GAS OIL	36.0	56.9	54.1	51.0	30.8	32.3	33.7	37.6	26.8	39.4	55.2	65.9	73.1	92.0	96.0	100.7	95.4	92.0	87.0	67.0
TOTAL SPIKES	91.7	90.4	84.5	68.5	53.1	55.9	70.5	80.7	58.3	81.4	106.7	121.8	130.1	166.6	166.9	172.5	153.6	140.7	135.1	114.0
TOTAL FEEDSTOCK	209.6	128.6	120.7	168.5	189.2	200.0	227.7	228.2	244.3	246.4	250.7	243.5	244.9	243.5	241.7	246.0	251.4	266.8	269.2	264.9
IMPORT COSTS																				
PROPANE	1.0	1.6	1.6	1.4	1.4	1.4	1.5	1.7	1.8	2.2	2.5	2.7	2.8	3.4	3.6	3.8	3.8	4.0	4.3	4.4
BUTANE	3.7	6.6	6.4	5.0	4.7	5.4	5.5	6.9	10.0	11.0	10.0	11.1	12.1	14.4	15.3	16.6	16.6	17.3	18.4	20.3
NOGAS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
KERO/TURBO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AUTO DIESEL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MARINE DIESEL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.6	16.9
HEAVY FUEL OIL	17.6	35.9	32.2	8.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.2	3.5	7.7	0.4	7.6	0.0	0.0	0.0
TOTAL	22.2	44.1	40.2	14.7	6.1	6.8	7.0	8.6	11.8	13.2	12.4	13.8	20.1	21.3	26.6	20.7	28.0	21.3	27.4	41.6

397 EXPORT REVENUES																				
398 ----------																				
399 PROPANE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
400 BUTANE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
401 MOGAS	30.0	0.0	0.0	0.0	7.9	7.8	18.0	18.8	17.8	18.6	16.9	16.2	14.6	15.4	13.0	10.3	6.1	1.1	0.0	1.7
402 KERO/TURBO	9.3	0.0	0.0	7.0	5.4	4.9	7.1	6.0	11.9	10.3	7.1	7.5	7.8	0.0	0.0	0.0	4.8	6.6	4.0	0.0
403 AUTO DIESEL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
404 MARINE DIESEL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
405 HEAVY FUEL OIL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
406	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
407 TOTAL	39.3	0.0	0.0	7.0	13.3	12.7	25.1	24.8	29.6	28.9	24.1	23.7	22.4	15.4	13.0	10.3	11.0	7.7	4.0	1.7
408																				
409																				
410 TOT CRUDE+PROD	192.6	172.7	160.9	176.3	181.9	194.1	209.6	211.9	226.4	230.7	239.0	233.6	242.6	249.5	255.4	256.6	268.5	280.3	292.6	304.8
411 REFINERY OP.COSTS																				
412 FIXED MM$/YR	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95	10.95
413 VARIABLE $/BBL	0.47	0.47	0.47	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22
414																				
415 TOT OPCOS MM$/YR	15.3	14.0	14.2	13.1	13.3	13.3	13.5	13.4	13.4	13.2	13.3	13.2	13.2	13.2	13.2	13.2	13.2	13.4	13.6	13.6
416																				
417 CAPITAL-PROJECT	0.0	9.1	6.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
418 -SUSTAINING	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
419 TOTAL COST CF	210.4	198.3	183.9	191.9	197.7	209.9	225.6	227.8	242.3	246.5	254.8	249.3	258.3	265.2	271.1	272.2	284.2	296.2	308.5	320.7
420 SAVING VS. TERM	1.4	-5.6	-5.2	4.2	5.4	5.9	7.5	7.9	9.0	10.0	9.1	9.3	9.2	9.7	10.2	10.7	11.6	12.6	13.9	15.3
421																				
422 INTRNL RATE RTRN	367.4%																			
423 NET PRES VALUE @	15.0%	24.5 US$million																		

91-04-25
04:03 PM

CASHFLOWS -- REFINING ALTERNATIVE II

FEEDSTOCK COSTS	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
BCF 24	118.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BCF 17	0.0	38.3	36.1	0.0	72.4	80.7	84.8	76.6	72.2	75.7	74.9	88.5	83.1	80.3	119.2	72.9	73.2	68.2	74.3	65.6
ISTMUS	0.0	0.0	0.0	0.0	85.3	132.1	138.8	172.7	199.5	209.4	208.8	176.6	186.7	191.1	95.6	206.3	206.3	213.7	206.3	218.4
MAYA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FORCADOS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ORIENTE	0.0	0.0	0.0	0.0	40.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL CRUDE	118.0	38.3	36.1	100.0	198.5	212.8	223.6	249.3	271.6	285.1	283.7	265.1	269.8	271.4	214.8	279.2	279.5	281.9	280.6	284.0
SPIKES																				
BUTANE	1.8	1.1	1.0	1.5	1.0	1.0	1.1	0.9	0.8	0.9	0.9	1.1	1.0	1.0	1.8	0.8	0.8	0.8	0.8	0.8
NAPHTHA	53.9	32.4	29.5	16.1	21.2	17.3	18.2	7.5	0.0	0.0	0.0	13.5	8.9	6.6	20.4	0.0	0.0	0.0	0.0	0.0
KERO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GAS OIL	36.0	56.9	54.1	51.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.7	0.0	0.0	0.0	0.0	0.0
TOTAL SPIKES	91.7	90.4	84.5	68.5	22.1	18.4	19.3	8.4	0.8	0.9	0.9	14.6	9.9	7.6	55.8	0.8	0.8	0.8	0.8	0.8
TOTAL FEEDSTOCK	209.6	128.6	120.7	168.5	220.6	231.2	242.9	257.7	272.5	286.0	284.6	279.8	279.7	279.0	270.7	280.0	280.3	282.7	281.4	284.8
IMPORT COSTS																				
PROPANE	1.0	1.6	1.6	1.4	0.2	0.2	0.4	0.4	0.5	0.7	0.9	1.2	1.3	1.6	2.4	1.9	2.1	2.3	2.7	2.8
BUTANE	3.7	6.6	6.4	5.0	6.7	7.3	8.2	10.0	11.7	13.0	13.7	13.6	14.8	15.8	15.0	18.4	19.5	21.0	22.2	24.0
MOGAS, LEADED	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
KERO/TURBO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	2.0	4.4	5.2
AUTO DIESEL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	7.3
MARINE DIESEL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	1.3	6.5	6.4	10.6	3.1
HEAVY FUEL OIL	17.6	35.9	32.2	8.4	5.1	5.5	8.6	2.8	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	22.2	44.1	40.2	14.7	12.0	13.0	17.2	13.3	15.3	13.7	14.7	14.8	16.1	17.3	18.6	21.6	28.6	31.7	40.0	42.4

461																					
462	EXPORT REVENUES																				
463	----------																				
464	PROPANE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
465	BUTANE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
466	MOGAS	30.0	0.0	0.0	0.0	65.0	67.1	69.6	69.9	71.1	73.5	71.5	72.3	69.6	67.3	51.8	63.1	61.7	62.1	59.8	60.7
467	KERO/TURBO	9.3	0.0	0.0	7.0	14.9	9.6	9.3	10.4	9.9	9.3	8.0	6.6	5.2	4.0	0.0	1.1	0.0	0.0	0.0	0.0
468	AUTO DIESEL	0.0	0.0	0.0	0.0	0.0	4.2	3.5	12.8	17.0	17.1	14.5	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
469	MARINE DIESEL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
470	HEAVY FUEL OIL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.3	3.3	16.9	13.7	10.1	14.9	15.1	13.6	8.1	6.5	0.0
471		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
472	TOTAL	39.3	0.0	0.0	7.0	80.0	81.0	82.4	93.1	97.9	107.3	97.4	96.7	88.5	81.5	66.7	79.3	75.3	70.3	66.3	60.7
473																					
474	CRUDE+PROD CST	192.6	172.7	160.9	176.3	152.6	163.2	177.7	177.9	189.8	192.4	201.9	197.8	207.3	214.9	222.5	222.3	233.7	244.1	255.1	266.5
475	REFINERY OP.COSTS																				
476	FIXED MM$/YR	10.95	10.95	10.95	10.95	15.20	15.20	15.20	15.20	15.20	15.20	15.20	15.20	15.20	15.20	15.20	15.20	15.20	15.20	15.20	15.20
477	VARIABLE $/BBL	0.47	0.47	0.47	0.47	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
478																					
479	TOT OPCOS MM$/YR	15.3	14.0	14.2	15.4	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3
480																					
481	CAPITAL-PROJECT	3.0	19.9	61.3	46.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
482	-SUSTAINING	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
483	TOTAL COST	213.4	209.1	238.9	240.5	174.5	185.1	199.5	199.7	211.7	215.0	224.5	220.5	230.0	237.5	245.2	245.0	256.3	266.7	277.8	289.2
484	SAVING VS. TERM	-1.6	-16.5	-60.1	-44.5	28.6	30.7	33.5	36.0	39.6	41.5	39.4	38.1	37.6	37.4	36.1	37.9	39.5	42.0	44.6	46.9
485	INTRNL RATE RTRN	23.0%																			
486	NPV @	15.0%	43.1 US$ millions @ Jan 1991																		
487																					
488	SAVING VS. REF I	-3.0	-10.8	-54.9	-48.6	23.2	24.9	26.0	28.1	30.6	31.4	30.3	28.8	28.4	27.7	25.9	27.2	27.9	29.5	30.7	31.6
489	INTRNL RATE RTRN	19.0%																			
490	NPV @	15.0%	18.6 US$ millions @ Jan 1991																		

Corporate and Financial Planning Analysis
Documentation Relating to the Financial Model

General

1. The financial models are linked to the refinery planning models and are designed to provide a more detailed analysis of certain issues, particularly those relating to finance and corporate planning.

2. The models are set up in LOTUS 2.2 and are named FINREF1.WK1 and FINREF2.WK1, in accordance with refinery configuration cases I and II. Tables 1 and 2 provide sample outputs.

3. Specific links have been established between the two FINREF spreadsheets and named ranges in REFPLAN.WK1 and DEMAND.WK1. The refinery planning models provide a range of base information for the financial analysis.

4. Historical financial data provide base input for the financial statements in two main areas: Group 1: other operating income; interest income and expenditure; investments in subsidiaries; fixed assets in service and accumulated depreciation; long-term debt and associated interest; paid-in capital; retained earnings. And Group 2: cash in bank; receivables and payables; inventories.

5. The items in Group 1 are projected to continue at their current levels, with adjustments for changes due to the proposed operations. Group 2 items are for reference only, and are not included in the forecast. All projections are for 1990.

Specific Model Information

6. Linkages between the refinery planning model and various components of the forecast are shown diagrammatically in Figure 1. The variables include the market forecast for Petrojam, crude and product prices, Petrojam revenues, refining costs, capital costs, depreciation, the financing structure, and tax-related allowances. The financial forecasts include income statements (revenues, operating income, interest income, taxes, dividends, net profit, etc.), and balance sheets (receivables, inventories, payables, interest on current debt, etc.).

Financial Analysis of Foreign Partner

7. The model assumes a repatriation of dividends, in proportion to the foreign partner's ownership share.

Non-Petrojam Market Forecast/Financial Analysis

8. The demand forecast includes marketing companies and major consumers. Importation costs are based on volumes in the demand forecast and prices, as for Petrojam. Revenues are calculated on the basis of the demand forecast and refinery gate prices, as for Petrojam. Operating cost for terminally is input as a unit cost and can be varied.

Analysis of Foreign Exchange Cash Flows

9. This analysis is tied to Petrojam's ownership structure. Information on sources and applications of funds comes from the detailed financial summary of Petrojam and marketing companies. The analysis of dividend repatriation assumes that the foreign partner will repatriate its share of the profit and dividends in full.

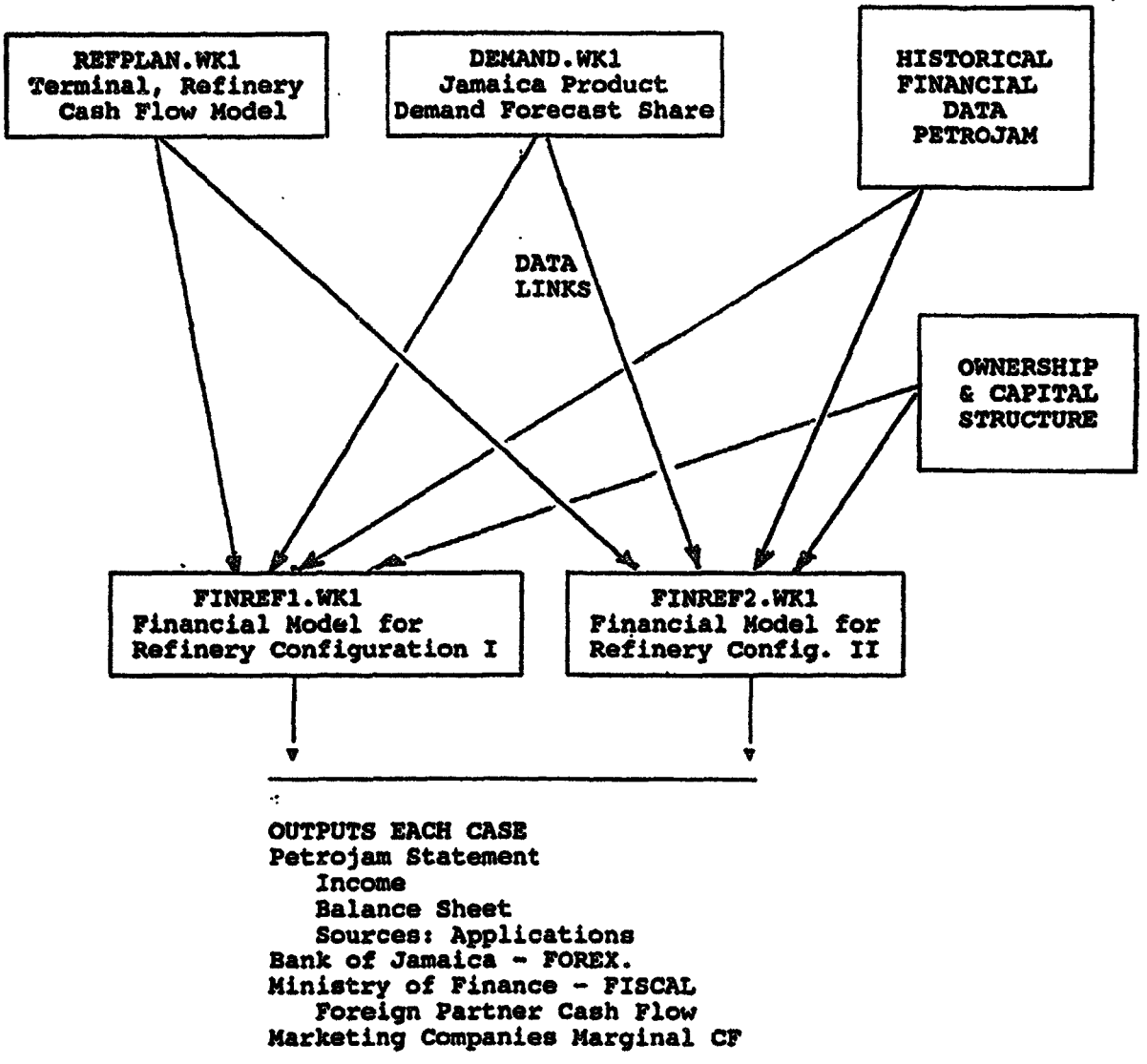
Analysis of Fiscal Cash Flows

10. This analysis is also tied to Petrojam's ownership structure. With regard to import duties, the assumption is that marketing companies will no longer have to pay import duty on products, and that all importers will be similarly regulated. Income tax is extracted from financial projections of relevant entities. PCJ's share of Petrojam profits and dividends is considered as cash inflow to the Jamaican Ministry of Finance.

11. A complete set of four financial analysis spreadsheets are attached for the following cases:

1.0.3	Business-as-Usual, Base margin, reduced demand, reduced price, 0% foreign ownership.
1.3.1	Business-as-Usual, Base margin, reduced demand, reduced price, 75% foreign ownership.
2.0.3	Cat Cracking, Base margin, reduced demand, reduced price, 0% foreign ownership.
2.3.1	Cat Cracking, Base margin, reduced demand, reduced price, 75% foreign ownership.

FIGURE 7.1: JAMAICA ESSIP STUDY - SCHEMATIC OF PETROLEUM SECTOR FINANCIAL MODELLING SYSTEM, INCLUDING LINKAGES WITH ECONOMIC MODELS



1 08/04/91 10:51 AM FILE = FINREF 1.0.3, BASE MARGIN, REDUCED DEMAND, PRICE, OXFOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE I - BUSINESS AS USUAL
4

5	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
6	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
7 MARKET FORECAST FOR PETROJAM - millions of barrels																					
8 **********																					
9																					
10 LOCAL DEMAND ON REFINERY																					
11 ----------																					
12 PROPANE	0.10	0.11	0.11	0.12	0.13	0.13	0.14	0.15	0.15	0.16	0.17	0.18	0.19	0.20	0.21	0.22	0.23	0.24	0.25	0.26	
13 BUTANE	0.42	0.44	0.46	0.48	0.51	0.53	0.56	0.59	0.62	0.65	0.68	0.71	0.75	0.79	0.83	0.87	0.91	0.96	1.00	1.05	
14 MOGAS, LEADED	0.93	0.85	0.77	0.68	0.58	0.48	0.37	0.25	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
15 MOGAS, UNLEADED	0.10	0.21	0.33	0.45	0.58	0.72	0.86	1.02	1.18	1.35	1.39	1.43	1.47	1.52	1.56	1.61	1.66	1.71	1.76	1.81	
16 KERO/TURBO	0.84	0.86	0.89	0.92	0.95	0.98	1.02	1.05	1.09	1.12	1.16	1.20	1.24	1.29	1.33	1.38	1.42	1.47	1.53	1.58	
17 AUTO DIESEL	1.35	1.51	1.65	2.14	1.69	1.68	1.71	1.62	1.69	1.70	1.81	1.93	2.06	2.11	2.15	2.31	2.48	2.54	2.60	2.67	
18 MARINE DIESEL	0.35	0.36	0.38	0.41	0.42	0.43	0.44	0.45	0.46	0.47	0.48	0.49	0.51	0.52	0.53	0.54	0.56	0.57	0.59	0.60	
19 HEAVY FUEL OIL	4.55	4.71	4.85	4.56	5.10	5.13	5.32	4.74	4.62	4.00	4.11	3.46	3.57	3.73	3.90	3.27	3.35	3.54	3.74	3.91	
20 ASPHALT	0.11	0.12	0.12	0.13	0.14	0.15	0.16	0.16	0.17	0.18	0.20	0.21	0.22	0.23	0.25	0.26	0.28	0.29	0.31	0.33	
21	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
22	8.75	9.18	9.58	9.90	10.10	10.24	10.58	10.03	10.11	9.63	10.00	9.62	10.01	10.38	10.76	10.46	10.88	11.33	11.78	12.23	
23 EXPORTS																					
24 ----------																					
25 PROPANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
26 BUTANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
27 MOGAS	0.98	0.00	0.00	0.00	0.32	0.30	0.67	0.66	0.59	0.59	0.54	0.52	0.47	0.50	0.43	0.34	0.20	0.04	0.00	0.05	
28 KERO/TURBO	0.30	0.00	0.00	0.30	0.22	0.19	0.26	0.21	0.39	0.32	0.23	0.24	0.25	0.00	0.00	0.00	0.16	0.21	0.13	0.00	
29 AUTO DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
30 MARINE DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
31 HEAVY FUEL OIL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
32	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
33	1.28	0.00	0.00	0.30	0.54	0.49	0.93	0.87	0.98	0.91	0.77	0.76	0.73	0.50	0.43	0.34	0.36	0.25	0.13	0.05	

1 08/04/91 10:25 AM FILE = FINREF 1.0.3, BASE MARGIN, REDUCED DEMAND, PRICE, 0%FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE I - BUSINESS AS USUAL
35 Jamaican Bauxite/Alumina Industry
36 Propane)LPG PART OF EXPORTS ABOVE
37 Butane)
38 Gasoline (Mogas, Leaded)
39 Kero/Turbo
40 ADO (Auto Diesel)
41 Marine Diesel
42 Fuel oil

44		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
46	TOTAL DEMAND	10.03	9.18	9.58	10.19	10.64	10.73	11.51	10.90	11.09	10.54	10.77	10.38	10.73	10.88	11.19	10.80	11.24	11.57	11.91	12.28

		1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
51	JAMAICAN IMPORTS																					
52	----------																					
53	PROPANE		0.05	0.09	0.09	0.08	0.08	0.08	0.08	0.08	0.09	0.10	0.11	0.12	0.13	0.16	0.17	0.18	0.18	0.19	0.20	0.20
54	BUTANE		0.15	0.30	0.32	0.24	0.22	0.26	0.23	0.28	0.39	0.41	0.38	0.42	0.46	0.55	0.59	0.64	0.64	0.66	0.70	0.77
55	MOGAS		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
56	KERO/TURBO		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
57	AUTO DIESEL		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
58	MARINE DIESEL		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.54
59	HEAVY FUEL OIL		1.07	2.56	2.57	0.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.31	0.21	0.46	0.02	0.46	0.00	0.00	0.00
61			1.26	2.95	2.98	0.96	0.29	0.31	0.31	0.36	0.47	0.51	0.49	0.55	0.90	0.92	1.23	0.84	1.27	0.85	1.05	1.51

1 08/04/91 10:25 AM FILE = FINREF 1.0.3, BASE MARGIN, REDUCED DEMAND, PRICE, OXFOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE I - BUSINESS AS USUAL

64 CRUDE RUN - millions of barrels
65 ----------

66 BCF24	5.82	0.00	0.00	6.37	8.34	8.40	8.72	7.79	5.47	4.97	6.95	5.91	5.60	0.00	0.00	0.20	4.30	6.16	6.53	6.38
67 BCF17	0.00	2.59	2.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.38	4.30	3.96	0.58	0.00	0.00	0.00
68 ISTHMUS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.38	2.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.83
69 MAYA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
70 FORCADOS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
71 ORIENTE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
72																				
73 TOTAL WHOLE CRUDE	5.82	2.59	2.74	6.37	8.34	8.40	8.72	7.79	8.85	7.54	6.95	5.91	5.60	4.38	4.30	4.16	4.88	6.16	6.53	7.21
74																				
75																				

76 SPIKES RUN - millions of barrels
77 ----------

78 BUTANE	0.09	0.06	0.07	0.09	0.11	0.11	0.11	0.11	0.07	0.08	0.11	0.10	0.10	0.10	0.10	0.10	0.10	0.11	0.11	0.10
79 NAPTHA	2.04	1.46	1.50	0.79	0.97	0.97	1.48	1.66	1.15	1.47	1.82	2.01	2.07	2.74	2.72	2.65	2.12	1.75	1.71	1.66
80 KERO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
81 GAS OIL	1.24	2.36	2.54	2.31	1.33	1.33	1.31	1.39	0.94	1.31	1.86	2.24	2.50	3.18	3.28	3.49	3.29	3.15	2.95	2.26
82																				
83 TOTAL SPIKES	3.37	3.88	4.11	3.19	2.41	2.41	2.91	3.16	2.16	2.86	3.78	4.35	4.67	6.02	6.10	6.24	5.52	5.00	4.77	4.02
84																				
85																				
86																				

1 08/04/91 10:25 AM FILE = FINREF 1.0.3, BASE MARGIN, REDUCED DEMAND, PRICE, OILFOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE I - BUSINESS AS USUAL

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
90 CRUDE AND PRODUCT PRICES - US$/BBL																					
91 **************************																					
92																					
93 IMPORT PRODUCT PRICES (C&F)																					
94 -----------------------																					
95 PROPANE	20.41	17.94	16.54	17.12	17.83	18.62	19.47	20.22	21.03	21.86	21.66	21.48	21.37	21.25	21.08	21.20	21.26	21.38	21.51	21.63	
96 BUTANE	25.02	21.94	20.19	20.89	21.76	22.73	23.78	24.72	25.72	26.72	26.50	26.28	26.14	26.00	25.78	25.93	26.00	26.16	26.32	26.47	
97 MOGAS	32.94	27.88	24.92	25.81	26.98	28.29	29.71	31.19	32.78	34.36	34.01	33.66	33.44	33.21	32.86	33.11	33.22	33.47	33.71	33.96	
98 KERO/TURBO	33.86	28.77	25.78	26.68	27.85	29.17	30.60	32.08	33.68	35.27	34.92	34.56	34.34	34.12	33.76	34.01	34.13	34.37	34.62	34.87	
99 AUTO DIESEL	31.32	26.50	23.66	24.51	25.62	26.87	28.22	29.63	31.15	32.65	32.32	31.99	31.78	31.56	31.23	31.46	31.57	31.81	32.04	32.28	
100 MARINE DIESEL	30.30	25.63	22.89	23.71	24.79	26.00	27.30	28.67	30.13	31.59	31.27	30.94	30.74	30.53	30.21	30.44	30.54	30.77	31.00	31.22	
101 HEAVY FUEL OIL	16.53	14.02	12.56	13.01	13.59	14.25	14.96	15.69	16.48	17.26	17.09	16.92	16.81	16.70	16.52	16.65	16.70	16.82	16.95	17.07	
102																					
103																					
104 EXPORT PRODUCT PRICES; BAUXITE/ALUMINA PRODUCT PRICES																					
105 ----------																					
106 PROPANE	11.61	8.88	7.21	7.50	7.92	8.42	8.96	9.72	10.53	11.33	11.15	10.97	10.86	10.75	10.57	10.69	10.75	10.88	11.00	11.13	
107 BUTANE	14.82	11.43	9.37	9.74	10.28	10.91	11.60	12.54	13.54	14.54	14.32	14.10	13.96	13.82	13.60	13.75	13.82	13.98	14.14	14.29	
108 MOGAS	30.68	25.56	22.52	23.35	24.44	25.68	27.02	28.50	30.09	31.66	31.31	30.96	30.74	30.52	30.17	30.41	30.53	30.77	31.02	31.27	
109 KERO/TURBO	30.94	25.79	22.73	23.56	24.66	25.91	27.26	28.75	30.35	31.94	31.58	31.23	31.01	30.79	30.43	30.68	30.80	31.04	31.29	31.54	
110 AUTO DIESEL	29.23	24.45	21.55	22.34	23.38	24.57	25.85	27.26	28.78	30.28	29.95	29.61	29.40	29.19	28.86	29.09	29.20	29.43	29.67	29.90	
111 MARINE DIESEL	28.36	23.63	20.83	21.59	22.60	23.75	24.99	26.35	27.82	29.27	28.95	28.62	28.42	28.22	27.89	28.12	28.22	28.45	28.68	28.91	
112 HEAVY FUEL OIL 1	15.13	12.59	11.08	11.49	12.02	12.64	13.30	14.03	14.82	15.60	15.43	15.26	15.15	15.04	14.86	14.98	15.04	15.16	15.29	15.41	
113 HEAVY FUEL OIL 2	16.06	13.55	12.06	12.50	13.07	13.71	14.41	15.14	15.93	16.71	16.54	16.36	16.25	16.14	15.97	16.09	16.15	16.27	16.39	16.52	
114																					
115																					
116 IMPORT PARITY FOR MOGAS																					
117 -----------------------																					
118 MOGAS, LEADED	31.43	26.34	23.32	24.17	25.28	26.55	27.92	29.39	30.98	32.56	32.21	31.86	31.64	31.42	31.07	31.31	31.43	31.67	31.92	32.17	
119 MOGAS, UNLEADED	31.43	26.34	23.32	24.17	25.28	26.55	27.92	29.39	30.98	32.56	32.21	31.86	31.64	31.42	31.07	31.31	31.43	31.67	31.92	32.17	
120																					
121 IMPORT PARITY FOR ASPHALT	26.18	23.43	21.81	22.31	22.95	23.67	24.46	25.26	26.13	26.99	26.80	26.61	26.49	26.37	26.18	26.31	26.37	26.51	26.64	26.78	
122 -----------------------																					

1 08/04/91 10:25 AM FILE = FINREF 1.0.3, BASE MARGIN, REDUCED DEMAND, PRICE, OXFOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE 1 - BUSINESS AS USUAL

		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
REFINERY GATE PRICE	ADD-ON	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
----------	TO CIF																				
PROPANE	2.37	22.78	20.32	18.92	19.49	20.20	20.99	21.84	22.60	23.41	24.21	24.03	23.85	23.74	23.63	23.45	23.57	23.63	23.76	23.88	24.01
BUTANE	2.37	27.39	24.31	22.56	23.26	24.13	25.11	26.15	27.09	28.10	29.09	28.87	28.65	28.51	28.37	28.15	28.30	28.38	28.53	28.69	28.86
MOGAS, LEADED	0.88	32.31	27.21	24.20	25.05	26.16	27.43	28.80	30.27	31.86	33.44	33.09	32.74	32.52	32.30	31.95	32.19	32.31	32.55	32.80	33.04
MOGAS, UNLEADED	0.88	32.32	27.22	24.20	25.05	26.17	27.43	28.80	30.28	31.87	33.44	33.09	32.74	32.52	32.30	31.95	32.19	32.31	32.55	32.80	33.05
KERO/TURBO	1.21	35.07	29.99	26.99	27.89	29.06	30.38	31.81	33.29	34.89	36.48	36.13	35.77	35.55	35.33	34.98	35.22	35.34	35.59	35.83	36.08
AUTO DIESEL	1.17	32.49	27.67	24.83	25.68	26.79	28.04	29.39	30.80	32.32	33.82	33.49	33.16	32.94	32.73	32.40	32.63	32.74	32.98	33.21	33.45
MARINE DIESEL	1.59	31.89	27.22	24.48	25.30	26.38	27.59	28.89	30.26	31.72	33.18	32.86	32.53	32.33	32.12	31.80	32.03	32.13	32.36	32.59	32.81
HEAVY FUEL OIL	1.56	18.08	15.58	14.11	14.56	15.15	15.81	16.52	17.25	18.04	18.82	18.45	18.48	18.37	18.26	18.08	18.20	18.26	18.38	18.50	18.63
ASPHALT	0.77	26.95	24.20	22.59	23.08	23.72	24.45	25.23	26.04	26.91	27.77	27.57	27.38	27.26	27.14	26.95	27.08	27.15	27.28	27.42	27.55
CRUDE																					

BCF24		20.28	17.20	15.24	15.71	16.31	17.15	18.04	18.95	19.91	20.86	20.72	20.59	20.52	20.45	20.31	20.38	20.38	20.45	20.52	20.59
BCF17		17.50	14.77	13.16	13.63	14.25	14.95	15.71	16.51	17.36	18.21	18.03	17.84	17.72	17.60	17.41	17.54	17.60	17.74	17.87	18.00
ISTHMUS		23.43	19.86	17.60	18.09	18.72	19.67	20.67	21.70	22.78	23.91	23.84	23.77	23.70	23.63	23.56	23.56	23.56	23.56	23.56	23.56
MAYA		19.64	16.66	14.81	15.29	15.90	16.70	17.56	18.44	19.37	20.29	20.14	19.98	19.90	19.82	19.67	19.75	19.77	19.86	19.95	20.04
FORCADOS		25.46	21.70	19.33	19.89	20.59	21.62	22.72	23.80	24.95	26.15	26.08	26.00	25.93	25.85	25.78	25.78	25.78	25.78	25.78	25.78
ORIENTE		22.81	19.17	16.88	17.41	18.08	19.07	20.12	21.17	22.28	23.44	23.37	23.30	23.22	23.15	23.08	23.08	23.08	23.08	23.08	23.08
SPIKES																					

BUTANE		20.72	17.49	15.58	16.11	16.82	17.62	18.49	19.43	20.43	21.43	21.21	20.99	20.85	20.71	20.49	20.64	20.71	20.87	21.03	21.18
NAPTHA		26.40	22.12	19.58	20.30	21.23	22.30	23.45	24.69	26.02	27.34	27.05	26.76	26.57	26.39	26.09	26.30	26.39	26.60	26.81	27.01
KERO		32.63	27.50	24.47	25.32	26.44	27.72	29.09	30.58	32.18	33.77	33.41	33.06	32.84	32.62	32.26	32.51	32.63	32.87	33.12	33.37
GAS OIL		29.00	24.13	21.25	22.06	23.13	24.33	25.64	27.05	28.57	30.07	29.74	29.40	29.19	28.98	28.65	28.88	28.99	29.23	29.46	29.70

1 08/04/91 10:25 AM FILE = FINREF 1.0.3, BASE MARGIN, REDUCED DEMAND, PRICE, OXFOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE I - BUSINESS AS USUAL

PETROJAM REVENUES - US$M

DOMESTIC MARKET REVENUES (US$ equivalent of local currency)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
PROPANE	2.38	2.22	2.17	2.35	2.56	2.79	3.05	3.32	3.61	3.92	4.08	4.25	4.45	4.65	4.84	5.11	5.38	5.68	5.99	6.33
BUTANE	11.42	10.65	10.37	11.23	12.23	13.36	14.62	15.90	17.31	18.82	19.61	20.44	21.35	22.31	23.24	24.54	25.83	27.27	28.79	30.40
MOGAS, LEADED	30.07	23.19	18.58	16.98	15.22	13.15	10.67	7.70	4.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MOGAS, UNLEADED	3.34	5.80	7.97	11.32	15.23	19.73	24.89	30.80	37.57	45.12	45.99	46.87	47.95	49.05	49.97	51.87	53.61	55.64	57.74	59.92
KERO/TURBO	29.37	25.93	24.11	25.73	27.70	29.92	32.37	35.02	37.94	41.01	41.99	43.00	44.19	45.43	46.52	48.47	50.32	52.44	54.65	56.96
AUTO DIESEL	43.78	41.77	41.08	55.05	45.32	47.17	50.26	49.89	54.54	57.43	60.54	63.94	67.82	68.93	69.80	75.29	81.08	85.70	86.50	89.43
MARINE DIESEL	11.01	9.92	9.42	10.28	11.09	11.85	12.70	13.60	14.59	15.61	15.83	16.05	16.34	16.65	16.89	17.45	17.96	18.56	19.19	19.84
HEAVY FUEL OIL	82.35	73.36	68.46	66.44	77.22	81.15	87.93	81.75	83.35	75.22	76.71	63.98	65.56	68.12	70.45	59.58	61.16	65.10	69.19	72.83
ASPHALT	2.95	2.81	2.78	3.01	3.28	3.58	3.91	4.28	4.69	5.13	5.40	5.69	6.00	6.33	6.66	7.10	7.54	8.03	8.56	9.12
Total	216.66	195.64	184.94	202.39	209.85	222.72	240.39	242.26	257.77	262.26	270.16	264.22	273.66	281.46	288.39	289.48	302.89	316.42	330.62	344.82

EXPORT REVENUES US$ - Foreign Exchange

PROPANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BUTANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MOGAS	30.01	0.00	0.00	0.00	7.94	7.78	18.05	18.83	17.79	18.61	16.91	16.16	14.59	15.37	12.99	10.32	6.13	1.12	0.00	1.71
KERO/TURBO	9.26	0.00	0.00	6.97	5.40	6.92	7.07	5.98	11.85	10.26	7.15	7.52	7.81	0.00	0.00	0.00	4.83	6.57	4.00	0.00
AUTO DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MARINE DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HEAVY FUEL OIL 1 -Case I	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HEAVY FUEL OIL 2 -Case II	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	39.27	0.00	0.00	6.97	13.34	12.70	25.11	24.81	29.64	28.86	24.06	23.68	22.40	15.37	12.99	10.32	10.96	7.70	4.00	1.71

1 08/04/91 10:25 AM FILE = FINREF 1.0.3, BASE MARGIN, REDUCED DEMAND, PRICE, 0%FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE 1 - BUSINESS AS USUAL

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
189 BAUXITE/ALUMINA REVENUES		US$ - Foreign Exchange																			
190 ----------																					
191 PROPANE		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
192 BUTANE		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
193 MOGAS		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
196 KERO/TURBO		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
195 AUTO DIESEL		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
196 MARINE DIESEL		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
197 HEAVY FUEL OIL 1		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
198 HEAVY FUEL OIL 2		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
199																					
200		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
201																					
202 TOTAL REVENUES - US$M		255.93	195.64	184.94	209.36	223.19	235.41	265.51	267.07	287.41	291.12	294.22	287.90	296.06	296.83	301.38	299.73	313.86	326.12	334.62	346.53
203																					
204																					
205																					
206	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
207	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
208 REFINING COSTS - US$M																					
209 **********																					
210																					
211 CRUDE																					
212 ----------																					
213 BCF24		117.98	0.00	0.00	100.02	136.05	144.04	157.20	147.53	108.88	103.79	144.02	121.72	114.81	0.00	0.00	4.17	87.56	126.01	134.08	131.31
214 BCF17		0.00	38.27	36.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	77.15	74.79	69.40	10.22	0.00	0.00	0.00
215 ISTHMUS		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	77.07	61.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19.61
216 MAYA		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
217 FORCADOS		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
218 ORIENTE		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
219																					
220 TOTAL WHOLE CRUDE IMPORTS		117.98	38.27	36.12	100.02	136.05	144.04	157.20	147.53	185.95	165.06	144.02	121.72	114.81	77.15	74.79	73.57	97.78	126.01	134.08	150.91
221																					

1 08/04/91 10:25 AM FILE = FINREF 1.0.3, BASE MARGIN, REDUCED DEMAND, PRICE, OXFOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE I - BUSINESS AS USUAL

223 SPIKES																				
224 ----------																				
225 BUTANE	1.81	1.09	1.02	1.47	1.78	1.87	2.09	2.06	1.49	1.64	2.25	2.07	2.05	2.12	2.09	2.11	2.12	2.29	2.30	2.16
226 NAPTHA	53.86	32.37	29.45	16.08	20.54	21.73	34.74	41.00	30.01	40.32	49.17	53.81	54.99	72.23	70.85	69.68	56.07	46.50	45.79	44.86
227 KERO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
228 GAS OIL	35.98	56.90	54.07	50.97	30.81	32.33	33.69	37.62	26.80	39.40	55.25	65.90	73.10	92.03	96.00	100.67	95.45	91.95	86.99	66.98
229																				
230 TOTAL SPIKES IMPORTS	91.66	90.36	86.55	68.52	53.13	55.92	70.53	80.67	58.30	81.37	106.66	121.78	130.14	166.38	166.95	172.46	153.63	140.74	135.08	114.01
231																				
232 PRODUCT IMPORTS																				
233 ----------																				
234 PROPANE	0.97	1.64	1.57	1.44	1.37	1.43	1.49	1.70	1.84	2.15	2.45	2.67	2.81	3.41	3.62	3.79	3.80	3.98	4.32	4.42
235 BUTANE	3.65	6.57	6.41	4.96	4.69	5.39	5.47	6.86	9.95	11.02	9.96	11.13	12.12	14.42	15.34	16.56	16.61	17.28	18.44	20.29
236 MOGAS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
237 KERO/TURBO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
238 AUTO DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
239 MARINE DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.64	16.87
240 HEAVY FUEL OIL	17.61	35.88	32.22	8.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.15	3.47	7.66	0.36	7.62	0.00	0.00	0.00
241																				
242 TOTAL COST OF PROD/RAW MTLS.	22.23	44.09	40.20	14.75	6.05	6.82	6.96	8.55	11.79	13.17	12.41	13.79	20.08	21.31	26.61	20.72	28.03	21.26	27.40	41.58
243																				
244 FIXED/VARIABLE OPERATING COST	15.27	13.99	14.17	13.05	13.31	13.33	13.51	13.36	13.37	13.24	13.31	13.21	13.21	13.24	13.24	13.24	13.24	13.41	13.44	13.42

1 08/04/91 10:25 AM FILE = FINREF 1.0.3, BASE MARGIN, REDUCED DEMAND, PRICE, 0%FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE I - BUSINESS AS USUAL

246			1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
247	ANNUAL DEPRECIATION																					
248	**********																					
249	Existing Capital	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
250	Project Capital yrs	15	0.00	0.61	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	0.43	0.00	0.00	0.00
251																						
252	TOTAL DEPRECIATION		0.97	1.57	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.16	1.03	1.03	1.03	1.03	0.43	0.00	0.00	0.00
253																						
254	CAPITAL INVESTMENT - PROJECT		0.00	9.10	6.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
255	HEAVY MAINTENANCE COSTS		2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
256																						
257			2.50	11.60	8.90	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
258	FINANCING STRUCTURE																					
259	**********		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
260																						
261	Project Investment		0.00	9.10	6.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
262	Local Component	28.0%	0.00	2.55	1.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
263	Foreign Component	72.0%	0.00	6.55	4.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
264																						
265	Local Component																					
266	----------																					
267	Local Equity Financed	0.0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
268	Local Cash Financed	100.0%	0.00	2.55	1.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
269	Local Loan Financed	0.0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
270	Local Loan Outstanding		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
271	Loan Repayment over yrs	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
272	Interest - % of O/S loa	12.0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
273																						
274	Foreign Component																					
275	----------																					
276	Foreign Equity Financed	0.0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
277	Foreign Loan Financed	100.0%	0.00	6.55	4.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
278	Foreign Loan Outstanding		0.00	6.55	11.16	11.16	10.04	8.93	7.81	6.69	5.58	4.46	3.35	2.23	1.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00
279	Loan Repayment over yrs	10	0.00	0.00	0.00	0.00	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	0.00	0.00	0.00	0.00	0.00	0.00
280	Interest - % of O/S loa	12.0%	0.00	0.79	1.34	1.34	1.21	1.07	0.94	0.80	0.67	0.54	0.40	0.27	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00

1 08/04/91 10:25 AM FILE = FINREF 1.0.3, BASE MARGIN, REDUCED DEMAND, PRICE, OXFOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE I - BUSINESS AS USUAL

282	ANNUAL ALLOWANCES																				
283	**********																				
284	Old Capital Investment		15.86	15.86	24.96	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36
285	Total Capital Investment		15.86	24.96	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36
286	Declining Balance		15.86	23.37	27.44	26.69	22.22	20.00	18.00	16.20	14.58	13.12	11.81	10.63	9.57	8.61	7.75	6.97	6.28	5.65	5.08	4.58
287	Annual Allowance, Basis	10.0%	1.59	2.34	2.74	2.67	2.22	2.00	1.80	1.62	1.46	1.31	1.18	1.06	0.96	0.86	0.77	0.70	0.63	0.56	0.51	0.46
288																						
289	OWNERSHIP STRUCTURE																					
290	**********																					
291	GOJ/Petrojam	100.0%																				
292	Foreign Investor	0.0%																				
293	Local Investor	0.0%																				
294																						
295																						
296	GR MRG VOLATILITY/SENSITIVITY		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

1 08/04/91 10:51 AM FILE = FINREF 1.0.3, BASE MARGIN, REDUCED DEMAND, PRICE, EXFOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE I - BUSINESS AS USUAL
298 PETROJAM PROFIT AND LOSS / INCOME STATEMENT
299 **********

300			1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
301			----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
302	Sales Revenue		235.93	195.64	184.96	209.36	223.19	235.61	265.51	267.07	287.41	291.12	294.22	287.90	296.06	296.83	301.38	299.75	313.86	324.12	334.62	346.53
303	Cost of Sales		231.87	172.71	160.87	183.29	195.24	206.79	234.69	236.76	256.05	259.60	263.10	257.29	265.03	264.84	268.35	266.75	279.44	288.02	296.57	306.50
304																						
305	Gross Margin		26.05	22.93	24.07	26.07	27.95	28.82	30.82	30.31	31.36	31.52	31.12	30.61	31.03	31.99	33.03	32.98	34.41	36.10	38.05	40.03
306	Other Operating Income	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65
307	Operating Expenses		15.27	13.99	14.17	13.05	13.31	13.33	13.51	13.36	13.37	13.24	13.31	13.21	13.21	13.24	13.24	13.24	13.24	13.41	13.44	13.42
308	Heavy Maintenance Expense		2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
309																						
310	Income From Operations		14.94	15.08	16.05	19.17	20.79	21.65	23.46	23.10	24.14	24.43	23.96	23.55	23.97	24.91	25.95	25.89	27.33	28.85	30.76	32.76
311																						
312	Interest Income	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52
313	Interest Expense	0.13	0.13	0.91	1.47	1.47	1.33	1.20	1.06	0.93	0.80	0.66	0.53	0.40	0.26	0.13	0.13	0.13	0.13	0.13	0.13	0.13
314																						
315	Non-operating Income		4.39	3.61	3.05	3.05	3.19	3.32	3.46	3.59	3.72	3.86	3.99	4.13	4.26	4.39	4.39	4.39	4.39	4.39	4.39	4.39
316																						
317	Profit Before Taxes		19.33	18.69	19.10	22.22	23.98	24.77	26.91	26.69	27.86	28.29	27.95	27.67	28.23	29.30	30.34	30.28	31.72	33.24	35.16	37.15
318																						
319	Less Investment Allowan	20.0%	0.08	1.82	1.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
320	Less Annual Allowance		1.59	2.34	2.74	2.47	2.22	2.00	1.80	1.62	1.46	1.31	1.18	1.06	0.96	0.86	0.77	0.70	0.63	0.56	0.51	0.46
321																						
322	TAXABLE INCOME		17.74	14.53	15.08	19.75	21.75	22.77	25.11	25.07	26.40	26.97	26.77	26.61	27.28	28.44	29.56	29.58	31.09	32.67	34.65	36.69
323																						
324	Income Taxes	33.33%	5.91	4.84	5.03	6.58	7.25	7.59	8.37	8.36	8.80	8.99	8.92	8.87	9.09	9.48	9.85	9.86	10.36	10.89	11.55	12.23
325																						
326	Net Profit		13.42	13.85	14.07	15.64	16.73	17.18	18.54	18.34	19.06	19.30	19.03	18.80	19.14	19.82	20.48	20.42	21.35	22.35	23.61	26.92
327																						
328	DIVIDENDS as % of net p	80.0%	0.00	11.08	11.26	12.51	13.38	13.74	14.83	14.67	15.25	15.44	15.22	15.04	15.31	15.86	16.39	16.34	17.08	17.88	18.89	19.94
329	PROFIT TO RETAINED EARN	20.0%	13.42	2.77	2.81	3.13	3.35	3.44	3.71	3.67	3.81	3.86	3.81	3.76	3.83	3.96	4.10	4.08	4.27	4.47	4.72	4.98
330																						
331	PRESENT VALUE OF DIVIDENDS @		12.00% DISCOUNT RATE			92.2																
332	**********	NET PROFITS				127.2																

1 08/04/91 10:51 AM FILE = FINREF 1.0.3, BASE MARGIN, REDUCED DEMAND, PRICE, OXFOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE 1 - BUSINESS AS USUAL

BALANCE SHEET

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
ASSETS																					
Current assets																					
Cash in Bank	19.21	-0.79	9.62	14.13	15.13	17.18	20.05	21.16	25.51	27.99	32.26	36.45	40.90	43.95	47.66	52.55	57.53	61.04	63.97	67.82	72.22
Receivables dys 30	18.26	21.04	16.08	15.20	17.21	18.34	19.35	21.82	21.95	23.62	23.93	24.18	23.66	24.33	24.40	24.77	24.64	25.80	26.64	27.50	28.48
Inventories	11.54																				
-Crude/Spikes dys 20		11.49	7.05	6.61	9.23	10.37	10.96	12.48	12.50	13.38	13.50	13.74	13.34	13.42	13.34	13.25	13.48	13.78	14.62	14.75	14.52
- Product dys 20		14.02	10.72	10.13	11.47	12.23	12.90	14.35	14.63	15.75	15.95	16.12	15.78	16.22	16.26	16.51	16.42	17.20	17.76	18.34	18.99
Total Current Assets	49.01	45.75	43.47	46.07	53.04	58.12	63.26	70.01	74.59	80.74	85.64	90.49	93.68	97.93	101.66	107.08	112.07	117.81	122.98	128.41	134.21
Fixed Assets/Plant in Service																					
Gross	15.86	15.86	24.96	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36
less Accum Deprec	5.10	6.07	7.64	9.64	11.64	13.64	15.64	17.64	19.64	21.64	23.64	25.64	26.80	27.83	28.87	29.90	30.93	31.36	31.36	31.36	31.36
Net Assets in Service	10.76	9.80	17.32	21.72	19.72	17.72	15.72	13.72	11.72	9.72	7.72	5.72	4.56	3.53	2.49	1.46	0.43	0.00	0.00	0.00	0.00
Investments in Subsidia	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07
Total Assets	70.85	66.62	71.86	78.87	83.84	86.91	90.05	94.80	97.39	101.54	104.44	107.28	109.31	112.53	115.23	119.61	123.57	128.88	134.05	139.48	145.28

1 08/06/91 10:51 AM FILE = FINREF 1.0.3, BASE MARGIN, REDUCED DEMAND, PRICE, 0%FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE I - BUSINESS AS USUAL

362 **********																					
363 Payables dys.	30	36.70	19.06	14.20	13.22	15.06	16.05	17.00	19.29	19.46	21.05	21.34	21.62	21.15	21.78	21.77	22.06	21.92	22.97	23.67	24.38	25.19
364 Interest on Current Deb		0.22	0.22	1.01	1.56	1.56	1.43	1.29	1.16	1.03	0.89	0.76	0.62	0.49	0.36	0.22	0.22	0.22	0.22	0.22	0.22	0.22
365																						
366		36.92	19.28	15.20	14.78	16.63	17.47	18.29	20.45	20.49	21.94	22.10	22.25	21.64	22.14	21.99	22.28	22.15	23.19	23.89	24.60	25.41
367																						
368 Long Term Debt		1.51	1.51	8.06	12.67	12.67	11.56	10.44	9.32	8.21	7.09	5.98	4.86	3.75	2.63	1.51	1.51	1.51	1.51	1.51	1.51	1.51
369																						
370 Paid in Capital																						
371 GOJ	0%	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66
372 Anchor - Foreign In	100%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
373 Local Partner	100%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
374																						
375 Total		3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66
376																						
377 Retained Earnings		28.75	42.17	44.94	47.75	50.88	54.22	57.66	61.37	65.04	68.85	72.71	76.51	80.27	84.10	88.06	92.16	96.25	100.52	104.99	109.71	114.69
378																						
379 Total Liabilities		70.85	66.62	71.86	78.87	83.84	86.91	90.05	94.80	97.39	101.54	104.44	107.28	109.31	112.53	115.23	119.61	123.57	128.88	134.05	139 48	145.28
380																						
381 D/E RATIO(LTD/LTD+RE)		5.0%	3.5%	15.2%	21.0%	19.9%	17.6%	15.3%	13.2%	11.2%	9.3%	7.6%	6.0%	4.5%	3.0%	1.7%	1.6%	1.5%	1.5%	1.4%	1.4%	1.3%
382																						
383																						

1 08/04/91 10:51 AM FILE = FINREF 1.0.3, BASE MARGIN, REDUCED DEMAND, PRICE, OXFOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE 1 - BUSINESS AS USUAL

385
386 SOURCES AND APPLICATIONS OF FUNDS
387 **********
388

389 SOURCE OF FUNDS	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
391 Net from Operations	13.42	13.85	14.07	15.64	16.73	17.18	18.54	18.34	19.06	19.30	19.03	18.80	19.14	19.82	20.48	20.42	21.35	22.35	23.61	24.92
392 Depreciation	0.97	1.57	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.16	1.03	1.03	1.03	1.03	0.43	0.00	0.00	0.00
393 Loans	0.00	6.55	4.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
394 Equity	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
395 BALANCING ITEM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
396																				
397 Total Sources	14.38	21.97	20.68	17.64	18.73	19.18	20.54	20.34	21.06	21.30	21.03	19.97	20.17	20.85	21.52	21.45	21.78	22.35	23.61	24.92
398																				
399 APPLICATION OF FUNDS																				
400 **********																				
401 Increase in Working Capital	14.38	1.80	3.02	5.13	4.23	4.32	4.59	4.55	4.70	4.74	4.69	3.81	3.75	3.88	5.13	5.12	4.70	4.47	4.72	4.98
402 Capital Investments/Construct	0.00	9.10	6.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
403 Principal Repayment - y10.00	0.00	0.00	0.00	0.00	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	0.00	0.00	0.00	0.00	0.00	0.00
404 Interest Repayment (part of operatin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
405 Dividend Payment - GOJ Treasu	0.00	11.08	11.26	12.51	13.38	13.74	14.83	14.67	15.25	15.44	15.22	15.04	15.31	15.86	16.39	16.34	17.08	17.88	18.89	19.94
406 Dividend Payment - Foreign Pa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
407 Dividend Payment - Local Part	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
408																				
409 Total Applications	14.38	21.97	20.68	17.64	18.73	19.18	20.54	20.34	21.06	21.30	21.03	19.97	20.17	20.85	21.52	21.45	21.78	22.35	23.61	24.92
410																				
411																				

1 08/06/91 10:51 AM FILE = FINREF 1.0.3, BASE MARGIN, REDUCED DEMAND, PRICE, OXFOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE I - BUSINESS AS USUAL

DEMAND FORECAST - millions of barrels

PRIVATE/MARKETING COMPA	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
PROPANE		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BUTANE		0.93	0.85	0.77	0.68	0.58	0.48	0.37	0.25	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MOGAS, LEADED		0.10	0.21	0.33	0.45	0.58	0.72	0.86	1.02	1.18	1.35	1.39	1.43	1.47	1.52	1.56	1.61	1.66	1.71	1.76	1.81
MOGAS, UNLEADED		0.84	0.86	0.89	0.92	0.95	0.98	1.02	1.05	1.09	1.12	1.16	1.20	1.24	1.29	1.33	1.38	1.42	1.47	1.53	1.58
KERO/TURBO		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AUTO DIESEL		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MARINE DIESEL		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HEAVY FUEL OIL		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ASPHALT		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	1.87	1.93	1.99	2.05	2.12	2.18	2.25	2.32	2.40	2.47	2.55	2.63	2.72	2.80	2.89	2.99	3.08	3.18	3.29	3.39

MAJOR CONSUMERS																					
PROPANE		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BUTANE		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MOGAS, LEADED		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MOGAS, UNLEADED		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
KERO/TURBO		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AUTO DIESEL		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MARINE DIESEL		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HEAVY FUEL OIL		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ASPHALT		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

1 08/06/91 10:51 AM FILE = FINREF 1.0.3, BASE MARGIN, REDUCED DEMAND, PRICE, DIFFOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE I - BUSINESS AS USUAL

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
PRIVATE/MARKETING COMPANIES																				
PROPANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BUTANE	23.28	18.78	15.58	14.16	12.66	10.90	8.81	6.29	3.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MOGAS, LEADED	3.25	5.61	7.67	10.92	14.71	19.09	24.13	29.91	36.53	43.93	44.76	45.60	46.65	47.71	48.59	50.44	52.15	54.13	56.19	58.32
MOGAS, UNLEADED	26.32	22.77	20.85	22.29	24.10	26.14	28.41	30.92	33.69	36.60	37.44	38.29	39.33	40.40	41.32	43.09	44.75	46.67	48.68	50.78
KERO/TURBO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AUTO DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MARINE DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HEAVY FUEL OIL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ASPHALT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	52.85	47.08	44.00	47.38	51.47	56.14	61.35	67.11	73.59	80.53	82.20	83.90	85.98	88.11	89.92	93.54	96.90	100.81	104.87	109.10
MAJOR CONSUMERS IMPORTS																				
PROPANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BUTANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MOGAS, LEADED	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MOGAS, UNLEADED	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
KERO/TURBO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AUTO DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MARINE DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HEAVY FUEL OIL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ASPHALT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL NON-PETROJAM IMPORT COS	52.85	47.08	44.00	47.38	51.47	56.14	61.35	67.11	73.59	80.53	82.20	83.90	85.98	88.11	89.92	93.54	96.90	100.81	104.87	109.10

1 08/04/91 10:51 AM FILE = FINREF 1.0.3, BASE MARGIN, REDUCED DEMAND, PRICE, OXFOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE I - BUSINESS AS USUAL

MARGINAL FINANCIAL ANALYSIS

		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
REVENUES																					
PROPANE		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BUTANE		25.49	20.72	17.32	15.77	14.04	12.04	9.69	6.89	3.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MOGAS, LEADED		3.34	5.80	7.96	11.32	15.22	19.73	24.89	30.80	37.56	45.12	45.98	46.86	47.94	49.05	49.97	51.86	53.61	55.64	57.74	59.92
MOGAS, UNLEADED		27.06	23.53	21.61	23.11	24.94	27.01	29.31	31.85	34.65	37.59	38.46	39.35	40.43	41.53	42.50	44.30	46.01	47.97	50.02	52.17
KERO/TURBO		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
A/TO DIESEL		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MARINE DIESEL		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HEAVY FUEL OIL		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ASPHALT		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		55.89	50.05	46.90	50.20	54.21	58.78	63.89	69.54	75.89	82.71	84.45	86.22	88.37	90.58	92.46	96.17	99.61	103.61	107.76	112.09
COSTS																					
Importation		52.85	47.08	44.00	47.38	51.47	56.14	61.35	67.11	73.59	80.53	82.20	83.90	85.98	88.11	89.92	93.54	96.90	100.81	104.87	109.10
Terminalling @/BBL	0.67	1.85	1.29	1.33	1.38	1.42	1.46	1.51	1.56	1.61	1.66	1.71	1.76	1.82	1.88	1.94	2.00	2.07	2.13	2.20	2.27
		54.71	48.37	45.34	48.75	52.89	57.60	62.86	68.67	75.19	82.19	83.91	85.66	87.80	89.99	91.86	95.54	98.97	102.94	107.07	111.37
MARGINAL PROFIT BEFORE TAX		1.18	1.68	1.57	1.44	1.31	1.18	1.03	0.87	0.70	0.52	0.54	0.55	0.57	0.59	0.61	0.63	0.65	0.67	0.69	0.71
INCOME TAX	33.33%	0.59	0.56	0.52	0.48	0.44	0.39	0.34	0.29	0.23	0.17	0.18	0.18	0.19	0.20	0.20	0.21	0.22	0.22	0.23	0.24
MARGINAL PROFIT AFTER TAX		1.19	1.12	1.04	0.96	0.88	0.78	0.68	0.58	0.47	0.35	0.36	0.37	0.38	0.39	0.41	0.42	0.43	0.45	0.46	0.48
PROFIT REPATRIATION	50.00%	0.59	0.56	0.52	0.48	0.44	0.39	0.34	0.29	0.23	0.17	0.18	0.18	0.19	0.20	0.20	0.21	0.22	0.22	0.23	0.24

NET PRESENT VALUE OF MARGINAL PROFIT 12.00% 5.76

1 08/04/91 11:21 AM FILE = FINREF 1.0.3, BASE MARGIN, REDUCED DEMAND, PRICE, OILFOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE I - BUSINESS AS USUAL
519 BANK OF JAMAICA
520 **********
521
522 MARGINAL CASH FLOW ANALYSIS WITH 100.00% GOJ OWNERSHIP OF PETROJAM
523 ----------

524		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
525		----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
526	SOURCES																				
527	**********																				
528	Current Account																				
529	----------																				
530	Petrojam Export Sales	39.27	0.00	0.00	6.97	13.34	12.70	25.11	24.81	29.64	28.86	24.06	23.68	22.40	15.37	12.99	10.32	10.96	7.70	4.00	1.71
531																					
532	Capital Account																				
533	----------																				
534	Equity Investment in Petrojam	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
535	Loan - Capital Investment	0.00	6.55	4.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
536		----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
537	TOTAL	39.27	6.55	4.61	6.97	13.34	12.70	25.11	24.81	29.64	28.86	24.06	23.68	22.40	15.37	12.99	10.32	10.96	7.70	4.00	1.71
538		====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====
539	APPLICATIONS																				
540	**********																				
541	Current Account																				
542	----------																				
543	Petrojam Purchases of Crude	$209.64	128.63	120.67	168.54	189.18	199.97	227.73	228.20	244.26	246.43	250.69	243.50	244.95	243.53	241.74	246.03	251.41	266.75	269.17	264.92
544	Petrojam Product Purchases	22.23	44.09	40.20	14.75	6.05	6.82	6.96	8.55	11.79	13.17	12.41	13.79	20.08	21.31	26.61	20.72	28.03	21.26	27.40	41.58
545	Heavy Maintenance Expen 50.0%	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
546	Operating Expense 20.0%	3.05	2.80	2.83	2.61	2.66	2.67	2.70	2.67	2.67	2.65	2.66	2.64	2.64	2.65	2.65	2.65	2.65	2.68	2.69	2.68
547	Marketing Companies Product P	60.86	52.93	48.61	51.92	55.97	60.55	65.61	71.13	77.21	83.58	85.35	87.15	89.34	91.58	93.50	97.25	100.75	104.79	108.99	113.37
548	Major consumers Product Purch	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
549	Interest on Foreign Loan	0.00	0.79	1.34	1.34	1.21	1.07	0.94	0.80	0.67	0.54	0.40	0.27	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
550	Dividend Repatriation - Forei	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
551	Dividend Repatriation - Mktg.	0.22	0.23	0.24	0.25	0.25	0.26	0.27	0.28	0.29	0.30	0.31	0.32	0.33	0.34	0.35	0.36	0.37	0.39	0.40	0.41
552																					

```
  1  08/06/91 11:21 AM     FILE = FINREF 1.0.3, BASE MARGIN, REDUCED DEMAND, PRICE, OXFOREIGN
  2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
  3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE 1  -  BUSINESS AS USUAL
554 ------------------
555 Petrojam Capital Goods        0.00  6.55  4.61  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
556 Principal Repayment           0.00  0.00  0.00  0.00  1.12  1.12  1.12  1.12  1.12  1.12  1.12  1.12  1.12  1.12  0.00  0.00  0.00  0.00  0.00  0.00
557                              ------------------------------------------------------------------------------------------------------------------------
558          TOTAL               297.26 237.26 219.75 240.65 257.69 273.70 306.57 314.01 339.26 349.03 354.18 350.03 359.83 361.77 366.10 368.26 384.46 397.12 409.90 424.22
559                              ========================================================================================================================
560
561 NET FOREIGN EXCHANGE FLOWS     -258  -231  -215  -234  -244  -261  -281  -289  -310  -320  -330  -326  -337  -346  -353  -358  -373  -389  -406  -423
562                              ************************************************************************************************************************
563
564 PRESENT VALUE OF NET FOREIGN EXCHANGE CASH  12.00%       -2091
565
566 DISCOUNTED BARRELS OF JAMAICA TOTAL DEMAND  90.93  FOREX $23.00 PER BARREL
567
```

1 08/04/91 11:29 AM FILE = FINREF 1.0.3, BASE MARGIN, REDUCED DEMAND, PRICE, OXFOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE 1 - BUSINESS AS USUAL
569 MINISTRY OF FINANCE
570 **********
571
572 FISCAL FLOWS WITH 100.0%OJ OWNERSHIP
573 ----------

		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
574																					
575																					
576	Sources																				
577	----------																				
578	Import Duty	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
579	Income Tax - Petrojam	5.91	4.84	5.03	6.58	7.25	7.59	8.37	8.36	8.80	8.99	8.92	8.87	9.09	9.48	9.85	9.86	10.36	10.89	11.55	12.23
580	Income Tax - Marketing Compan	0.22	0.23	0.24	0.25	0.25	0.26	0.27	0.28	0.29	0.30	0.31	0.32	0.33	0.34	0.35	0.36	0.37	0.39	0.40	0.41
581	Dividends from Petrojam Opera	0.00	11.08	11.26	12.51	13.38	13.74	14.83	14.67	15.25	15.44	15.22	15.04	15.31	15.86	16.39	16.34	17.08	17.88	18.89	19.94
582																					
583	TOTAL	6.14	16.15	16.52	19.34	20.89	21.59	23.48	23.31	24.34	24.73	24.45	24.23	24.73	25.67	26.59	26.56	27.82	29.16	30.84	32.58
584																					
585	Applications																				
586	----------																				
587	Equity Investment 0.00%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
588																					
589	TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
590																					
591																					
592	NET CASH FLOW	6.14	16.15	16.52	19.34	20.89	21.59	23.48	23.31	24.34	24.73	24.45	24.23	24.73	25.67	26.59	26.56	27.82	29.16	30.84	32.58
593																					
594																					

595 NET PRESENT VALUE @ 12.0%150.13
596
597

FOREIGN PARTNER

1 08/04/91 11:21 AM FILE = FINREF 1.0.3, BASE MARGIN, REDUCED DEMAND, PRICE, OXFOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE I - BUSINESS AS USUAL
599 OFFSHORE PARTNER WITH 0.00% OWNERSHIP
600 **********
601

			1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
602	US$ CASH FLOWS																					
603	----------																					
604	Sources																					
605	----------	YRLY PV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
606	Dividend Repatriation		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
607																						
608			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
609		CUMUL PV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
610	Applications	PAYBACK PT	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR
611	----------	CUMUL PV	0.00	0.00	0.00	0.00																
612	Equity Investment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
613		YRLY PV	0.00	0.00	0.00	0.00																
614	AVGE INV POINT		ERR																			
615	NET CASH FLOW		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
616																						
617																						

618 PRESENT VALUE OF NET CASH FLOW @ 12.00% 0.00
619 PAYBACK PERIOD OF DCF ERR
620

08/04/91 12:06 PM FILE = FINREF 1.3.1, BASE MARGIN, REDUCED DEMAND & PRICE, 75% FOREIGN
JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE I - BUSINESS AS USUAL

MARKET FORECAST FOR PETROJAM - millions of barrels

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
LOCAL DEMAND ON REFINERY																					
PROPANE	0.10	0.11	0.11	0.12	0.13	0.13	0.14	0.15	0.15	0.16	0.17	0.18	0.19	0.20	0.21	0.22	0.23	0.24	0.25	0.26	
BUTANE	0.42	0.44	0.46	0.48	0.51	0.53	0.56	0.59	0.62	0.65	0.68	0.71	0.75	0.79	0.83	0.87	0.91	0.96	1.00	1.05	
MOGAS, LEADED	0.93	0.85	0.77	0.68	0.58	0.48	0.37	0.25	0.13	0.00	0.00	0.00	0.00	-0.00	0.00	0.00	0.00	0.00	0.00	0.00	
MOGAS, UNLEADED	0.10	0.21	0.33	0.45	0.58	0.72	0.86	1.02	1.18	1.35	1.39	1.43	1.47	1.52	1.56	1.61	1.66	1.71	1.76	1.81	
KERO/TURBO	0.84	0.86	0.89	0.92	0.95	0.98	1.02	1.05	1.09	1.12	1.16	1.20	1.24	1.29	1.33	1.38	1.42	1.47	1.53	1.58	
AUTO DIESEL	1.35	1.51	1.65	2.14	1.69	1.68	1.71	1.62	1.69	1.70	1.81	1.93	2.06	2.11	2.15	2.31	2.48	2.54	2.60	2.67	
MARINE DIESEL	0.35	0.36	0.38	0.41	0.42	0.43	0.44	0.45	0.46	0.47	0.48	0.49	0.51	0.52	0.53	0.54	0.56	0.57	0.59	0.60	
HEAVY FUEL OIL	4.55	4.71	4.85	4.56	5.10	5.13	5.32	4.74	4.62	4.00	4.11	3.46	3.57	3.73	3.90	3.27	3.35	3.54	3.74	3.91	
ASPHALT	0.11	0.12	0.12	0.13	0.14	0.15	0.16	0.16	0.17	0.18	0.20	0.21	0.22	0.23	0.25	0.26	0.28	0.29	0.31	0.33	
	8.75	9.18	9.58	9.90	10.10	10.24	10.58	10.03	10.11	9.63	10.00	9.62	10.01	10.38	10.76	10.46	10.88	11.33	11.78	12.23	
EXPORTS																					
PROPANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
BUTANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
MOGAS	0.98	0.00	0.00	0.00	0.32	0.30	0.67	0.66	0.59	0.59	0.54	0.52	0.47	0.50	0.43	0.34	0.20	0.04	0.00	0.05	
KERO/TURBO	0.30	0.00	0.00	0.30	0.22	0.19	0.26	0.21	0.39	0.32	0.23	0.24	0.25	0.00	0.00	0.00	0.16	0.21	0.13	0.00	
AUTO DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
MARINE DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
HEAVY FUEL OIL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	1.28	0.00	0.00	0.30	0.54	0.49	0.93	0.87	0.98	0.91	0.77	0.76	0.73	0.50	0.43	0.34	0.36	0.25	0.13	0.05	

1 08/04/91 12:04 PM FILE = FINREF 1.3.1, BASE MARGIN, REDUCED DEMAND & PRICE, 75% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE I - BUSINESS AS USUAL
35 Jamaican Bauxite/Alumina Industry
36 Propane)LPG PART OF EXPORTS ABOVE
37 Butane)
38 Gasoline (Mogas, Leaded)
39 Kero/Turbo
40 ADO (Auto Diesel)
41 Marine Diesel
42 Fuel oil

44		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
46	TOTAL DEMAND	10.83	9.18	9.58	10.19	10.66	10.73	11.51	10.90	11.09	10.54	10.77	10.38	10.73	10.88	11.19	10.80	11.26	11.57	11.91	12.28

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
51 JAMAICAN IMPORTS																					
53 PROPANE		0.05	0.09	0.09	0.08	0.08	0.08	0.09	0.08	0.09	0.10	0.11	0.12	0.13	0.16	0.17	0.18	0.18	0.19	0.20	0.20
54 BUTANE		0.15	0.30	0.32	0.24	0.22	0.24	0.25	0.28	0.39	0.41	0.38	0.42	0.46	0.55	0.59	0.64	0.64	0.66	0.70	0.77
55 MOGAS		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
56 KERO/TURBO		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
57 AUTO DIESEL		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
58 MARINE DIESEL		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.54
59 HEAVY FUEL OIL		1.07	2.56	2.57	0.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.31	0.21	0.46	0.02	0.46	0.00	0.00
61		1.26	2.95	2.98	0.96	0.29	0.31	0.31	0.36	0.47	0.51	0.49	0.55	0.59	0.92	1.23	0.84	1.27	0.85	1.05	1.51

1 08/04/91 12:04 PM FILE = FINREF 1.3.1, BASE MARGIN, REDUCED DEMAND & PRICE, 75% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE I - BUSINESS AS USUAL

64 CRUDE RUN - millions of barrels
65 ----------

66 BCF24	5.82	0.00	0.00	6.37	8.34	8.40	8.72	7.79	5.47	4.97	6.95	5.91	5.60	0.00	0.00	0.20	4.30	6.16	6.53	6.38
67 BCF17	0.00	2.59	2.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.38	4.30	3.96	0.58	0.00	0.00	0.00
68 ISTHMUS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.38	2.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.83
69 MAYA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
70 FORCADOS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
71 ORIENTE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
72																				
73 TOTAL WHOLE CRUDE	5.82	2.59	2.74	6.37	8.34	8.40	8.72	7.79	8.85	7.54	6.95	5.91	5.60	4.38	4.30	4.16	4.88	6.16	6.53	7.21
74																				

75
76 SPIKES RUN - millions of barrels
77 ----------

78 BUTANE	0.09	0.06	0.07	0.09	0.11	0.11	0.11	0.11	0.07	0.08	0.11	0.10	0.10	0.10	0.10	0.10	0.10	0.11	0.11	0.10
79 NAPTHA	2.04	1.46	1.50	0.79	0.97	0.97	1.48	1.66	1.15	1.47	1.82	2.01	2.07	2.74	2.72	2.65	2.12	1.75	1.71	1.66
80 KERO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
81 GAS OIL	1.24	2.36	2.54	2.31	1.33	1.33	1.31	1.39	0.94	1.31	1.86	2.24	2.50	3.18	3.28	3.49	3.29	3.15	2.95	2.26
82																				
83 TOTAL SPIKES	3.37	3.88	4.11	3.19	2.41	2.41	2.91	3.16	2.16	2.86	3.78	4.35	4.67	6.02	6.10	6.24	5.52	5.00	4.77	4.02
84																				

85
86

1 08/04/91 12:04 PM FILE = FINREF 1.3.1, BASE MARGIN, REDUCED DEMAND & PRICE, 75% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE I - BUSINESS AS USUAL

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
CRUDE AND PRODUCT PRICES - US$/BBL																					
IMPORT PRODUCT PRICES (CIF)																					
PROPANE	20.41	17.94	16.54	17.12	17.83	18.62	19.47	20.22	21.03	21.84	21.66	21.48	21.37	21.25	21.08	21.20	21.26	21.38	21.51	21.63	
BUTANE	25.02	21.94	20.19	20.89	21.76	22.73	23.78	24.72	25.72	26.72	26.50	26.28	26.14	26.00	25.78	25.93	26.00	26.16	26.32	26.47	
MOGAS	32.94	27.88	24.92	25.81	26.98	28.29	29.71	31.19	32.78	34.36	34.01	33.66	33.44	33.21	32.86	33.11	33.22	33.47	33.71	33.96	
KERO/TURBO	33.86	28.77	25.78	26.68	27.85	29.17	30.60	32.08	33.68	35.27	34.92	34.56	34.34	34.12	33.76	34.01	34.13	34.37	34.62	34.87	
AUTO DIESEL	31.32	26.50	23.66	24.51	25.62	26.87	28.22	29.63	31.15	32.65	32.32	31.99	31.78	31.56	31.23	31.46	31.57	31.81	32.06	32.28	
MARINE DIESEL	30.30	25.63	22.89	23.71	24.79	26.00	27.30	28.67	30.13	31.59	31.27	30.94	30.74	30.53	30.21	30.44	30.56	30.77	31.00	31.22	
HEAVY FUEL OIL	16.53	14.02	12.56	13.01	13.59	14.25	14.96	15.69	16.48	17.26	17.09	16.92	16.81	16.70	16.52	16.65	16.70	16.82	16.95	17.07	
EXPORT PRODUCT PRICES; BAUXITE/ALUMINA PRODUCT PRICES																					
PROPANE	11.61	8.88	7.21	7.58	7.92	8.42	8.96	9.72	10.53	11.33	11.15	10.97	10.86	10.75	10.57	10.69	10.75	10.88	11.00	11.13	
BUTANE	14.82	11.43	9.37	9.76	10.28	10.91	11.60	12.54	13.54	14.54	14.32	14.10	13.96	13.82	13.60	13.75	13.82	13.98	14.14	14.29	
MOGAS	30.68	25.56	22.52	23.35	24.44	25.68	27.02	28.50	30.09	31.66	31.31	30.96	30.74	30.52	30.17	30.41	30.53	30.77	31.02	31.27	
KERO/TURBO	30.94	25.79	22.73	23.56	24.66	25.91	27.26	28.75	30.35	31.94	31.58	31.23	31.01	30.79	30.43	30.68	30.80	31.04	31.29	31.54	
AUTO DIESEL	29.33	24.45	21.55	22.34	23.38	24.57	25.85	27.26	28.78	30.28	29.95	29.61	29.40	29.19	28.86	29.09	29.20	29.43	29.67	29.90	
MARINE DIESEL	28.36	23.63	20.83	21.59	22.60	23.75	24.99	26.35	27.82	29.27	28.95	28.62	28.42	28.22	27.89	28.12	28.22	28.45	28.68	28.91	
HEAVY FUEL OIL 1	15.13	12.59	11.08	11.49	12.02	12.64	13.30	14.03	14.82	15.60	15.43	15.26	15.15	15.04	14.86	14.98	15.04	15.16	15.29	15.41	
HEAVY FUEL OIL 2	16.06	13.55	12.06	12.50	13.07	13.71	14.41	15.14	15.93	16.71	16.54	16.36	16.25	16.14	15.97	16.09	16.15	16.27	16.39	16.52	
IMPORT PARITY FOR MOGAS																					
MOGAS, LEADED	31.43	26.34	23.32	24.17	25.28	26.55	27.92	29.39	30.98	32.56	32.21	31.86	31.64	31.42	31.07	31.31	31.43	31.67	31.92	32.17	
MOGAS, UNLEADED	31.43	26.34	23.32	24.17	25.28	26.55	27.92	29.39	30.98	32.56	32.21	31.86	31.64	31.42	31.07	31.31	31.43	31.67	31.92	32.17	
IMPORT PARITY FOR ASPHALT	26.18	23.43	21.81	22.31	22.95	23.67	24.46	25.26	26.13	26.99	26.80	26.61	26.49	26.37	26.18	26.31	26.37	26.51	26.64	26.78	

1 08/04/91 12:04 PM FILE = FINREF 1.3.1, BASE MARGIN, REDUCED DEMAND & PRICE, 75% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE I - BUSINESS AS USUAL

124			1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
125	REFINERY GATE PRICE	ADD-ON	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
126	----------	TO CIF																				
127	PROPANE	2.37	22.78	20.32	18.92	19.49	20.20	20.99	21.84	22.60	23.41	24.21	24.03	23.85	23.74	23.63	23.45	23.57	23.63	23.76	23.88	24.01
128	BUTANE	2.37	27.39	24.31	22.56	23.26	24.13	25.11	26.15	27.09	28.10	29.09	28.87	28.65	28.51	28.37	28.15	28.30	28.38	28.53	28.69	28.84
129	MOGAS, LEADED	0.88	32.31	27.21	24.20	25.05	26.16	27.43	28.80	30.27	31.86	33.44	33.09	32.74	32.52	32.30	31.95	32.19	32.31	32.55	32.80	33.04
130	MOGAS, UNLEADED	0.88	32.32	27.22	24.20	25.05	26.17	27.43	28.80	30.28	31.87	33.44	33.09	32.74	32.52	32.30	31.95	32.19	32.31	32.55	32.80	33.05
131	KERO/TURBO	1.21	35.07	29.99	26.99	27.89	29.06	30.38	31.81	33.29	34.89	36.48	36.13	35.77	35.55	35.33	34.98	35.22	35.34	35.59	35.83	36.08
132	AUTO DIESEL	1.17	32.49	27.67	24.83	25.68	26.79	28.04	29.39	30.88	32.32	33.82	33.49	33.16	32.94	32.73	32.40	32.63	32.74	32.98	33.21	33.45
133	MARINE DIESEL	1.59	31.89	27.22	24.48	25.30	26.38	27.59	28.89	30.26	31.72	33.18	32.86	32.53	32.33	32.12	31.80	32.03	32.13	32.36	32.59	32.81
134	HEAVY FUEL OIL	1.56	18.08	15.58	14.11	14.56	15.15	15.81	16.52	17.25	18.04	18.82	18.65	18.48	18.37	18.26	18.08	18.20	18.26	18.38	18.50	18.63
135	ASPHALT	0.77	26.95	24.20	22.59	23.08	23.72	24.45	25.23	26.04	26.91	27.77	27.57	27.38	27.26	27.14	26.95	27.08	27.15	27.28	27.42	27.55
136																						
137	CRUDE																					
138	----------																					
139	BCF24		20.28	17.20	15.24	15.71	16.31	17.15	18.04	18.95	19.91	20.86	20.72	20.59	20.52	20.45	20.31	20.38	20.38	20.45	20.52	20.59
140	BCF17		17.50	14.77	13.16	13.63	14.25	14.95	15.71	16.51	17.36	18.21	18.03	17.84	17.72	17.60	17.41	17.54	17.60	17.74	17.87	18.00
141	ISTHMUS		23.43	19.86	17.60	18.09	18.72	19.67	20.67	21.70	22.78	23.91	23.84	23.77	23.70	23.63	23.56	23.56	23.56	23.56	23.56	23.56
142	MAYA		19.64	16.66	14.81	15.29	15.90	16.70	17.56	18.44	19.37	20.29	20.14	19.98	19.90	19.82	19.67	19.75	19.77	19.86	19.95	20.04
143	FORCADOS		25.46	21.70	19.33	19.89	20.59	21.62	22.72	23.80	24.95	26.15	26.08	26.00	25.93	25.85	25.78	25.78	25.78	25.78	25.78	25.78
144	ORIENTE		22.81	19.17	16.88	17.41	18.08	19.07	20.12	21.17	22.28	23.44	23.37	23.30	23.22	23.15	23.08	23.08	23.08	23.08	23.08	23.08
145																						
146	SPIKES																					
147	----------																					
148	BUTANE		20.72	17.49	15.58	16.11	16.82	17.62	18.49	19.43	20.43	21.43	21.21	20.99	20.85	20.71	20.69	20.64	20.71	20.87	21.03	21.18
149	NAPTHA		26.60	22.12	19.58	20.30	21.23	22.30	23.45	24.69	26.02	27.34	27.05	26.76	26.57	26.39	26.09	26.30	26.39	26.60	26.81	27.01
150	KERO		32.63	27.50	24.47	25.32	26.44	27.72	29.09	30.58	32.18	33.77	33.41	33.06	32.84	32.62	32.26	32.51	32.63	32.87	33.12	33.37
151	GAS OIL		29.00	24.13	21.25	22.06	23.13	24.33	25.64	27.05	28.57	30.07	29.74	29.40	29.19	28.98	28.65	28.88	28.99	29.25	29.46	29.70

1 08/04/91 12:04 PM FILE = FINREF 1.3.1, BASE MARGIN, REDUCED DEMAND & PRICE, 75% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE 1 - BUSINESS AS USUAL

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
PETROJAM REVENUES - US$M																					
**********																					
DOMESTIC MARKET REVENUES (US$ equivalent of local currency)																					

PROPANE	2.38	2.22	2.17	2.35	2.56	2.79	3.05	3.32	3.61	3.92	4.08	4.25	4.45	4.65	4.86	5.11	5.38	5.68	5.99	6.33	
BUTANE	11.42	10.65	10.37	11.23	12.23	13.36	14.62	15.90	17.31	18.82	19.61	20.44	21.35	22.31	23.24	24.54	25.83	27.27	28.79	30.40	
MOGAS, LEADED	30.07	23.19	18.58	16.98	15.22	13.15	10.67	7.70	4.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
MOGAS, UNLEADED	3.34	5.80	7.97	11.32	15.23	19.73	24.89	30.80	37.57	45.12	45.99	46.87	47.95	49.05	49.97	51.87	53.61	55.64	57.74	59.92	
KERO/TURBO	29.37	25.93	24.11	25.73	27.70	29.92	32.37	35.02	37.96	41.01	41.99	43.00	44.19	45.43	46.52	48.47	50.32	52.44	54.65	56.96	
AUTO DIESEL	43.78	41.77	41.09	55.05	45.32	47.17	50.26	49.89	54.54	57.43	60.54	63.94	67.82	68.93	69.80	75.29	81.08	83.70	86.50	89.43	
MARINE DIESEL	11.01	9.92	9.42	10.28	11.09	11.85	12.70	13.60	14.59	15.61	15.83	16.05	16.34	16.65	16.89	17.45	17.96	18.56	19.19	19.84	
HEAVY FUEL OIL	82.35	73.36	68.46	66.44	77.22	81.15	87.93	81.75	83.35	75.22	76.71	63.98	65.56	68.12	70.45	59.58	61.16	65.10	69.19	72.83	
ASPHALT	2.95	2.81	2.78	3.01	3.28	3.58	3.91	4.28	4.69	5.13	5.40	5.69	6.00	6.33	6.66	7.10	7.54	8.03	8.56	9.12	

Total	216.66	195.64	184.94	202.39	209.85	222.72	240.39	242.26	257.77	262.26	270.16	264.72	273.66	281.46	288.39	289.40	302.89	316.42	330.62	344.82	
EXPORT REVENUES	US$ - Foreign Exchange																				

PROPANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
BUTANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
MOGAS	30.01	0.00	0.00	0.00	7.94	7.78	18.05	18.83	17.79	18.61	16.91	16.16	14.59	15.37	12.99	10.32	6.13	1.12	0.00	1.71	
KERO/TURBO	9.26	0.00	0.00	6.97	5.40	4.92	7.07	5.98	11.85	10.26	7.15	7.52	7.81	0.00	0.00	0.00	4.83	6.57	4.00	0.00	
AUTO DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
MARINE DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
HEAVY FUEL OIL 1 -Case I	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
HEAVY FUEL OIL 2 -Case II	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

	39.27	0.00	0.00	6.97	13.34	12.70	25.11	24.81	29.64	28.86	24.06	23.68	22.40	15.37	12.99	10.32	10.96	7.70	4.00	1.71	

1 08/04/91 12:04 PM FILE = FINREF 1.3.1, BASE MARGIN, REDUCED DEMAND & PRICE, 75% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE 1 - BUSINESS AS USUAL

189 BAUXITE/ALUMINA REVENUES	US$ - Foreign Exchange																				
190 ----------																					
191 PROPANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
192 BUTANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
193 NOGAS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
194 KERO/TURBO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
195 AUTO DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
196 MARINE DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
197 HEAVY FUEL OIL 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
198 HEAVY FUEL OIL 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
199	----------																				
200	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
201	----------																				
202 TOTAL REVENUES - US$M	255.93	195.66	184.96	209.36	225.19	235.61	265.51	267.07	287.41	291.12	296.22	287.90	296.06	296.83	301.38	299.73	313.86	326.12	334.62	346.53	
203	==========																				
204																					
205																					
206	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
207	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
208 REFINING COSTS - US$M																					
209 **********																					
210																					
211 CRUDE																					
212 ----------																					
213 BCF24	117.98	0.00	0.00	100.02	136.05	144.04	157.20	147.53	108.88	103.79	144.02	121.72	114.81	0.00	0.00	4.17	87.56	126.01	134.08	131.31	
214 BCF17	0.00	38.27	36.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	77.15	74.79	69.40	10.22	0.00	0.00	0.00	
215 ISTHMUS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	77.07	61.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19.61	
216 MAYA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
217 FORCADOS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
218 ORIENTE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
219	----------																				
220 TOTAL WHOLE CRUDE IMPORTS	117.98	38.27	36.12	100.02	136.05	144.04	157.20	147.53	185.95	165.06	144.02	121.72	114.81	77.15	74.79	73.57	97.78	126.01	134.08	150.91	
221																					

1 08/04/91 12:04 PM FILE = FINREF 1.3.1, BASE MARGIN, REDUCED DEMAND & PRICE, 75% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE I - BUSINESS AS USUAL

223 SPIKES																				
224 ----------																				
225 BUTANE	1.81	1.09	1.02	1.47	1.78	1.87	2.09	2.06	1.49	1.64	2.25	2.07	2.05	2.12	2.09	2.11	2.12	2.29	2.30	2.16
226 NAPTHA	53.86	32.37	29.45	16.08	20.54	21.75	34.76	41.00	30.01	40.32	49.17	53.81	54.99	72.23	70.85	69.68	56.07	46.50	45.79	44.86
227 KERO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
228 GAS OIL	35.98	56.90	54.07	50.97	30.81	32.33	33.69	37.62	26.80	39.40	55.25	65.90	73.10	92.03	94.00	100.67	95.45	91.95	86.99	66.98
229	----------																			
230 TOTAL SPIKES IMPORTS	91.66	90.36	84.55	68.52	53.13	55.92	70.53	80.67	58.30	81.37	106.66	121.78	130.14	166.38	166.95	172.46	153.63	140.74	135.08	114.01
231																				
232 PRODUCT IMPORTS																				
233 ----------																				
234 PROPANE	0.97	1.64	1.57	1.44	1.37	1.43	1.49	1.70	1.84	2.15	2.45	2.67	2.81	3.41	3.62	3.79	3.80	3.98	4.32	4.42
235 BUTANE	3.65	6.57	6.41	4.96	4.69	5.39	5.47	6.86	9.95	11.02	9.96	11.13	12.12	14.42	15.34	16.56	16.61	17.28	18.44	20.29
236 NOGAS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
237 KERO/TURBO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
238 AUTO DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
239 MARINE DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.64	16.87
240 HEAVY FUEL OIL	17.61	35.88	32.22	8.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.15	3.47	7.66	0.36	7.62	0.00	0.00	0.00
241	----------																			
242 TOTAL COST OF PROD/RAW MTLS.	22.23	44.09	40.20	14.75	6.05	6.82	6.96	8.55	11.79	13.17	12.41	13.79	20.08	21.31	26.61	20.72	28.03	21.26	27.40	41.58
243																				
244 FIXED/VARIABLE OPERATING COST	15.27	13.99	14.17	13.05	13.31	13.33	13.51	13.36	13.37	13.24	13.31	13.21	13.21	13.26	13.26	13.26	13.24	13.41	13.44	13.42

1 08/04/91 12:06 PM FILE = FINREF 1.3.1, BASE MARGIN, REDUCED DEMAND & PRICE, 75% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE I - BUSINESS AS USUAL

246			1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
247	ANNUAL DEPRECIATION		----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
248	**********																					
249	Existing Capital	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
250	Project Capital yrs	15	0.00	0.61	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	0.43	0.00	0.00	0.00
251																						
252	TOTAL DEPRECIATION		0.97	1.57	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.16	1.03	1.03	1.03	1.03	1.03	0.43	0.00	0.00	0.00
253																						
254	CAPITAL INVESTMENT - PROJECT		0.00	9.10	6.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
255	HEAVY MAINTENANCE COSTS		2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
256																						
257			2.50	11.60	8.90	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
258	FINANCING STRUCTURE																					
259	**********		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
260																						
261	Project Investment		0.00	9.10	6.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
262	Local Component	28.0%	0.00	2.55	1.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
263	Foreign Component	72.0%	0.00	6.55	4.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
264																						
265	Local Component																					
266	----------																					
267	Local Equity Financed	0.0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
268	Local Cash Financed	100.0%	0.00	2.55	1.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
269	Local Loan Financed	0.0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
270	Local Loan Outstanding		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
271	Loan Repayment over yrs	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
272	Interest - % of O/S loa	12.0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
273																						
274	Foreign Component																					
275	----------																					
276	Foreign Equity Financed	100.0%	0.00	6.55	4.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
277	Foreign Loan Financed	0.0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
278	Foreign Loan Outstanding		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
279	Loan Repayment over yrs	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
280	Interest - % of O/S loa	12.0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

1	08/04/91 12:04 PM	FILE = FINREF 1.3.1, BASE MARGIN, REDUCED DEMAND & PRICE, 75% FOREIGN																				
2	JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY																					
3	PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE I - BUSINESS AS USUAL																					
282	ANNUAL ALLOWANCES																					
283	**********																					
284	Old Capital Investment		15.86	15.86	24.96	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36
285	Total Capital Investment		15.86	24.96	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36
286	Declining Balance		15.86	23.37	27.44	26.69	22.22	20.00	18.00	16.20	14.58	13.12	11.81	10.63	9.57	8.61	7.75	6.97	6.28	5.65	5.08	4.58
287	Annual Allowance, Basis	10.0%	1.59	2.34	2.74	2.67	2.22	2.00	1.80	1.62	1.46	1.31	1.18	1.06	0.96	0.86	0.77	0.70	0.63	0.56	0.51	0.46
288																						
289	OWNERSHIP STRUCTURE																					
290	**********																					
291	GOJ/Petrojam	25.0%																				
292	Foreign Investor	75.0%																				
293	Local Investor	0.0%																				
294																						
295																						
296	GR NRG VOLATILITY/SENSITIVITY		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

1 08/04/91 12:04 PM FILE = FINREF 1.3.1, BASE MARGIN, REDUCED DEMAND & PRICE, 75% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE I - BUSINESS AS USUAL
298 PETROJAM PROFIT AND LOSS / INCOME STATEMENT
299 **********

300			1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
301			----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
302	Sales Revenue		255.93	195.64	184.94	209.36	225.19	235.41	265.51	267.07	287.41	291.12	296.22	287.90	296.06	296.83	301.38	299.73	313.86	324.12	334.62	346.53
303	Cost of Sales		231.87	172.71	160.87	183.29	195.24	206.79	234.69	236.76	256.95	259.60	263.18	257.29	265.03	264.84	268.35	266.75	279.44	288.02	296.57	306.50
304																						
305	Gross Margin		24.05	22.93	24.07	26.07	27.95	28.62	30.82	30.31	31.36	31.52	31.12	30.61	31.03	31.99	33.03	32.98	34.41	36.10	38.05	40.03
306	Other Operating Income	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65
307	Operating Expenses		15.27	13.99	14.17	13.05	13.31	13.33	13.51	13.36	13.37	13.24	13.31	13.21	13.21	13.24	13.24	13.24	13.24	13.41	13.44	13.42
308	Heavy Maintenance Expense		2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
309																						
310	Income From Operations		16.94	15.08	16.05	19.17	20.79	21.45	23.46	23.10	24.14	24.43	23.96	23.55	23.97	24.91	25.95	25.89	27.33	28.85	30.76	32.76
311																						
312	Interest Income	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52
313	Interest Expense	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
314																						
315	Non-operating Income		4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39
316																						
317	Profit Before Taxes		19.33	19.47	20.44	23.56	25.18	25.84	27.85	27.50	28.53	28.82	28.35	27.94	28.77	29.30	30.34	30.28	31.72	33.24	35.16	37.15
318																						
319	Less Investment Allowan	20.0%	0.00	1.82	1.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
320	Less Annual Allowance		1.59	2.34	2.74	2.47	2.22	2.00	1.80	1.62	1.46	1.31	1.18	1.06	0.96	0.86	0.77	0.70	0.63	0.56	0.51	0.46
321																						
322	TAXABLE INCOME		17.74	15.32	16.41	21.09	22.96	23.84	26.05	25.88	27.07	27.51	27.17	26.88	27.41	28.44	29.56	29.58	31.09	32.67	34.65	36.69
323																						
324	Income Taxes	33.33%	5.91	5.11	5.47	7.03	7.65	7.95	8.68	8.63	9.02	9.17	9.06	8.96	9.14	9.48	9.85	9.86	10.36	10.89	11.55	12.23
325																						
326	Net Profit		13.42	14.37	14.97	16.53	17.53	17.89	19.17	18.87	19.31	19.65	19.29	18.98	19.23	19.82	20.48	20.42	21.35	22.35	23.61	24.92
327																						
328	DIVIDENDS as % of net p	80.0%	0.00	11.50	11.97	13.22	14.02	14.31	15.33	15.10	15.60	15.72	15.44	15.19	15.38	15.86	16.39	16.34	17.08	17.88	18.89	19.94
329	PROFIT TO RETAINED EARN	20.0%	13.42	2.87	2.99	3.31	3.51	3.58	3.83	3.77	3.90	3.93	3.86	3.80	3.85	3.96	4.10	4.08	4.27	4.47	4.72	4.98
330																						
331	PRESENT VALUE OF DIVIDENDS @	12.00%	DISCOUNT RATE			94.9																
332	**********	NET PROFITS				130.6																

1 08/04/91 12:06 PM FILE = FINREF 1.3.1, BASE MARGIN, REDUCED DEMAND & PRICE, 75% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE I - BUSINESS AS USUAL

BALANCE SHEET

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
ASSETS																					
Current assets																					
Cash in Bank	19.21	-0.79	8.96	13.07	14.25	17.71	21.98	26.46	30.16	33.98	39.58	45.07	50.81	55.13	60.08	64.97	69.95	73.46	76.39	80.24	84.64
Receivables dys 30	18.26	21.04	16.08	15.20	17.21	18.34	19.35	21.82	21.95	23.62	23.95	26.18	25.66	26.33	26.40	26.77	26.64	25.80	26.64	27.50	28.48
Inventories	11.56																				
-Crude/Spikes dys 20		11.49	7.05	6.61	9.23	10.37	10.96	12.48	12.50	13.38	13.50	13.74	13.34	13.42	13.34	13.25	13.48	13.78	14.62	14.75	14.52
- Product dys 20		14.02	10.72	10.13	11.47	12.23	12.90	14.55	14.63	15.75	15.95	16.12	15.78	16.22	16.26	16.51	16.42	17.20	17.76	18.34	18.99
Total Current Assets	49.01	45.75	42.79	45.02	52.17	58.65	65.18	73.31	79.25	86.74	92.96	99.11	103.59	109.10	116.09	119.51	124.49	130.23	135.41	140.83	146.63
Fixed Assets/Plant in Service																					
Gross	15.86	15.86	24.96	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36	31.36
less Accum Deprec	5.10	6.07	7.64	9.64	11.64	13.64	15.64	17.64	19.64	21.64	23.64	25.64	26.80	27.83	28.87	29.90	30.93	31.36	31.36	31.36	31.36
Net Assets in Service	10.76	9.80	17.32	21.72	19.72	17.72	15.72	13.72	11.72	9.72	7.72	5.72	4.56	3.53	2.49	1.46	0.43	0.00	0.00	0.00	0.00
Investments in Subsidia	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07
Total Assets	70.85	66.62	71.18	77.81	82.96	87.45	91.97	98.10	102.05	107.53	111.76	115.90	119.22	123.70	127.65	132.04	135.99	141.30	146.48	151.90	157.70

1 08/04/91 12:04 PM FILE = FINREF 1.3.1, BASE MARGIN, REDUCED DEMAND & PRICE, 75% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE 1 - BUSINESS AS USUAL

362	**********																					
363	Payables dys.	30	36.70	19.06	14.20	13.22	15.06	16.05	17.00	19.29	19.46	21.05	21.34	21.62	21.15	21.78	21.77	22.06	21.92	22.97	23.67	24.38	25.19
364	Interest on Current Deb		0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22
365																							
366			36.92	19.28	14.42	13.44	15.29	16.27	17.22	19.51	19.68	21.27	21.56	21.85	21.37	22.01	21.99	22.28	22.15	23.19	23.89	24.60	25.41
367																							
368	Long Term Debt		1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51
369																							
370	Paid in Capital																						
371	GOJ	0%	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66
372	Anchor - Foreign In	100%	0.00	0.00	6.55	11.16	11.16	11.16	11.16	11.16	11.16	11.16	11.16	11.16	11.16	11.16	11.16	11.16	11.16	11.16	11.16	11.16	11.16
373	Local Partner	100%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
374																							
375	Total		3.66	3.66	10.21	14.82	14.82	14.82	14.82	14.82	14.82	14.82	14.82	14.82	14.82	14.82	14.82	14.82	14.82	14.82	14.82	14.82	14.82
376																							
377	Retained Earnings		28.75	42.17	45.06	48.06	51.34	54.85	58.43	62.26	66.03	69.93	73.86	77.72	81.52	85.37	89.33	93.43	97.51	101.78	106.25	110.97	115.9
378																							
379	Total Liabilities		70.85	66.62	71.18	77.81	82.96	87.65	91.97	98.10	102.05	107.53	111.76	115.90	119.22	123.70	127.65	132.04	135.99	141.30	146.68	151.90	157.70
380																							
381	D/E RATIO(LTD/LTD+RE)		5.0%	3.5%	3.3%	3.1%	2.9%	2.7%	2.5%	2.4%	2.2%	2.1%	2.0%	1.9%	1.8%	1.7%	1.7%	1.6%	1.5%	1.5%	1.4%	1.3%	1.3%
382																							
383																							

1 08/04/91 12:04 PM FILE = FINREF 1.3.1, BASE MARGIN, REDUCED DEMAND & PRICE, 75% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE I - BUSINESS AS USUAL

385
386 SOURCES AND APPLICATIONS OF FUNDS
387 **********
388

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
389 SOURCE OF FUNDS																				
390 **********																				
391 Net from Operations	13.42	14.37	14.97	16.53	17.53	17.89	19.17	18.87	19.51	19.65	19.29	18.98	19.23	19.82	20.48	20.42	21.35	22.35	23.61	24.92
392 Depreciation	0.97	1.57	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.16	1.03	1.03	1.03	1.03	0.43	0.00	0.00	0.00
393 Loans	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
394 Equity	0.00	6.55	4.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
395 BALANCING ITEM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
396																				
397 Total Sources	14.38	22.49	21.57	18.53	19.53	19.89	21.17	20.87	21.51	21.65	21.29	20.15	20.26	20.85	21.52	21.45	21.78	22.35	23.61	24.92
398																				
399 APPLICATION OF FUNDS																				
400 **********																				
401 Increase in Working Capital	14.38	1.90	3.20	5.31	5.51	5.58	5.83	5.77	5.90	5.93	5.86	4.96	4.88	5.00	5.13	5.12	4.70	4.47	4.72	4.98
402 Capital Investments/Construct	0.00	9.10	6.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
403 Principal Repayment - y10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
404 Interest Repayment (part of operatin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
405 Dividend Payment - GOJ Treasu	0.00	2.87	2.99	3.31	3.51	3.58	3.83	3.77	3.90	3.93	3.86	3.80	3.85	3.96	4.10	4.08	4.27	4.47	4.72	4.98
406 Dividend Payment - Foreign Pa	0.00	8.62	8.98	9.92	10.52	10.74	11.50	11.32	11.70	11.79	11.58	11.39	11.54	11.89	12.29	12.25	12.81	13.41	14.16	14.95
407 Dividend Payment - Local Part	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
408																				
409 Total Applications	14.38	22.49	21.57	18.53	19.53	19.89	21.17	20.87	21.51	21.65	21.29	20.15	20.26	20.85	21.52	21.45	21.78	22.35	23.61	24.92

410
411

1 08/04/91 12:06 PM FILE = FINREF 1.3.1, BASE MARGIN, REDUCED DEMAND & PRICE, 75% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE I - BUSINESS AS USUAL

DEMAND FORECAST - millions of barrels

PRIVATE/MARKETING COMPA	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
PROPANE		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BUTANE		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MOGAS, LEADED		0.93	0.85	0.77	0.68	0.58	0.48	0.37	0.25	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MOGAS, UNLEADED		0.10	0.21	0.33	0.45	0.58	0.72	0.86	1.02	1.18	1.35	1.39	1.43	1.47	1.52	1.56	1.61	1.66	1.71	1.76	1.81
KERO/TURBO		0.86	0.86	0.89	0.92	0.95	0.98	1.02	1.05	1.09	1.12	1.16	1.20	1.24	1.29	1.33	1.38	1.42	1.47	1.53	1.58
AUTO DIESEL		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MARINE DIESEL		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HEAVY FUEL OIL		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ASPHALT		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	1.87	1.93	1.99	2.05	2.12	2.18	2.25	2.32	2.40	2.47	2.55	2.63	2.72	2.80	2.89	2.99	3.08	3.18	3.29	3.39

MAJOR CONSUMERS

PROPANE		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BUTANE		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MOGAS, LEADED		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MOGAS, UNLEADED		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
KERO/TURBO		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AUTO DIESEL		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MARINE DIESEL		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HEAVY FUEL OIL		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ASPHALT		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

1 08/04/91 12:04 PM FILE = FINREF 1.3.1, BASE MARGIN, REDUCED DEMAND & PRICE, 75% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE 1 - BUSINESS AS USUAL

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
PRIVATE/MARKETING COMPANIES																				
PROPANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BUTANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MOGAS, LEADED	29.25	22.44	17.91	16.38	14.71	12.73	10.34	7.48	4.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MOGAS, UNLEADED	3.25	5.61	7.67	10.92	14.71	19.09	26.13	29.91	36.53	43.93	44.76	45.60	46.65	47.71	48.59	50.44	52.15	54.13	56.19	58.32
KERO/TURBO	28.35	24.88	23.03	24.61	26.56	28.73	31.14	33.75	36.62	39.64	40.58	41.54	42.69	43.87	44.91	46.81	48.60	50.65	52.80	55.05
AUTO DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MARINE DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HEAVY FUEL OIL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ASPHALT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	60.86	52.93	48.61	51.92	55.97	60.55	65.61	71.13	77.21	83.58	85.35	87.15	89.34	91.58	93.50	97.25	100.75	104.79	108.99	113.37
MAJOR CONSUMERS IMPORTS																				
PROPANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BUTANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MOGAS, LEADED	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MOGAS, UNLEADED	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
KERO/TURBO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AUTO DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MARINE DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HEAVY FUEL OIL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ASPHALT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL NON-PETROJAM IMPORT COS	60.86	52.93	48.61	51.92	55.97	60.55	65.61	71.13	77.21	83.58	85.35	87.15	89.34	91.58	93.50	97.25	100.75	104.79	108.99	113.37

1 08/06/91 12:04 PM FILE = FINREF 1.3.1, BASE MARGIN, REDUCED DEMAND & PRICE, 75% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE I - BUSINESS AS USUAL

483 **********
484 MARGINAL FINANCIAL ANALYSIS
485 ----------

		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
487 REVENUES		----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
488 ----------																					
489 PROPANE		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
490 BUTANE		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
491 MOGAS, LEADED		30.07	23.19	18.58	16.98	15.22	13.15	10.67	7.70	4.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
492 MOGAS, UNLEADED		3.34	5.80	7.97	11.32	15.23	19.73	24.89	30.80	37.57	45.12	45.99	66.87	47.95	49.05	49.97	51.87	53.61	55.64	57.74	59.92
493 KERO/TURBO		29.37	25.93	24.11	25.73	27.70	29.92	32.37	35.02	37.94	41.01	41.99	43.00	44.19	45.43	46.52	48.47	50.32	52.44	54.65	56.96
494 AUTO DIESEL		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
495 MARINE DIESEL		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
496 HEAVY FUEL OIL		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
497 ASPHALT		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
498		----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
499		62.78	54.91	50.66	54.03	58.15	62.80	67.93	73.52	79.68	86.13	87.98	89.87	92.14	94.48	96.50	100.34	103.93	108.08	112.39	116.88
500 COSTS																					
501 -----																					
502 Importation		60.86	52.93	48.61	51.92	55.97	60.55	65.61	71.13	77.21	83.58	85.35	87.15	89.34	91.58	93.50	97.25	100.75	104.79	108.99	113.37
503 Terminalling @/BBL	0.67	1.25	1.29	1.33	1.38	1.42	1.46	1.51	1.56	1.61	1.66	1.71	1.76	1.82	1.88	1.94	2.00	2.07	2.13	2.20	2.27
504		----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
505		62.11	54.22	49.94	53.30	57.39	62.01	67.12	72.69	78.82	85.23	87.06	88.91	91.16	93.46	95.44	99.25	102.81	106.92	111.19	115.64
506		----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
507 MARGINAL PROFIT BEFORE TAX		0.67	0.69	0.71	0.74	0.76	0.79	0.81	0.84	0.87	0.89	0.92	0.95	0.99	1.02	1.05	1.09	1.12	1.16	1.20	1.24
508																					
509 INCOME TAX	33.33%	0.22	0.23	0.24	0.25	0.25	0.26	0.27	0.28	0.29	0.30	0.31	0.32	0.33	0.34	0.35	0.36	0.37	0.39	0.40	0.41
510		----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
511 MARGINAL PROFIT AFTER TAX		0.45	0.46	0.48	0.49	0.51	0.52	0.54	0.56	0.58	0.60	0.62	0.64	0.66	0.68	0.70	0.72	0.75	0.77	0.80	0.83
512		====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====
513 PROFIT REPATRIATION	50.00%	0.22	0.23	0.24	0.25	0.25	0.26	0.27	0.28	0.29	0.30	0.31	0.32	0.33	0.34	0.35	0.36	0.37	0.39	0.40	0.41
514																					
515 NET PRESENT VALUE OF MARGINAL PROFIT	12.00%	4.10																			
516																					

1 05/04/91 12:06 PM FILE = FINREF 1.3.1, BASE MARGIN, REDUCED DEMAND & PRICE, 75% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE I - BUSINESS AS USUAL
519 BANK OF JAMAICA
520 **********
521
522 MARGINAL CASH FLOW ANALYSIS WITH 25.00% GOJ OWNERSHIP OF PETROJAM
523 ----------

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
524																				
525																				
526 SOURCES																				
527 **********																				
528 Current Account																				
529 ----------																				
530 Petrojam Export Sales	39.27	0.00	0.00	6.97	13.34	12.70	25.11	24.81	29.64	28.86	24.06	23.68	22.40	15.37	12.99	10.32	10.96	7.70	4.00	1.71
531																				
532 Capital Account																				
533 ----------																				
534 Equity Investment in Petrojam	0.00	6.55	4.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
535 Loan - Capital Investment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
536																				
537 TOTAL	39.27	6.55	4.61	6.97	13.34	12.70	25.11	24.81	29.64	28.86	24.06	23.68	22.40	15.37	12.99	10.32	10.96	7.70	4.00	1.71
538																				
539 APPLICATIONS																				
540 **********																				
541 Current Account																				
542 ----------																				
543 Petrojam Purchases of Crude	209.64	128.63	120.67	168.54	189.18	199.97	227.73	228.28	244.26	246.43	250.69	243.50	244.95	243.53	241.74	246.03	251.41	266.75	269.17	264.92
544 Petrojam Product Purchases	22.23	44.09	40.20	14.75	6.05	6.82	6.96	8.55	11.79	13.17	12.41	13.79	20.08	21.31	26.61	20.72	28.03	21.26	27.40	41.58
545 Heavy Maintenance Expen 50.0%	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
546 Operating Expense 20.0%	3.05	2.80	2.83	2.61	2.66	2.67	2.70	2.67	2.67	2.65	2.66	2.64	2.64	2.65	2.65	2.65	2.65	2.68	2.69	2.68
547 Marketing Companies Product P	60.86	52.93	48.61	51.92	55.97	60.55	65.61	71.13	77.21	83.58	85.35	87.15	89.34	91.58	93.50	97.25	100.75	104.79	108.99	113.37
548 Major consumers Product Purch	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
549 Interest on Foreign Loan	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
550 Dividend Repatriation - Forei	0.00	8.62	8.98	9.92	10.52	10.74	11.50	11.32	11.70	11.79	11.58	11.39	11.56	11.89	12.29	12.25	12.81	13.41	14.16	14.95
551 Dividend Repatriation - Mktg.	0.22	0.23	0.24	0.25	0.25	0.26	0.27	0.28	0.29	0.30	0.31	0.32	0.33	0.34	0.35	0.36	0.37	0.39	0.40	0.41
552																				

```
  1  08/06/91 12:04 PM     FILE = FINREF 1.3.1, BASE MARGIN, REDUCED DEMAND & PRICE, 75% FOREIGN
  2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
  3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE I  -  BUSINESS AS USUAL
554 --------------------
555 Petrojam Capital Goods        0.00  6.55  4.61  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
556 Principal Repayment           0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
557                              ------------------------------------------------------------------------------------------------------------------------
558          TOTAL               297.26 245.09 227.39 249.23 265.89 282.25 316.02 323.41 349.18 359.17 364.24 360.04 370.12 372.55 378.39 380.51 397.27 410.53 424.06 439.17
559                              ========================================================================================================================
560
561 NET FOREIGN EXCHANGE FLOWS     -258  -239  -225  -242  -253  -270  -291  -299  -320  -330  -340  -336  -348  -357  -365  -370  -386  -403  -420  -437
562                              ************************************************************************************************************************
563
564 PRESENT VALUE OF NET FOREIGN EXCHANGE CASH  12.00%       -2153
565
566 DISCOUNTED BARRELS OF JAMAICA TOTAL DEMAND  90.93  FOREX $23.68 PER BARREL
567
```

1 08/04/91 12:04 PM FILE = FINREF 1.3.1, BASE MARGIN, REDUCED DEMAND & PRICE, 75% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE 1 - BUSINESS AS USUAL
569 MINISTRY OF FINANCE
570 **********
571
572 FISCAL FLOWS WITH 25.00000J OWNERSHIP
573 ----------

		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
574																					
575		----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
576 Sources																					
577 ----------																					
578 Import Duty		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
579 Income Tax - Petrojam		5.91	5.11	5.47	7.03	7.65	7.95	8.68	8.63	9.02	9.17	9.06	8.96	9.14	9.48	9.85	9.86	10.36	10.89	11.55	12.25
580 Income Tax - Marketing Compan		0.22	0.23	0.24	0.25	0.25	0.26	0.27	0.28	0.29	0.30	0.31	0.32	0.33	0.34	0.35	0.36	0.37	0.39	0.40	0.41
581 Dividends from Petrojam Opera		0.00	2.87	2.99	3.31	3.51	3.58	3.83	3.77	3.90	3.93	3.86	3.80	3.85	3.96	4.10	4.08	4.27	4.47	4.72	4.98
582		----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
583 TOTAL		6.14	8.21	8.70	10.58	11.41	11.79	12.79	12.68	13.21	13.40	13.22	13.07	13.31	13.78	14.30	14.31	15.01	15.75	16.67	17.63
584		====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====
585 Applications																					
586 ----------																					
587 Equity Investment	0.00%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
588		----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
589 TOTAL		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
590		====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====
591																					
592 NET CASH FLOW		6.14	8.21	8.70	10.58	11.41	11.79	12.79	12.68	13.21	13.40	13.22	13.07	13.31	13.78	14.30	14.31	15.01	15.75	16.67	17.63
593		====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====
594																					
595 NET PRESENT VALUE @	12.0%	83.35																			
596																					
597																					

1 08/04/91 12:06 PM FILE = FINREF 1.3.1, BASE MARGIN, REDUCED DEMAND & PRICE, 75% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE 1 - BUSINESS AS USUAL
599 OFFSHORE PARTNER WITH 75.00% OWNERSHIP
600 **********
601

602 US$ CASH FLOWS		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
603 ----------		----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
604 Sources																					
605 ----------	YRLY PV	0.00	6.87	6.39	6.30	5.97	5.44	5.20	4.57	4.22	3.80	3.33	2.92	2.64	2.43	2.25	2.00	1.87	1.74	1.64	1.55
606 Dividend Repatriation		0.00	8.62	8.98	9.92	10.52	10.74	11.50	11.32	11.70	11.79	11.58	11.39	11.54	11.89	12.29	12.25	12.81	13.41	14.16	14.95
607																					
608		0.00	8.62	8.98	9.92	10.52	10.74	11.50	11.32	11.70	11.79	11.58	11.39	11.54	11.89	12.29	12.25	12.81	13.41	14.16	14.95
609	CUMUL PV	0.00	6.87	13.26	19.57	25.54	30.97	36.18	40.75	44.97	48.77	52.10	55.02	57.66	60.10	62.34	64.34	66.21	67.95	69.59	71.14
610 Applications	PAYBACK PT	1.0	1.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
611 ----------	CUMUL PV	0.00	5.22	8.50	8.50																
612 Equity Investment 8.50		0.00	6.55	4.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
613	YRLY PV	0.00	5.22	3.28	0.00																
614 AVGE INV POINT		1992.9																			
615 NET CASH FLOW		0.00	2.07	4.37	9.92	10.52	10.74	11.50	11.32	11.70	11.79	11.58	11.39	11.54	11.89	12.29	12.25	12.81	13.41	14.16	14.95
616																					

617
618 PRESENT VALUE OF NET CASH FLOW @ 12.00% 62.64
619 PAYBACK PERIOD OF DCF 0.4
620

08/06/91 01:43 PM FILE = FINREF 2.0.3 BASE MARGIN, REDUCED DEMANDPRICE, 0% FOREIGN
JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE II - CAT CRACKING

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
MARKET FORECAST FOR PETROJAM - millions of barrels																					
LOCAL DEMAND ON REFINERY																					
PROPANE	0.10	0.11	0.11	0.12	0.13	0.13	0.14	0.15	0.15	0.16	0.17	0.18	0.19	0.20	0.21	0.22	0.23	0.24	0.25	0.26	
BUTANE	0.42	0.44	0.46	0.48	0.51	0.53	0.56	0.59	0.62	0.65	0.68	0.71	0.75	0.79	0.83	0.87	0.91	0.96	1.00	1.05	
MOGAS, LEADED	0.93	0.85	0.77	0.68	0.58	0.48	0.37	0.25	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
MOGAS, UNLEADED	0.10	0.21	0.33	0.45	0.58	0.72	0.86	1.02	1.18	1.35	1.39	1.43	1.47	1.52	1.56	1.61	1.66	1.71	1.76	1.81	
KERO/TURBO	0.84	0.86	0.89	0.92	0.95	0.98	1.02	1.05	1.09	1.12	1.16	1.20	1.24	1.29	1.33	1.38	1.42	1.47	1.53	1.58	
AUTO DIESEL	1.35	1.51	1.65	2.14	1.69	1.68	1.71	1.62	1.69	1.70	1.81	1.93	2.06	2.11	2.15	2.31	2.48	2.54	2.60	2.67	
MARINE DIESEL	0.35	0.36	0.38	0.41	0.42	0.43	0.44	0.45	0.46	0.47	0.48	0.49	0.51	0.52	0.53	0.54	0.56	0.57	0.59	0.60	
HEAVY FUEL OIL	4.55	4.71	4.85	4.56	5.10	5.13	5.32	4.74	4.62	4.00	4.11	3.46	3.57	3.73	3.90	3.27	3.35	3.54	3.74	3.91	
ASPHALT	0.11	0.12	0.12	0.13	0.14	0.15	0.16	0.16	0.17	0.18	0.20	0.21	0.22	0.23	0.25	0.26	0.28	0.29	0.31	0.33	
	8.75	9.18	9.58	9.90	10.10	10.24	10.58	10.03	10.11	9.63	10.00	9.62	10.01	10.38	10.76	10.46	10.88	11.33	11.78	12.25	
EXPORTS																					
PROPANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
BUTANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
MOGAS	0.98	0.00	0.00	0.00	2.66	2.61	2.58	2.45	2.36	2.32	2.28	2.34	2.26	2.20	1.72	2.07	2.02	2.02	1.93	1.96	
KERO/TURBO	0.30	0.00	0.00	0.30	0.61	0.37	0.34	0.36	0.32	0.29	0.25	0.21	0.17	0.13	0.00	0.04	0.00	0.00	0.00	0.00	
AUTO DIESEL	0.00	0.00	0.00	0.00	0.00	0.17	0.14	0.47	0.59	0.57	0.49	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
MARINE DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
HEAVY FUEL OIL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.44	0.28	1.03	0.86	0.63	0.93	0.96	0.86	0.50	0.40	0.00	
	1.28	0.00	0.00	0.30	3.27	3.16	3.05	3.29	3.28	3.62	3.22	3.61	3.27	2.96	2.65	3.05	2.86	2.52	2.33	1.96	

1 08/04/91 01:43 PM FILE = FINREF 2.0.3 BASE MARGIN, REDUCED DEMANDSPRICE, OX FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE II - CAT CRACKING
35 Jamaican Bauxite/Alumina Industry
36 Propane)LPG PART OF EXPORTS ABOVE
37 Butane)
38 Gasoline (Mogas, Leaded)
39 Kero/Turbo
40 ADO (Auto Diesel)
41 Marine Diesel
42 Fuel oil

44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
46 TOTAL DEMAND	10.03	9.18	9.58	10.19	13.37	13.40	13.63	13.31	13.39	13.25	13.22	13.23	13.28	13.34	13.41	13.51	13.75	13.84	14.11	14.17

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
51 JAMAICAN IMPORTS																					
53 PROPANE		0.05	0.09	0.09	0.08	0.01	0.01	0.02	0.02	0.03	0.03	0.04	0.05	0.06	0.07	0.11	0.09	0.10	0.11	0.12	0.13
54 BUTANE		0.15	0.30	0.32	0.24	0.31	0.32	0.35	0.41	0.46	0.49	0.52	0.52	0.57	0.61	0.58	0.71	0.75	0.80	0.84	0.91
55 MOGAS		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
56 KERO/TURBO		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.06	0.13	0.15
57 AUTO DIESEL		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.23
58 MARINE DIESEL		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.04	0.21	0.21	0.34	0.10
59 HEAVY FUEL OIL		1.07	2.56	2.57	0.64	0.38	0.39	0.57	0.18	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
61		1.26	2.95	2.98	0.96	0.69	0.72	0.94	0.61	0.66	0.52	0.56	0.57	0.63	0.68	0.73	0.84	1.08	1.18	1.44	1.51

1 08/06/91 01:43 PM FILE = FINREF 2.0.3 BASE MARGIN, REDUCED DEMANDEPRICE, 0% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE II - CAT CRACKING

64 CRUDE RUN - millions of barrels
65 ----------

66 BCF24	5.82	0.00	0.00	6.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
67 BCF17	0.00	2.59	2.74	0.00	5.08	5.39	5.39	4.64	4.16	4.16	4.16	4.96	4.69	4.56	6.85	4.16	4.16	3.85	4.16	3.65
68 ISTHMUS	0.00	0.00	0.00	0.00	4.56	6.72	6.72	7.96	8.76	8.76	8.76	7.43	7.88	8.09	4.06	8.76	8.76	9.07	8.76	9.27
69 MAYA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
70 FORCADOS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
71 ORIENTE	0.00	0.00	0.00	0.00	2.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
72																				
73 TOTAL WHOLE CRUDE	5.82	2.59	2.74	6.37	11.89	12.11	12.11	12.60	12.91	12.91	12.91	12.39	12.57	12.65	10.91	12.91	12.91	12.92	12.91	12.92
74																				
75																				
76 SPIKES RUN - millions of barrels																				
77 ----------																				
78 BUTANE	0.09	0.06	0.07	0.09	0.06	0.06	0.06	0.05	0.04	0.04	0.04	0.05	0.05	0.05	0.09	0.04	0.04	0.04	0.04	0.04
79 NAPTHA	2.04	1.46	1.50	0.79	1.00	0.78	0.78	0.30	0.00	0.00	0.00	0.50	0.34	0.25	0.78	0.00	0.00	0.00	0.00	0.00
80 KERO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
81 GAS OIL	1.24	2.36	2.54	2.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.18	0.00	0.00	0.00	0.00	0.00
82																				
83 TOTAL SPIKES	3.37	3.88	4.11	3.19	1.05	0.84	0.84	0.35	0.04	0.04	0.04	0.56	0.38	0.30	2.04	0.04	0.04	0.04	0.04	0.04
84																				
85																				
86																				

1 08/04/91 01:43 PM FILE = FINREF 2.0.3 BASE MARGIN, REDUCED DEMANDEPRICE, 6X FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE II - CAT CRACKING

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
90 CRUDE AND PRODUCT PRICES - US$/BBL																					
91 **********																					
92																					
93 IMPORT PRODUCT PRICES (C&F)																					
94 ----------																					
95 PROPANE	20.41	17.94	16.54	17.12	17.83	18.62	19.47	20.22	21.03	21.84	21.66	21.48	21.37	21.25	21.08	21.20	21.26	21.38	21.51	21.63	
96 BUTANE	25.02	21.94	20.19	20.89	21.76	22.73	23.78	24.72	25.72	26.72	26.50	26.28	26.14	26.00	25.78	25.93	26.00	26.16	26.32	26.47	
97 MOGAS	32.94	27.88	24.92	25.81	26.98	28.29	29.71	31.19	32.78	34.36	34.01	33.66	33.44	33.21	32.86	33.11	33.22	33.47	33.71	33.96	
98 KERO/TURBO	33.86	28.77	25.78	26.68	27.85	29.17	30.60	32.08	33.68	35.27	34.92	34.56	34.34	34.12	33.76	34.01	34.13	34.37	34.62	34.87	
99 AUTO DIESEL	31.32	26.50	23.66	24.51	25.62	26.87	28.22	29.63	31.15	32.65	32.32	31.99	31.78	31.56	31.23	31.46	31.57	31.81	32.04	32.28	
100 MARINE DIESEL	30.30	25.63	22.89	23.71	24.79	26.00	27.30	28.67	30.13	31.59	31.27	30.94	30.74	30.53	30.21	30.44	30.54	30.77	31.00	31.22	
101 HEAVY FUEL OIL	16.53	14.02	12.56	13.01	13.59	14.25	14.96	15.69	16.48	17.26	17.09	16.92	16.81	16.70	16.52	16.65	16.70	16.82	16.95	17.07	
102																					
103																					
104 EXPORT PRODUCT PRICES; BAUXITE/ALUMINA PRODUCT PRICES																					
105 ----------																					
106 PROPANE	11.61	8.88	7.21	7.50	7.92	8.42	8.96	9.72	10.53	11.33	11.15	10.97	10.86	10.75	10.57	10.69	10.75	10.88	11.00	11.13	
107 BUTANE	14.82	11.43	9.37	9.74	10.28	10.91	11.60	12.54	13.54	14.54	14.32	14.10	13.96	13.82	13.60	13.75	13.82	13.98	14.14	14.29	
108 MOGAS	30.68	25.56	22.52	23.35	24.44	25.68	27.02	28.50	30.09	31.66	31.31	30.96	30.74	30.52	30.17	30.41	30.53	30.77	31.02	31.27	
109 KERO/TURBO	30.94	25.79	22.73	23.56	24.66	25.91	27.26	28.75	30.35	31.94	31.58	31.23	31.01	30.79	30.43	30.68	30.80	31.04	31.29	31.54	
110 AUTO DIESEL	29.33	24.45	21.55	22.34	23.38	24.57	25.85	27.26	28.78	30.28	29.95	29.61	29.40	29.19	28.86	29.09	29.20	29.43	29.67	29.90	
111 MARINE DIESEL	28.36	23.63	20.83	21.59	22.60	23.75	24.99	26.35	27.82	29.27	28.95	28.62	28.42	28.22	27.89	28.12	28.22	28.45	28.68	28.91	
112 HEAVY FUEL OIL 1	15.13	12.59	11.08	11.49	12.02	12.64	13.30	14.03	14.82	15.60	15.43	15.26	15.15	15.04	14.86	14.98	15.04	15.16	15.29	15.41	
113 HEAVY FUEL OIL 2	16.06	13.55	12.06	12.50	13.07	13.71	14.41	15.14	15.93	16.71	16.54	16.36	16.25	16.14	15.97	16.09	16.15	16.27	16.39	16.52	
114																					
115																					
116 IMPORT PARITY FOR MOGAS																					
117 ----------																					
118 MOGAS, LEADED	31.43	26.34	23.32	24.17	25.28	26.55	27.92	29.39	30.98	32.56	32.21	31.86	31.64	31.42	31.07	31.31	31.43	31.67	31.92	32.17	
119 MOGAS, UNLEADED	31.43	26.34	23.32	24.17	25.28	26.55	27.92	29.39	30.98	32.56	32.21	31.86	31.64	31.42	31.07	31.31	31.43	31.67	31.92	32.17	
120																					
121 IMPORT PARITY FOR ASPHALT	26.18	23.43	21.81	22.31	22.95	23.67	24.46	25.26	26.13	26.99	26.80	26.61	26.49	26.37	26.18	26.31	26.37	26.51	26.64	26.78	
122 ----------																					

1 08/04/91 01:43 PM FILE = FINREF 2.0.3 BASE MARGIN, REDUCED DEMAND&PRICE, 0% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE II - CAT CRACKING

124			1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
125	REFINERY GATE PRICE	REFINE	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
126	----------	MARGIN																				
127	PROPANE	2.37	22.78	20.32	18.92	19.49	20.20	20.99	21.84	22.60	23.41	24.21	24.03	23.85	23.74	23.63	23.45	23.57	23.63	23.76	23.88	24.01
128	BUTANE	2.37	27.39	24.31	22.56	23.26	24.13	25.11	26.15	27.09	28.10	29.09	28.87	28.65	28.51	28.37	28.15	28.30	28.38	28.53	28.69	28.84
129	MOGAS, LEADED	0.88	32.31	27.21	24.20	25.05	26.16	27.43	28.80	30.27	31.86	33.44	33.09	32.74	32.52	32.30	31.95	32.19	32.31	32.55	32.80	33.04
130	MOGAS, UNLEADED	0.88	32.32	27.22	24.20	25.05	26.17	27.43	28.80	30.28	31.87	33.44	33.09	32.74	32.52	32.30	31.95	32.19	32.31	32.55	32.80	33.05
131	KERO/TURBO	1.21	35.07	29.99	26.99	27.89	29.06	30.38	31.81	33.29	34.89	36.48	36.13	35.77	35.55	35.33	34.98	35.22	35.34	35.59	35.83	36.08
132	AUTO DIESEL	1.17	32.49	27.67	24.83	25.68	26.79	28.04	29.39	30.80	32.32	33.82	33.49	33.16	32.94	32.73	32.40	32.63	32.74	32.98	33.21	33.45
133	MARINE DIESEL	1.59	31.89	27.22	24.48	25.30	26.38	27.59	28.89	30.26	31.72	33.18	32.86	32.53	32.33	32.12	31.80	32.03	32.13	32.36	32.59	32.81
134	HEAVY FUEL OIL	1.56	18.08	15.58	14.11	14.56	15.15	15.81	16.52	17.25	18.04	18.82	18.65	18.48	18.37	18.26	18.08	18.20	18.26	18.38	18.50	18.63
135	ASPHALT	0.77	26.95	24.20	22.59	23.08	23.72	24.45	25.23	26.04	26.91	27.77	27.57	27.38	27.26	27.14	26.95	27.08	27.15	27.28	27.42	27.55
136																						
137	CRUDE																					
138	----------																					
139	BCF24		20.28	17.20	15.24	15.71	16.31	17.15	18.04	18.95	19.91	20.86	20.72	20.59	20.52	20.45	20.31	20.38	20.38	20.45	20.52	20.59
140	BCF17		17.50	14.77	13.16	13.63	14.25	14.95	15.71	16.51	17.36	18.21	18.03	17.84	17.72	17.60	17.41	17.54	17.60	17.74	17.87	18.00
141	ISTHMUS		23.43	19.86	17.60	18.09	18.72	19.67	20.67	21.70	22.78	23.91	23.84	23.77	23.70	23.63	23.56	23.56	23.56	23.56	23.56	23.56
142	MAYA		19.64	16.66	14.81	15.29	15.90	16.70	17.56	18.44	19.37	20.29	20.14	19.98	19.90	19.82	19.67	19.75	19.77	19.86	19.95	20.04
143	FORCADOS		25.46	21.70	19.33	19.89	20.59	21.62	22.72	23.80	24.95	26.15	26.08	26.00	25.93	25.85	25.78	25.78	25.78	25.78	25.78	25.78
144	ORIENTE		22.81	19.17	16.88	17.41	18.08	19.07	20.12	21.17	22.28	23.44	23.37	23.30	23.22	23.15	23.08	23.08	23.08	23.08	23.08	23.08
145																						
146	SPIKES																					
147	----------																					
148	BUTANE		20.72	17.49	15.58	16.11	16.82	17.62	18.49	19.43	20.43	21.43	21.21	20.99	20.85	20.71	20.49	20.64	20.71	20.87	21.03	21.18
149	NAPTHA		26.40	22.12	19.58	20.30	21.23	22.30	23.45	24.69	26.02	27.34	27.05	26.76	26.57	26.39	26.09	26.30	26.39	26.60	26.81	27.01
150	KERO		32.63	27.50	24.47	25.32	26.44	27.72	29.09	30.58	32.18	33.77	33.41	33.06	32.84	32.62	32.26	32.51	32.63	32.87	33.12	33.37
151	GAS OIL		29.00	24.13	21.25	22.06	23.13	24.33	25.64	27.05	28.57	30.07	29.74	29.40	29.19	28.98	28.65	28.88	28.99	29.23	29.46	29.70

1 08/04/91 01:43 PM FILE = FINREF 2.0.3 BASE MARGIN, REDUCED DEMAND&PRICE, OX FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE II - CAT CRACKING

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
PETROJAM REVENUES - US$M																					
DOMESTIC MARKET REVENUES (US$ equivalent of local currency)																					
PROPANE	2.38	2.22	2.17	2.35	2.56	2.79	3.05	3.32	3.61	3.92	4.08	4.25	4.45	4.65	4.86	5.11	5.38	5.68	5.99	6.33	
BUTANE	11.42	10.65	10.37	11.23	12.23	13.36	14.62	15.90	17.31	18.82	19.61	20.44	21.35	22.31	23.26	24.54	25.83	27.27	28.79	30.40	
MOGAS, LEADED	30.07	23.19	18.58	16.98	15.22	13.15	10.67	7.70	4.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
MOGAS, UNLEADED	3.34	5.80	7.97	11.32	15.23	19.73	26.89	30.80	37.57	45.12	45.99	46.87	47.95	49.05	49.97	51.87	53.61	55.64	57.74	59.92	
KERO/TURBO	29.37	25.93	24.11	25.73	27.70	29.92	32.37	35.02	37.94	41.01	41.99	43.00	44.19	45.43	46.52	48.47	50.32	52.44	54.65	56.96	
AUTO DIESEL	43.78	41.77	41.08	55.05	45.32	47.17	50.26	49.89	54.54	57.43	60.54	63.94	67.82	68.93	69.80	75.29	81.08	83.70	86.50	89.43	
MARINE DIESEL	11.01	9.92	9.42	10.28	11.09	11.85	12.70	13.60	14.59	15.61	15.83	16.05	16.34	16.65	16.89	17.45	17.96	18.56	19.19	19.84	
HEAVY FUEL OIL	82.35	73.36	68.46	66.44	77.22	81.15	87.93	81.75	83.35	75.22	76.71	63.98	65.56	68.12	70.45	59.58	61.16	65.10	69.19	72.83	
ASPHALT	2.95	2.81	2.78	3.01	3.28	3.58	3.91	4.28	4.69	5.13	5.40	5.69	6.00	6.33	6.66	7.10	7.54	8.03	8.56	9.12	
Total	216.66	195.64	184.94	202.39	209.85	222.72	240.39	242.26	257.77	262.26	270.16	264.22	273.66	281.46	288.39	289.40	302.89	316.62	330.62	344.82	
EXPORT REVENUES	US$ - Foreign Exchange																				
PROPANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
BUTANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
MOGAS	30.01	0.00	0.00	0.00	65.02	67.10	69.63	69.90	71.05	73.50	71.55	72.33	69.57	67.29	51.76	63.05	61.73	62.12	59.78	60.72	
KERO/TURBO	9.26	0.00	0.00	6.97	14.94	9.65	9.25	10.39	9.86	9.33	7.95	6.61	5.21	4.05	0.00	1.12	0.00	0.00	0.00	0.00	
AUTO DIESEL	0.00	0.00	0.00	0.00	0.00	4.21	3.49	12.84	17.02	17.13	14.54	0.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
MARINE DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
HEAVY FUEL OIL 1 -Case I	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.83	3.10	15.76	12.77	9.44	13.89	14.06	12.63	7.58	6.08	0.00	
HEAVY FUEL OIL 2 -Case II	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	39.27	0.00	0.00	6.97	79.97	80.96	82.37	93.12	97.93	106.79	97.14	95.56	87.55	80.77	65.64	78.23	74.36	69.70	65.86	60.72	

1 08/04/91 01:43 PM FILE = FINREF 2.0.3 BASE MARGIN, REDUCED DEMAND&PRICE, 0% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE II - CAT CRACKING

BAUXITE/ALUMINA REVENUES US$ - Foreign Exchange

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
PROPANE		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BUTANE		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MOGAS		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
KERO/TURBO		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AUTO DIESEL		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MARINE DIESEL		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HEAVY FUEL OIL 1		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HEAVY FUEL OIL 2		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL REVENUES - US$M		255.93	195.64	184.96	209.36	289.82	303.68	322.76	335.38	355.69	369.05	367.29	359.78	361.21	362.23	354.03	367.63	377.25	386.12	396.48	405.54

REFINING COSTS - US$M

CRUDE

BCF24		117.98	0.00	0.00	100.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BCF17		0.00	38.27	36.12	0.00	72.37	80.68	84.76	76.58	72.19	75.72	74.94	88.48	83.10	80.29	119.21	72.92	73.18	68.23	74.28	65.64
ISTHMUS		0.00	0.00	0.00	0.00	85.28	132.12	138.83	172.73	199.45	209.39	208.77	176.65	186.68	191.12	95.62	226.29	206.29	213.68	206.29	218.41
MAYA		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FORCADOS		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ORIENTE		0.00	0.00	0.00	0.00	40.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		117.98	38.27	36.12	100.02	198.50	212.80	223.59	249.32	271.64	285.11	283.70	265.12	269.78	271.41	214.83	279.21	279.47	281.91	280.57	284.05
TOTAL WHOLE CRUDE IMPORTS		117.98	38.27	36.12	100.02	198.50	212.80	223.59	249.32	271.64	285.11	283.70	265.12	269.78	271.41	214.83	279.21	279.47	281.91	280.57	284.05

1 08/06/91 01:43 PM FILE = FINREF 2.0.3 BASE MARGIN, REDUCED DEMAND&PRICE, 0% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE II - CAT CRACKING

223 SPIKES																				
224 ----------																				
225 BUTANE	1.81	1.09	1.02	1.47	0.98	1.03	1.08	0.92	0.82	0.86	0.85	1.15	0.99	0.98	1.79	0.83	0.83	0.76	0.84	0.77
226 NAPTHA	53.86	32.37	29.45	16.08	21.16	17.33	18.23	7.48	0.00	0.00	0.00	13.48	8.92	6.65	20.38	0.00	0.00	0.00	0.00	0.00
227 KERO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
228 GAS OIL	35.98	56.90	54.07	50.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	33.67	0.00	0.00	0.00	0.00	0.00
229																				
230 TOTAL SPIKES IMPORTS	91.66	90.36	84.55	68.52	22.14	18.36	19.31	8.40	0.82	0.86	0.85	14.63	9.91	7.63	55.84	0.83	0.83	0.76	0.84	0.77
231																				
232 PRODUCT IMPORTS																				
233 ----------																				
234 PROPANE	0.97	1.64	1.57	1.44	0.20	0.20	0.36	0.44	0.54	0.72	0.95	1.18	1.33	1.55	2.38	1.86	2.10	2.26	2.67	2.84
235 BUTANE	3.65	6.57	6.41	4.96	6.67	7.30	8.25	10.01	11.74	12.97	13.74	13.62	14.79	15.75	14.96	18.36	19.46	21.01	22.19	23.96
236 MOGAS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
237 KERO/TURBO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.62	2.01	4.42	5.22
238 AUTO DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.35	7.30
239 MARINE DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.21	1.33	6.47	6.40	10.41	3.08
240 HEAVY FUEL OIL	17.61	35.88	32.22	8.36	5.11	5.51	8.57	2.81	3.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
241																				
242 TOTAL COST OF PROD/RAW MTLS.	22.23	44.09	40.20	14.75	11.98	13.02	17.17	13.26	15.28	13.69	14.68	14.80	16.11	17.30	18.56	21.55	28.64	31.68	40.04	42.40
243																				
244 FIXED/VARIABLE OPERATING COST	15.27	13.99	14.17	15.44	19.34	19.34	19.34	19.34	19.35	19.35	19.35	19.34	19.34	19.34	19.34	19.35	19.35	19.35	19.35	19.35

1 08/04/91 01:43 PM FILE = FINREF 2.0.3 BASE MARGIN, REDUCED DEMANDEPRICE, 0% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE 11 - CAT CRACKING

246			1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
247	ANNUAL DEPRECIATION		----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
248	**********																					
249	Existing Capital	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
250	Project Capital yrs	15	0.20	1.53	5.62	8.70	8.70	8.70	8.70	8.70	8.70	8.70	8.70	8.70	8.70	8.70	8.70	8.50	7.17	3.08	0.00	0.00
251																						
252	TOTAL DEPRECIATION		1.17	2.49	6.58	9.67	9.67	9.67	9.67	9.67	9.67	9.67	9.67	8.83	8.70	8.70	8.70	8.50	7.17	3.08	0.00	0.00
253																						
254	CAPITAL INVESTMENT - PROJECT		3.00	19.92	61.33	46.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
255	HEAVY MAINTENANCE COSTS		2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30
256																						
257			5.50	22.42	63.83	48.75	2.50	2.50	2.50	2.50	2.50	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30
258	FINANCING STRUCTURE																					
259	**********		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
260																						
261	Project Investment		3.00	19.92	61.33	46.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
262	Local Component	17.0%	0.51	3.39	10.43	7.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
263	Foreign Component	83.0%	2.49	16.53	50.90	38.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
264																						
265	Local Component																					
266	----------																					
267	Local Equity Financed	0.0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
268	Local Cash Financed	100.0%	0.51	3.39	10.43	7.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
269	Local Loan Financed	0.0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
270	Local Loan Outstanding		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
271	Loan Repayment over yrs	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
272	Interest - % of O/S loa	12.0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
273																						
274	Foreign Component																					
275	----------																					
276	Foreign Equity Financed	0.0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
277	Foreign Loan Financed	100.0%	2.49	16.53	50.98	38.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
278	Foreign Loan Outstanding		2.49	19.02	69.93	108.31	97.48	86.65	75.82	64.99	54.16	43.33	32.49	21.66	10.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00
279	Loan Repayment over yrs	10	0.00	0.00	0.00	0.00	10.83	10.83	10.83	10.83	10.83	10.83	10.83	10.83	10.83	10.83	0.00	0.00	0.00	0.00	0.00	0.00
280	Interest - % of O/S loa	12.0%	0.30	2.28	8.39	13.00	11.70	10.40	9.10	7.80	6.50	5.20	3.90	2.60	1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00

1 08/04/91 01:43 PM FILE = PINREF 2.0.3 BASE MARGIN, REDUCED DEMAND&PRICE, 0% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE II - CAT CRACKING

282 ANNUAL ALLOWANCES																					
283 **********																					
284 Old Capital Investment		15.86	18.86	38.78	100.11	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36
285 Total Capital Investment		18.86	38.78	100.11	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36
286 Declining Balance		18.86	36.90	94.53	131.33	118.20	106.38	95.74	86.17	77.55	69.80	62.82	56.53	50.88	45.79	41.21	37.09	33.38	30.04	27.04	24.34
287 Annual Allowance, Basis	10.0%	1.89	3.69	9.45	13.13	11.82	10.64	9.57	8.62	7.76	6.98	6.28	5.65	5.09	4.58	4.12	3.71	3.34	3.00	2.70	2.43
288																					
289 OWNERSHIP STRUCTURE																					
290 **********																					
291 GOJ/Petrojam	100.0%																				
292 Foreign Investor	0.0%																				
293 Local Investor	0.0%																				
294																					
295																					
296 MARGIN VOLATILITY		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

1 08/04/91 01:43 PM FILE = FINREF 2.0.3 BASE MARGIN, REDUCED DEMAND&PRICE, 0% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE II - CAT CRACKING

298 PETROJAM PROFIT AND LOSS / INCOME STATEMENT
299 **********

			1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
300																						
301																						
302	Sales Revenue		255.93	195.64	184.94	209.36	289.82	303.68	322.76	335.38	355.69	369.05	367.29	359.78	361.21	362.23	354.03	367.63	377.25	386.12	396.48	405.54
303	Cost of Sales		231.87	172.71	160.87	183.29	232.61	244.18	260.07	270.98	287.74	299.66	299.26	294.55	295.80	296.35	289.23	301.59	308.96	314.35	321.45	327.23
304																						
305	Gross Margin		24.05	22.93	24.07	26.07	57.20	59.50	62.69	64.40	67.95	69.39	68.05	65.23	65.41	65.88	64.80	66.04	68.31	71.77	75.03	78.31
306	Other Operating Income	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65
307	Operating Expenses		15.27	13.99	14.17	15.44	19.34	19.34	19.34	19.34	19.35	19.35	19.35	19.34	19.34	19.34	19.34	19.35	19.35	19.35	19.35	19.35
308	Heavy Maintenance Expense		2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30
309																						
310	Income From Operations		14.94	15.08	16.05	16.78	44.01	46.31	49.50	51.21	54.76	55.39	54.06	51.24	51.41	51.89	50.81	52.05	54.32	57.78	61.03	64.31
311																						
312	Interest Income	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52
313	Interest Expense	0.13	0.43	2.41	8.52	13.13	11.83	10.53	9.23	7.93	6.63	5.33	4.03	2.73	1.43	0.13	0.13	0.13	0.13	0.13	0.13	0.13
314																						
315	Non-operating Income		4.09	2.11	-4.00	-8.60	-7.30	-6.01	-4.71	-3.41	-2.11	-0.81	0.69	1.79	3.09	4.39	4.39	4.39	4.39	4.39	4.39	4.39
316																						
317	Profit Before Taxes		19.03	17.19	12.05	8.17	36.70	40.30	44.79	47.80	52.65	54.59	54.55	53.03	54.51	56.28	55.20	56.44	58.71	62.17	65.43	68.71
318																						
319	Less Investment Allowan	20.0%	0.60	3.98	12.27	9.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
320	Less Annual Allowance		1.89	3.69	9.45	13.13	11.82	10.64	9.57	8.62	7.76	6.98	6.28	5.65	5.09	4.58	4.12	3.71	3.34	3.00	2.70	2.43
321																						
322	TAXABLE INCOME		16.54	9.52	-9.67	-14.21	24.88	29.66	35.22	39.19	44.90	47.61	48.27	47.38	49.42	51.70	51.08	52.73	55.37	59.16	62.72	66.27
323																						
324	Income Taxes	33.33%	5.51	3.17	-3.22	-4.74	8.29	9.89	11.74	13.06	14.96	15.87	16.09	15.79	16.47	17.23	17.03	17.58	18.46	19.72	20.91	22.09
325																						
326	Net Profit		13.52	14.02	15.27	12.91	28.41	30.41	33.05	34.74	37.69	38.72	38.46	37.24	38.03	39.05	38.18	38.86	40.25	42.45	44.52	46.62
327																						
328	DIVIDENDS as % of net p	80.0%	0.00	11.22	12.22	10.33	22.73	24.33	26.44	27.79	30.15	30.97	30.77	29.79	30.43	31.24	30.54	31.09	32.20	33.96	35.62	37.29
329	PROFIT TO RETAINED EARN	20.0%	13.52	2.80	3.05	2.58	5.68	6.08	6.61	6.95	7.54	7.74	7.69	7.45	7.61	7.81	7.64	7.77	8.05	8.49	8.90	9.32
330																						

331 PRESENT VALUE OF DIVIDENDS @ 12.00% DISCOUNT RATE 151.1
332 ********** NET PROFIT 200.9

1 08/04/91 01:43 PM FILE = FINREF 2.0.3 BASE MARGIN, REDUCED DEMAND&PRICE, OK FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE II - CAT CRACKING

BALANCE SHEET

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
ASSETS																					
Current assets																					
Cash in Bank	19.21	-0.70	11.03	17.28	22.14	15.54	17.63	19.83	22.67	25.53	29.21	34.73	39.78	43.87	48.18	65.52	80.43	94.92	105.60	113.73	122.10
Receivables dys 30	18.26	21.06	16.08	15.20	17.21	23.82	26.96	26.53	27.57	29.24	30.33	30.19	29.57	29.69	29.77	29.10	30.22	31.01	31.74	32.59	33.33
Inventories	11.56																				
-Crude/Spikes dys 20		11.49	7.05	6.61	9.23	12.09	12.67	13.31	14.12	14.93	15.67	15.59	15.33	15.33	15.29	14.83	15.34	15.36	15.49	15.42	15.61
- Product dys 20		14.02	10.72	10.13	11.47	15.88	16.64	17.69	18.38	19.49	20.22	20.13	19.71	19.79	19.85	19.40	20.14	20.67	21.16	21.73	22.22
Total Current Assets	49.01	45.84	44.87	49.22	60.06	67.33	71.90	77.35	82.73	89.18	95.44	100.63	104.39	108.67	113.10	128.85	146.13	161.96	173.98	183.47	193.26
Fixed Assets/Plant in Service																					
Gross	15.86	18.86	38.78	100.11	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36
Less Accum Deprec	5.10	6.27	8.76	15.34	25.01	34.68	44.34	54.01	63.68	73.34	83.01	92.68	101.51	110.21	118.91	127.61	136.11	143.28	146.36	146.36	146.36
Net Assets in Service	10.76	12.60	30.02	84.77	121.35	111.68	102.02	92.35	82.68	73.02	63.35	53.68	44.85	36.15	27.45	18.76	10.26	3.08	0.00	0.00	0.00
Investments in Subsidie	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07
Total Assets	70.85	69.51	85.97	145.06	192.48	190.08	184.99	180.77	176.49	173.27	169.86	165.39	160.32	155.90	151.62	158.67	167.46	176.12	185.05	194.54	204.33

1 08/04/91 01:43 PM FILE = FINREF 2.0.3 BASE MARGIN, REDUCED DEMAND&PRICE, 0% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE II - CAT CRACKING

361 LIABILITIES																					
362 **********																					
363 Payables dys.	30	36.70	19.06	14.20	13.22	15.06	19.12	20.07	21.38	22.27	23.65	24.63	24.59	24.21	24.31	24.36	23.77	24.79	25.39	25.84	26.42	26.90
364 Interest on Current Deb		0.22	0.52	2.50	8.61	13.22	11.92	10.62	9.32	8.02	6.72	5.42	4.12	2.82	1.52	0.22	0.22	0.22	0.22	0.22	0.22	0.22
365																						
366		36.92	19.58	16.70	21.84	28.28	31.04	30.69	30.70	30.29	30.37	30.05	28.72	27.03	25.83	24.58	23.99	25.01	25.61	26.06	26.64	27.12
367																						
368 Long Term Debt		1.51	4.00	20.54	71.44	109.83	99.00	88.16	77.33	66.50	55.67	44.84	34.01	23.18	12.35	1.51	1.51	1.51	1.51	1.51	1.51	1.51
369																						
370 Paid in Capital																						
371 GOJ	0%	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66
372 Anchor - Foreign In	100%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
373 Local Partner	100%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
374																						
375 Total		3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66
376																						
377 Retained Earnings		28.75	42.27	45.07	48.13	50.71	56.39	62.47	69.08	76.03	83.57	91.31	99.01	106.65	114.06	121.87	129.50	137.28	145.33	153.82	162.72	172.04
378																						
379 Total Liabilities		70.85	69.51	85.97	145.06	192.48	190.08	184.99	180.77	176.49	173.27	169.86	165.39	160.32	155.90	151.62	158.67	167.46	176.12	185.05	194.54	204.33
380																						
381 D/E RATIO(LTD/LTD+RE)		5.0%	8.7%	31.3%	59.7%	68.4%	63.7%	58.5%	52.8%	46.7%	40.0%	32.9%	25.6%	17.9%	9.8%	1.2%	1.2%	1.1%	1.0%	1.0%	0.9%	0.9%
382																						
383																						

1 08/04/91 01:43 PM FILE = FINREF 2.0.3 BASE MARGIN, REDUCED DEMAND&PRICE, 0% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE II - CAT CRACKING

385
386 SOURCES AND APPLICATIONS OF FUNDS
387 **********
388

389 SOURCE OF FUNDS	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
390 **********	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
391 Net from Operations	13.52	14.02	15.27	12.91	28.61	30.41	33.05	34.74	37.69	38.72	38.66	37.26	38.03	39.05	38.18	38.86	40.25	42.45	44.52	46.62
392 Depreciation	1.17	2.49	6.58	9.67	9.67	9.67	9.67	9.67	9.67	9.67	9.67	8.83	8.70	8.70	8.70	8.50	7.17	3.08	0.00	0.00
395 Loans	2.49	16.53	50.90	38.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
396 Equity	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
395 BALANCING ITEM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
396																				
397 Total Sources	17.17	33.05	72.76	60.96	38.08	40.08	42.72	44.41	47.35	48.38	48.13	46.07	46.73	47.75	46.88	47.36	47.42	45.53	44.52	46.62
398																				
399 APPLICATION OF FUNDS																				
400 **********																				
401 Increase in Working Capital	14.17	1.91	-0.79	4.39	4.52	4.92	5.45	5.78	6.37	6.58	6.53	5.45	5.48	5.68	16.34	16.27	15.22	11.57	8.90	9.32
402 Capital Investments/Construct	3.00	19.92	61.33	46.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
403 Principal Repayment yrs 10	0.00	0.00	0.00	0.00	10.83	10.83	10.83	10.83	10.83	10.83	10.83	10.83	10.83	10.83	0.00	0.00	0.00	0.00	0.00	0.00
404 Interest Repayment (part of operatin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
405 Dividend Payment - GOJ Treasu	0.00	11.22	12.22	10.33	22.73	24.33	26.44	27.79	30.15	30.97	30.77	29.79	30.43	31.24	30.56	31.09	32.20	33.96	35.62	37.29
406 Dividend Payment - Foreign Pa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
407 Dividend Payment - Local Part	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
408																				
409 Total Applications	17.17	33.05	72.76	60.96	38.08	40.08	42.72	44.41	47.35	48.38	48.13	46.07	46.73	47.75	46.88	47.36	47.42	45.53	44.52	46.62
410																				

1 08/04/91 01:43 PM FILE = FINREF 2.0.3 BASE MARGIN, REDUCED DEMANDEPRICE, 8% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE II - CAT CRACKING
447 IMPORTATION COSTS NON-PETROJAM- US$M
448 **********

449		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
450	PRIVATE/MARKETING COMPANIES	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
451	----------																				
452	PROPANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
453	BUTANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
454	MOGAS, LEADED	29.25	22.44	17.91	16.38	14.71	12.73	10.34	7.48	4.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
455	MOGAS, UNLEADED	3.25	5.61	7.67	10.92	14.71	19.09	24.13	29.91	36.53	43.93	44.76	45.60	46.65	47.71	48.59	50.44	52.15	54.13	56.19	58.32
456	KERO/TURBO	28.35	26.88	23.03	24.61	26.54	28.73	31.14	33.75	36.62	39.64	40.58	41.54	42.69	43.87	44.91	46.81	48.60	50.65	52.80	55.05
457	AUTO DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
458	MARINE DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
459	HEAVY FUEL OIL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
460	ASPHALT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
461																					
462		60.86	52.93	48.61	51.92	55.97	60.55	65.61	71.13	77.21	83.58	85.35	87.15	89.34	91.58	93.50	97.25	100.75	104.79	108.99	113.37
463																					
464																					
465	MAJOR CONSUMERS IMPORTS																				
466	----------																				
467	PROPANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
468	BUTANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
469	MOGAS, LEADED	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
470	MOGAS, UNLEADED	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
471	KERO/TURBO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
472	AUTO DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
473	MARINE DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
474	HEAVY FUEL OIL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
475	ASPHALT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
476																					
477		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
478																					
479	TOTAL NON-PETROJAM IMPORT COS	60.86	52.93	48.61	51.92	55.97	60.55	65.61	71.13	77.21	83.58	85.35	87.15	89.34	91.58	93.50	97.25	100.75	104.79	108.99	113.37
480																					

1 08/04/91 01:43 PM · FILE = FINREF 2.0.3 BASE MARGIN, REDUCED DEMAND&PRICE, 0% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE II - CAT CRACKING

482 PRIVATE/MARKETING COMPANIES
483 **********
484 MARGINAL FINANCIAL ANALYSIS
485 ----------

		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
487 REVENUES		----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
488 ----------																					
489 PROPANE		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
490 BUTANE		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
491 MOGAS, LEADED		30.07	23.19	18.58	16.98	15.22	13.15	10.67	7.70	4.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
492 MOGAS, UNLEADED		3.34	5.80	7.97	11.32	15.23	19.73	24.89	30.80	37.57	45.12	45.99	46.87	47.95	49.05	49.97	51.87	53.61	55.66	57.74	59.92
493 KERO/TURBO		29.37	25.93	24.11	25.73	27.70	29.92	32.37	35.02	37.94	41.01	41.99	43.00	44.19	45.43	46.52	48.47	50.32	52.44	54.65	56.96
494 AUTO DIESEL		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
495 MARINE DIESEL		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
496 HEAVY FUEL OIL		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
497 ASPHALT		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
498																					
499		62.78	54.91	50.66	54.03	58.15	62.80	67.93	73.52	79.68	86.13	87.98	89.87	92.14	94.48	96.50	100.34	103.93	108.08	112.39	116.88
500 COSTS																					
501 -----																					
502 Importation		60.88	52.93	48.61	51.92	55.97	60.55	65.61	71.13	77.21	83.58	85.35	87.15	89.34	91.58	93.50	97.25	100.75	104.79	108.99	113.37
503 Terminalling @/BBL	0.67	1.29	1.29	1.33	1.38	1.42	1.46	1.51	1.56	1.61	1.66	1.71	1.76	1.82	1.88	1.94	2.00	2.07	2.13	2.20	2.27
504																					
505		62.11	54.22	49.94	53.30	57.39	62.01	67.12	72.69	78.82	85.23	87.06	88.91	91.16	93.46	95.44	99.25	102.81	106.92	111.19	115.64
506																					
507 MARGINAL PROFIT BEFORE TAX		0.67	0.69	0.71	0.74	0.76	0.79	0.81	0.84	0.87	0.89	0.92	0.95	0.99	1.02	1.05	1.09	1.12	1.16	1.20	1.24
508																					
509 INCOME TAX	33.33%	0.22	0.23	0.24	0.25	0.25	0.26	0.27	0.28	0.29	0.30	0.31	0.32	0.33	0.34	0.35	0.36	0.37	0.39	0.40	0.41
510																					
511 MARGINAL PROFIT AFTER TAX		0.45	0.46	0.48	0.49	0.51	0.52	0.54	0.56	0.58	0.60	0.62	0.64	0.66	0.68	0.70	0.72	0.75	0.77	0.80	0.83
512																					
513 PROFIT REPATRIATION	50.00%	0.22	0.23	0.24	0.25	0.25	0.26	0.27	0.28	0.29	0.30	0.31	0.32	0.33	0.34	0.35	0.36	0.37	0.39	0.40	0.41
514																					

515 NET PRESENT VALUE OF MARGINAL PROFIT 12.00% 4.10
516

1 08/04/91 01:43 PM FILE = FINREF 2.0.3 BASE MARGIN, REDUCED DEMANDPRICE, 0% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE II - CAT CRACKING
519 BANK OF JAMAICA
520 **********
521
522 MARGINAL CASH FLOW ANALYSIS WITH 100% GOJ OWNERSHIP OF PETROJAM
523 ----------

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
524																				
525																				
526 SOURCES																				
527 **********																				
528 Current Account																				
529 ----------																				
530 Petrojam Export Sales	39.27	0.00	0.00	6.97	79.97	80.96	82.37	93.12	97.93	106.79	97.14	95.56	87.55	80.77	65.64	78.23	74.36	69.70	65.86	60.72
531																				
532 Capital Account																				
533 ----------																				
534 Equity Investment in Petrojam	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
535 Loan - Capital Investment	2.49	16.53	50.90	38.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
536																				
537 TOTAL	41.76	16.53	50.90	45.35	79.97	80.96	82.37	93.12	97.93	106.79	97.14	95.56	87.55	80.77	65.64	78.23	74.36	69.70	65.86	60.72
538																				
539 APPLICATIONS																				
540 **********																				
541 Current Account																				
542 ----------																				
543 Petrojam Purchases of Crude	$209.64	128.63	120.67	168.54	220.64	231.16	242.90	257.72	272.46	285.97	284.56	279.75	279.69	279.04	270.67	280.04	280.30	282.67	281.41	284.82
544 Petrojam Product Purchases	22.23	44.09	40.20	14.75	11.98	13.02	17.17	13.26	15.28	13.69	14.68	14.80	16.11	17.30	18.56	21.55	28.64	31.68	40.04	42.40
545 Heavy Maintenance Expen 50.0%	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65
546 Operating Expense 20.0%	3.05	2.80	2.83	3.09	3.87	3.87	3.87	3.87	3.87	3.87	3.87	3.87	3.87	3.87	3.87	3.87	3.87	3.87	3.87	3.87
547 Marketing Companies Product P	60.86	52.93	48.61	51.92	55.97	60.55	65.61	71.13	77.21	83.58	85.35	87.15	89.34	91.58	93.50	97.25	100.75	104.79	108.99	113.37
548 Major consumers Product Purch	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
549 Interest on Foreign Loan	0.30	2.28	8.39	13.00	11.70	10.40	9.10	7.80	6.50	5.20	3.90	2.60	1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00
550 Dividend Repatriation - Forei	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
551 Dividend Repatriation - Mktg.	0.22	0.23	0.24	0.25	0.25	0.26	0.27	0.28	0.29	0.30	0.31	0.32	0.33	0.34	0.35	0.36	0.37	0.39	0.40	0.41

```
  1  08/04/91 01:43 PM     FILE = FINREF 2.0.3 BASE MARGIN, REDUCED DEMAND&PRICE, 0% FOREIGN
  2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
  3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE II  -  CAT CRACKING
553 Capital Account
554 ------------------
555 Petrojam Capital Goods        2.49  16.53  50.90  38.39   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
556 Principal Repayment           0.00   0.00   0.00   0.00  10.83  10.83  10.83  10.83  10.83  10.83  10.83  10.83  10.83  10.83   0.00   0.00   0.00   0.00   0.00   0.00
557                              ------------------------------------------------------------------------------------------------------------------------------------------
558          TOTAL               300.05 248.74 273.09 291.18 316.48 331.34 351.00 366.14 387.69 405.08 405.14 400.96 403.12 404.62 388.60 404.72 415.58 425.05 436.37 446.53
559                              ==========================================================================================================================================
560
561 NET FOREIGN EXCHANGE FLOWS    -258   -232   -222   -246   -237   -250   -269   -273   -290   -298   -308   -305   -316   -324   -323   -326   -341   -355   -371   -386
562                              ******************************************************************************************************************************************
563
564 PRESENT VALUE OF NET FOREIGN EXCHANGE CASH  12.00%        -2020
565
566 DISCOUNTED BARRELS OF JAMAICA TOTAL DEMAND  90.93 ,FOREX $22.22 PER BARREL
567
```

1 08/04/91 01:43 PM FILE = FINREF 2.0.3 BASE MARGIN, REDUCED DEMANDPRICE, 0% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE II - CAT CRACKING

MINISTRY OF FINANCE

FISCAL FLOWS WITH 100.0000J OWNERSHIP

		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Sources																					
Import Duty		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Income Tax - Petrojam		5.51	3.17	-3.22	-4.74	8.29	9.89	11.74	13.06	14.96	15.87	16.09	15.79	16.47	17.23	17.03	17.58	18.46	19.72	20.91	22.09
Income Tax - Marketing Compan		0.22	0.23	0.24	0.25	0.25	0.26	0.27	0.28	0.29	0.30	0.31	0.32	0.33	0.34	0.35	0.36	0.37	0.39	0.40	0.41
Dividends from Petrojam Opera		0.00	11.22	12.22	10.33	22.73	24.33	26.44	27.79	30.15	30.97	30.77	29.79	30.43	31.24	30.54	31.09	32.20	33.96	35.62	37.29
TOTAL		5.74	14.62	9.23	5.84	31.28	34.48	38.45	41.13	45.40	47.14	47.17	45.90	47.23	48.81	47.92	49.03	51.03	54.07	56.92	59.80
Applications																					
Equity Investment	0.000%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NET CASH FLOW		5.74	14.62	9.23	5.84	31.28	34.48	38.45	41.13	45.40	47.14	47.17	45.90	47.23	48.81	47.92	49.03	51.03	54.07	56.92	59.80

NET PRESENT VALUE 12.0%218.01

1 08/04/91 01:43 PM FILE = FINREF 2.0.3 BASE MARGIN, REDUCED DEMANDPRICE, 0% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE II - CAT CRACKING
598 OFFSHORE PARTNER WITH 0.00% OWNERSHIP
599 **
600
601

602 US$ CASH FLOWS		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
603 ----------		----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
604 Sources																					
605 ----------		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
606 Dividend Repatriation		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
607																					
608		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
609	CUMUL PV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
610 Applications	PAYBACK PT	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR
611 ----------	CUMUL PV	0.00	0.00	0.00	0.00																
612 Equity Investment 0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
613	YRLY PV	0.00	0.00	0.00	0.00																
614		ERR																			
615 NET CASH FLOW		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
616																					

617 RETURN ON EQUITY ERR
618 PRESENT VALUE OF NET CASH FLOW @ 12.00% 0.00
619 PAYBACK PERIOD OF DCF ERR YEARS

08/04/91 01:23 PM FILE = FINREF 2.3.1 BASE MARGIN, REDUCED DEMAND&PRICE, 75% FOREIGN
JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE II - CAT CRACKING

MARKET FORECAST FOR PETROJAM - millions of barrels

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
LOCAL DEMAND ON REFINERY																					
PROPANE	0.10	0.11	0.11	0.12	0.13	0.13	0.14	0.15	0.15	0.16	0.17	0.18	0.19	0.20	0.21	0.22	0.23	0.24	0.25	0.26	
BUTANE	0.42	0.44	0.46	0.48	0.51	0.53	0.56	0.59	0.62	0.65	0.68	0.71	0.75	0.79	0.83	0.87	0.91	0.96	1.00	1.05	
MOGAS, LEADED	0.93	0.85	0.77	0.68	0.58	0.48	0.37	0.25	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
MOGAS, UNLEADED	0.10	0.21	0.33	0.45	0.58	0.72	0.86	1.02	1.18	1.35	1.39	1.43	1.47	1.52	1.56	1.61	1.66	1.71	1.76	1.81	
KERO/TURBO	0.84	0.86	0.89	0.92	0.95	0.98	1.02	1.05	1.09	1.12	1.16	1.20	1.24	1.29	1.33	1.38	1.42	1.47	1.53	1.58	
AUTO DIESEL	1.35	1.51	1.65	2.14	1.69	1.68	1.71	1.62	1.69	1.70	1.81	1.93	2.06	2.11	2.15	2.31	2.48	2.56	2.60	2.67	
MARINE DIESEL	0.35	0.36	0.38	0.41	0.42	0.43	0.44	0.45	0.46	0.47	0.48	0.49	0.51	0.52	0.53	0.54	0.56	0.57	0.59	0.60	
HEAVY FUEL OIL	4.55	4.71	4.85	4.56	5.10	5.13	5.32	4.74	4.62	4.00	4.11	3.46	3.57	3.73	3.90	3.27	3.35	3.54	3.74	3.91	
ASPHALT	0.11	0.12	0.12	0.13	0.14	0.15	0.16	0.16	0.17	0.18	0.20	0.21	0.22	0.23	0.25	0.26	0.28	0.29	0.31	0.33	
	8.75	9.18	9.58	9.90	10.10	10.24	10.58	10.03	10.11	9.63	10.00	9.62	10.01	10.38	10.76	10.46	10.88	11.33	11.78	12.23	
EXPORTS																					
PROPANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
BUTANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
MOGAS	0.00	0.00	0.00	0.00	2.66	2.61	2.58	2.45	2.36	2.32	2.28	2.34	2.26	2.20	1.72	2.07	2.02	2.02	1.93	1.94	
KERO/TURBO	0.30	0.00	0.00	0.30	0.61	0.37	0.34	0.36	0.32	0.29	0.25	0.21	0.17	0.13	0.08	0.04	0.00	0.00	0.00	0.00	
AUTO DIESEL	0.00	0.00	0.00	0.00	0.00	0.17	0.14	0.47	0.59	0.57	0.49	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
MARINE DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
HEAVY FUEL OIL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.44	0.20	1.03	0.84	0.63	0.93	0.94	0.84	0.50	0.40	0.00	
	1.28	0.00	0.00	0.30	3.27	3.16	3.05	3.29	3.28	3.62	3.22	3.61	3.27	2.96	2.65	3.05	2.86	2.52	2.33	1.94	

1 08/06/91 01:25 PM FILE = FINREF 2.3.1 BASE MARGIN, REDUCED DEMAND&PRICE, 75% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE II - CAT CRACKING
35 Jamaican Bauxite/Alumina Industry
36 Propane)LPG PART OF EXPORTS ABOVE
37 Butane)
38 Gasoline (Mogas, Leaded)
39 Kero/Turbo
40 ADO (Auto Diesel)
41 Marine Diesel
42 Fuel oil

43																					
44		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45																					
46	TOTAL DEMAND	10.03	9.18	9.58	10.19	13.37	13.40	13.63	13.31	13.39	13.25	13.22	13.23	13.28	13.34	13.41	13.51	13.75	13.84	14.11	14.17
47																					
48																					
49	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
50	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
51	JAMAICAN IMPORTS																				
52	----------																				
53	PROPANE	0.05	0.09	0.09	0.08	0.01	0.01	0.02	0.02	0.03	0.03	0.04	0.05	0.06	0.07	0.11	0.09	0.10	0.11	0.12	0.13
54	BUTANE	0.15	0.30	0.32	0.24	0.31	0.32	0.35	0.41	0.46	0.49	0.52	0.52	0.57	0.61	0.58	0.71	0.75	0.80	0.86	0.91
55	MOGAS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
56	KERO/TURBO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.06	0.13	0.15
57	AUTO DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.23
58	MARINE DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.04	0.21	0.21	0.36	0.10
59	HEAVY FUEL OIL	1.07	2.56	2.57	0.64	0.38	0.39	0.57	0.18	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
60																					
61		1.26	2.95	2.98	0.96	0.69	0.72	0.94	0.61	0.66	0.52	0.56	0.57	0.63	0.68	0.73	0.84	1.08	1.18	1.44	1.51
62																					

1 08/04/91 01:23 PM FILE = FINREF 2.3.1 BASE MARGIN, REDUCED DEMAND&PRICE, 75% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE II - CAT CRACKING

64 CRUDE RUN - millions of barrels
65 ----------

66 BCF24	5.82	0.00	0.00	6.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
67 BCF17	0.00	2.59	2.74	0.00	5.08	5.39	5.39	4.64	4.16	4.16	4.16	4.96	4.69	4.56	6.85	4.16	4.16	3.85	4.16	3.65
68 ISTHMUS	0.00	0.00	0.00	0.00	4.56	6.72	6.72	7.96	8.76	8.76	8.76	7.43	7.88	8.09	4.06	8.76	8.76	9.07	8.76	9.27
69 MAYA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
70 FORCADOS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
71 ORIENTE	0.00	0.00	0.00	0.00	2.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
72																				
73 TOTAL WHOLE CRUDE	5.82	2.59	2.74	6.37	11.89	12.11	12.11	12.60	12.91	12.91	12.91	12.39	12.57	12.65	10.91	12.91	12.91	12.92	12.91	12.92
74																				
75																				

76 SPIKES RUN - millions of barrels
77 ----------

78 BUTANE	0.09	0.06	0.07	0.09	0.06	0.06	0.06	0.05	0.04	0.04	0.04	0.05	0.05	0.05	0.09	0.04	0.04	0.04	0.04	0.04
79 NAPTHA	2.04	1.46	1.50	0.79	1.00	0.78	0.78	0.30	0.00	0.00	0.00	0.50	0.34	0.25	0.78	0.00	0.00	0.00	0.00	0.00
80 KERO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
81 GAS OIL	1.24	2.36	2.54	2.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.18	0.00	0.00	0.00	0.00	0.00
82																				
83 TOTAL SPIKES	3.37	3.88	4.11	3.19	1.05	0.84	0.84	0.35	0.04	0.04	0.04	0.56	0.38	0.30	2.04	0.04	0.04	0.04	0.04	0.04
84																				
85																				
86																				

1 08/06/91 01:23 PM FILE = FINREF 2.3.1 BASE MARGIN, REDUCED DEMANDPRICE, 75% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE II - CAT CRACKING

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
90 CRUDE AND PRODUCT PRICES - US$/BBL																					
91 **********																					
92																					
93 IMPORT PRODUCT PRICES (C&F)																					
94 ----------																					
95 PROPANE	20.41	17.94	16.54	17.12	17.83	18.62	19.47	20.22	21.03	21.84	21.66	21.48	21.37	21.25	21.08	21.20	21.26	21.38	21.51	21.63	
96 BUTANE	25.02	21.94	20.19	20.89	21.76	22.73	23.78	24.72	25.72	26.72	26.50	26.28	26.14	26.00	25.78	25.93	26.00	26.16	26.32	26.47	
97 MOGAS	32.94	27.88	24.92	25.81	26.98	28.29	29.71	31.19	32.78	34.36	34.01	33.66	33.44	33.21	32.86	33.11	33.22	33.47	33.71	33.96	
98 KERO/TURBO	33.86	28.77	25.78	26.68	27.85	29.17	30.60	32.08	33.68	35.27	34.92	34.56	34.34	34.12	33.76	34.01	34.13	34.37	34.62	34.87	
99 AUTO DIESEL	31.32	26.50	23.66	24.51	25.62	26.87	28.22	29.63	31.15	32.65	32.32	31.99	31.78	31.56	31.23	31.46	31.57	31.81	32.04	32.28	
100 MARINE DIESEL	30.30	25.63	22.89	23.71	24.79	26.00	27.30	28.67	30.13	31.59	31.27	30.94	30.74	30.53	30.21	30.44	30.54	30.77	31.00	31.22	
101 HEAVY FUEL OIL	16.53	14.02	12.56	13.01	13.59	14.25	14.96	15.69	16.48	17.26	17.09	16.92	16.81	16.70	16.52	16.65	16.70	16.82	16.95	17.07	
102																					
103																					
104 EXPORT PRODUCT PRICES; BAUXITE/ALUMINA PRODUCT PRICES																					
105 ----------																					
106 PROPANE	11.61	8.88	7.21	7.50	7.92	8.42	8.96	9.72	10.53	11.33	11.15	10.97	10.86	10.75	10.57	10.69	10.75	10.88	11.00	11.13	
107 BUTANE	14.82	11.43	9.37	9.74	10.28	10.91	11.60	12.54	13.54	14.54	14.32	14.10	13.96	13.82	13.60	13.75	13.82	13.98	14.14	14.29	
108 MOGAS	30.68	25.56	22.52	23.35	24.44	25.68	27.02	28.50	30.09	31.66	31.31	30.96	30.74	30.52	30.17	30.41	30.53	30.77	31.02	31.27	
109 KERO/TURBO	30.94	25.79	22.73	23.56	24.66	25.91	27.26	28.75	30.35	31.94	31.58	31.23	31.01	30.79	30.43	30.68	30.80	31.04	31.29	31.54	
110 AUTO DIESEL	29.38	24.45	21.55	22.34	23.38	24.57	25.85	27.26	28.78	30.28	29.95	29.61	29.40	29.19	28.86	29.09	29.20	29.43	29.67	29.90	
111 MARINE DIESEL	28.36	23.63	20.83	21.59	22.60	23.75	24.99	26.35	27.82	29.27	28.95	28.62	28.42	28.22	27.89	28.12	28.22	28.45	28.68	28.91	
112 HEAVY FUEL OIL 1	15.13	12.59	11.08	11.49	12.02	12.64	13.30	14.03	14.82	15.60	15.43	15.26	15.15	15.04	14.86	14.98	15.04	15.16	15.29	15.41	
113 HEAVY FUEL OIL 2	16.06	13.55	12.06	12.50	13.07	13.71	14.41	15.14	15.93	16.71	16.54	16.36	16.25	16.14	15.97	16.09	16.15	16.27	16.39	16.52	
114																					
115																					
116 IMPORT PARITY FOR MOGAS																					
117 ----------																					
118 MOGAS, LEADED	31.43	26.34	23.32	24.17	25.28	26.55	27.92	29.39	30.98	32.56	32.21	31.86	31.64	31.42	31.07	31.31	31.43	31.67	31.92	32.17	
119 MOGAS, UNLEADED	31.43	26.34	23.32	24.17	25.28	26.55	27.92	29.39	30.98	32.56	32.21	31.86	31.64	31.42	31.07	31.31	31.43	31.67	31.92	32.17	
120																					
121 IMPORT PARITY FOR ASPHALT	26.18	23.43	21.81	22.31	22.95	23.67	24.46	25.26	26.13	26.99	26.80	26.61	26.49	26.37	26.18	26.31	26.37	26.51	26.64	26.78	
122 ----------																					

1 08/04/91 01:23 PM FILE = FINREF 2.3.1 BASE MARGIN, REDUCED DEMANDPRICE, 75% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE II - CAT CRACKING

126			1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
125	REFINERY GATE PRICE	REFINE	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
126	----------	MARGIN																				
127	PROPANE	2.37	22.78	20.32	18.92	19.69	20.20	20.99	21.84	22.60	23.41	24.21	24.03	23.85	23.74	23.63	23.45	23.57	23.63	23.76	23.88	24.01
128	BUTANE	2.37	27.39	24.31	22.56	23.26	24.13	25.11	26.15	27.09	28.10	29.09	28.87	28.65	28.51	28.37	28.15	28.30	28.38	28.53	28.69	28.84
129	MOGAS, LEADED	0.88	32.31	27.21	24.20	25.05	26.16	27.43	28.80	30.27	31.86	33.44	33.09	32.74	32.52	32.30	31.95	32.19	32.31	32.55	32.80	33.04
130	MOGAS, UNLEADED	0.88	32.32	27.22	24.20	25.05	26.17	27.43	28.80	30.28	31.87	33.44	33.09	32.74	32.52	32.30	31.95	32.19	32.31	32.55	32.80	33.05
131	KERO/TURBO	1.21	35.07	29.99	26.99	27.89	29.06	30.38	31.81	33.29	34.89	36.48	36.13	35.77	35.55	35.33	34.98	35.22	35.34	35.59	35.83	36.08
132	AUTO DIESEL	1.17	32.49	27.67	24.83	25.68	26.79	28.04	29.39	30.80	32.32	33.82	33.49	33.16	32.94	32.73	32.48	32.63	32.74	32.98	33.21	33.45
133	MARINE DIESEL	1.59	31.89	27.22	24.48	25.30	26.38	27.59	28.89	30.26	31.72	33.18	32.86	32.53	32.33	32.12	31.80	32.03	32.13	32.36	32.59	32.81
134	HEAVY FUEL OIL	1.56	18.08	15.58	14.11	14.56	15.15	15.81	16.52	17.25	18.04	18.82	18.65	18.48	18.37	18.26	18.08	18.20	18.26	18.38	18.50	18.63
135	ASPHALT	0.77	26.95	24.20	22.59	23.08	23.72	24.45	25.23	26.04	26.91	27.77	27.57	27.38	27.26	27.14	26.95	27.08	27.15	27.28	27.42	27.55
136																						
137	CRUDE																					
138	----------																					
139	BCF26		20.28	17.20	15.24	15.71	16.31	17.15	18.04	18.95	19.91	20.86	20.72	20.59	20.52	20.45	20.31	20.38	20.38	20.45	20.52	20.59
140	BCF17		17.50	14.77	13.16	13.63	14.25	14.95	15.71	16.51	17.36	18.21	18.03	17.84	17.72	17.60	17.41	17.54	17.60	17.74	17.87	18.00
141	ISTHMUS		23.43	19.86	17.60	18.09	18.72	19.67	20.67	21.70	22.78	23.91	23.84	23.77	23.70	23.63	23.56	23.56	23.56	23.56	23.56	23.56
142	MAYA		19.64	16.66	14.81	15.29	15.90	16.70	17.56	18.44	19.37	20.29	20.14	19.98	19.90	19.82	19.67	19.75	19.77	19.86	19.95	20.04
143	FORCADOS		25.46	21.70	19.33	19.89	20.59	21.62	22.72	23.80	24.95	26.15	26.08	26.00	25.93	25.85	25.78	25.78	25.78	25.78	25.78	25.78
144	ORIENTE		22.81	19.17	16.88	17.41	18.08	19.07	20.12	21.17	22.28	23.44	23.37	23.30	23.22	23.15	23.08	23.08	23.08	23.08	23.08	23.08
145																						
146	SPIKES																					
147	----------																					
148	BUTANE		20.72	17.49	15.58	16.11	16.82	17.62	18.49	19.43	20.43	21.43	21.21	20.99	20.85	20.71	20.49	20.64	20.71	20.87	21.03	21.18
149	NAPTHA		26.40	22.12	19.58	20.30	21.25	22.30	23.45	24.69	26.02	27.34	27.05	26.76	26.57	26.39	26.09	26.30	26.39	26.60	26.81	27.01
150	KERO		32.63	27.50	24.47	25.32	26.44	27.72	29.09	30.58	32.18	33.77	33.41	33.06	32.84	32.62	32.26	32.51	32.63	32.87	33.12	33.37
151	GAS OIL		29.00	24.13	21.25	22.06	23.13	24.33	25.64	27.05	28.57	30.07	29.74	29.40	29.19	28.98	28.65	28.88	28.99	29.23	29.46	29.70

1 08/04/91 01:23 PM FILE = FINREF 2.3.1 BASE MARGIN, REDUCED DEMANDPRICE, 75% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE II - CAT CRACKING

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
PETROJAM REVENUES - US$M																					
DOMESTIC MARKET REVENUES (US$ equivalent of local currency)																					
PROPANE	2.38	2.22	2.17	2.35	2.56	2.79	3.05	3.32	3.61	3.92	4.08	4.25	4.65	4.65	4.84	5.11	5.38	5.68	5.99	6.33	
BUTANE	11.42	10.65	10.37	11.23	12.23	13.36	14.62	15.90	17.31	18.82	19.61	20.44	21.35	22.31	23.26	24.54	25.83	27.27	28.79	30.40	
MOGAS, LEADED	30.07	23.19	18.58	16.98	15.22	13.15	10.67	7.78	4.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
MOGAS, UNLEADED	3.34	5.80	7.97	11.32	15.23	19.73	26.89	30.80	37.57	45.12	45.99	46.87	47.95	49.05	49.97	51.87	53.61	55.64	57.74	59.92	
KERO/TURBO	29.37	25.93	24.11	25.73	27.70	29.92	32.37	35.02	37.94	41.01	41.99	43.00	44.19	45.43	46.52	48.47	50.32	52.44	54.65	56.96	
AUTO DIESEL	43.78	41.77	41.08	55.05	45.32	47.17	50.26	49.89	54.54	57.43	60.54	63.94	67.82	68.93	69.80	75.29	81.08	83.70	86.50	89.43	
MARINE DIESEL	11.01	9.92	9.42	10.28	11.09	11.85	12.70	13.60	14.59	15.61	15.83	16.05	16.34	16.65	16.89	17.45	17.96	18.56	19.19	19.84	
HEAVY FUEL OIL	82.35	73.36	68.46	66.44	77.22	81.15	87.93	81.75	83.35	75.22	76.71	63.98	65.56	68.12	70.45	59.58	61.16	65.10	69.19	72.83	
ASPHALT	2.95	2.81	2.78	3.01	3.28	3.58	3.91	4.28	4.69	5.13	5.40	5.69	6.00	6.33	6.66	7.10	7.54	8.03	8.56	9.12	
Total	216.66	195.64	184.94	202.39	209.85	222.72	240.39	242.26	257.77	262.26	270.16	264.22	273.66	281.46	288.39	289.40	302.89	316.42	330.62	344.82	
EXPORT REVENUES	US$ - Foreign Exchange																				
PROPANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
BUTANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
MOGAS	30.01	0.00	0.00	0.00	65.02	67.10	69.63	69.90	71.05	73.50	71.55	72.33	69.57	67.29	51.76	63.05	61.73	62.12	59.78	60.72	
KERO/TURBO	9.26	0.00	0.00	6.97	14.94	9.65	9.25	10.39	9.86	9.33	7.95	6.61	5.21	4.05	0.00	1.12	0.00	0.00	0.00	0.00	
AUTO DIESEL	0.00	0.00	0.00	0.00	0.00	4.21	3.49	12.84	17.02	17.13	14.54	0.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
MARINE DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
HEAVY FUEL OIL 1 -Case I	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.83	3.10	15.76	12.77	9.44	13.89	14.06	12.63	7.58	6.88	0.00	
HEAVY FUEL OIL 2 -Case II	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	39.27	0.00	0.00	6.97	79.97	80.96	82.37	93.12	97.93	106.79	97.14	95.56	87.55	80.77	65.66	78.23	74.36	69.70	65.86	60.72	

1 08/04/91 01:23 PM FILE = FINREF 2.3.1 BASE MARGIN, REDUCED DEMANDEPRICE, 75% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE II - CAT CRACKING

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
189 BAUXITE/ALUMINA REVENUES		US$ - Foreign Exchange																			
191 PROPANE		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
192 BUTANE		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
193 NOGAS		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
194 KERO/TURBO		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
195 AUTO DIESEL		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
196 MARINE DIESEL		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
197 HEAVY FUEL OIL 1		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
198 HEAVY FUEL OIL 2		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
200		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
202 TOTAL REVENUES - US$M		255.93	195.64	184.94	209.36	289.82	303.68	322.76	335.38	355.69	369.05	367.29	359.78	361.21	362.23	354.03	367.63	377.25	386.12	396.48	405.54
208 REFINING COSTS - US$M																					
211 CRUDE																					
213 BCF24		117.98	0.00	0.00	100.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
214 BCF17		0.00	38.27	36.12	0.00	72.37	80.68	86.76	76.58	72.19	75.72	74.94	88.48	83.10	80.29	119.21	72.92	73.18	68.23	74.28	65.64
215 ISTHMUS		0.00	0.00	0.00	0.00	85.28	132.12	138.83	172.73	199.45	209.39	208.77	176.65	186.68	191.12	95.62	206.29	206.29	213.68	206.29	218.41
216 MAYA		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
217 FORCADOS		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
218 ORIENTE		0.00	0.00	0.00	0.00	40.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
220 TOTAL WHOLE CRUDE IMPORTS		117.98	38.27	36.12	100.02	198.50	212.80	225.59	249.32	271.64	285.11	283.70	265.12	269.78	271.41	214.83	279.21	279.47	281.91	280.57	284.05

1 08/04/91 01:23 PM FILE = FINREF 2.3.1 BASE MARGIN, REDUCED DEMANDPRICE, 75% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE II - CAT CRACKING

223 SPIKES																				
224 ----------																				
225 BUTANE	1.81	1.09	1.02	1.47	0.98	1.03	1.08	0.92	0.82	0.86	0.85	1.15	0.99	0.98	1.79	0.83	0.83	0.76	0.84	0.77
226 NAPTHA	53.86	32.37	29.45	16.08	21.16	17.33	18.23	7.48	0.00	0.00	0.00	13.48	8.92	6.65	20.38	0.00	0.00	0.00	0.00	0.00
227 KERO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
228 GAS OIL	35.98	56.90	54.07	50.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	33.67	0.00	0.00	0.00	0.00	0.00
229																				
230 TOTAL SPIKES IMPORTS	91.66	90.36	84.55	68.52	22.14	18.36	19.31	8.40	0.82	0.86	0.85	14.63	9.91	7.63	55.84	0.83	0.83	0.76	0.84	0.77
231																				
232 PRODUCT IMPORTS																				
233 ----------																				
234 PROPANE	0.97	1.64	1.57	1.44	0.20	0.20	0.36	0.44	0.54	0.72	0.95	1.18	1.33	1.55	2.38	1.86	2.10	2.26	2.67	2.84
235 BUTANE	3.65	6.57	6.41	4.96	6.67	7.30	8.25	10.01	11.74	12.97	13.74	13.62	14.79	15.75	14.96	18.36	19.46	21.01	22.19	23.96
236 MOGAS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
237 KERO/TURBO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.62	2.01	4.42	5.22
238 AUTO DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.35	7.30
239 MARINE DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.21	1.33	6.47	6.40	10.41	3.08
240 HEAVY FUEL OIL	17.61	35.88	32.22	8.36	5.11	5.51	8.57	2.81	3.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
241																				
242 TOTAL COST OF PROD/RAW MTLS.	22.23	44.09	40.20	14.75	11.98	13.02	17.17	13.26	15.28	13.69	14.68	14.80	16.11	17.30	18.56	21.55	28.64	31.68	40.04	42.40
243																				
244 FIXED/VARIABLE OPERATING COST	15.27	13.99	14.17	15.44	19.34	19.34	19.34	19.34	19.35	19.35	19.35	19.34	19.34	19.34	19.34	19.35	19.35	19.35	19.35	19.35

1 08/06/91 01:23 PM FILE = FINREF 2.3.1 BASE MARGIN, REDUCED DEMANDPRICE, 75% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE II - CAT CRACKING

			1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
246																						
247	ANNUAL DEPRECIATION																					
248	**********																					
249	Existing Capital	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
250	Project Capital yrs	15	0.20	1.53	5.62	8.70	8.70	8.70	8.70	8.70	8.70	8.70	8.70	8.70	8.70	8.70	8.70	8.50	7.17	3.08	0.00	0.00
251																						
252	TOTAL DEPRECIATION		1.17	2.49	6.58	9.67	9.67	9.67	9.67	9.67	9.67	9.67	9.67	8.83	8.70	8.70	8.70	8.50	7.17	3.08	0.00	0.00
253																						
254	CAPITAL INVESTMENT - PROJECT		3.00	19.92	61.33	46.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
255	HEAVY MAINTENANCE COSTS		2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30
256																						
257			5.50	22.42	63.83	48.75	2.50	2.50	2.50	2.50	2.50	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30
258	FINANCING STRUCTURE																					
259	**********		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
260																						
261	Project Investment		3.00	19.92	61.33	46.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
262	Local Component	17.0%	0.51	3.39	10.43	7.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
263	Foreign Component	83.0%	2.49	16.53	50.90	38.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
264																						
265	Local Component																					
266	**********																					
267	Local Equity Financed	0.0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
268	Local Cash Financed	100.0%	0.51	3.39	10.43	7.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
269	Local Loan Financed	0.0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
270	Local Loan Outstanding		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
271	Loan Repayment over yrs	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
272	Interest - % of O/S loa	12.0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
273																						
274	Foreign Component																					
275	**********																					
276	Foreign Equity Financed	100.0%	2.49	16.53	50.90	38.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
277	Foreign Loan Financed	0.0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
278	Foreign Loan Outstanding		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
279	Loan Repayment over yrs	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
280	Interest - % of O/S loa	12.0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

1 08/04/91 01:23 PM FILE = FINREF 2.3.1 BASE MARGIN, REDUCED DEMANDPRICE, 75% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE II - CAT CRACKING

282 ANNUAL ALLOWANCES																					
283 **********																					
284 Old Capital Investment		15.86	18.86	38.78	100.11	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36
285 Total Capital Investment		18.86	38.78	100.11	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36
286 Declining Balance		18.86	36.90	94.53	131.33	118.20	106.38	95.74	86.17	77.55	69.80	62.82	56.53	50.88	45.79	41.21	37.09	33.38	30.04	27.04	24.34
287 Annual Allowance, Basis	10.0%	1.89	3.69	9.45	13.13	11.82	10.64	9.57	8.62	7.76	6.98	6.28	5.65	5.09	4.58	4.12	3.71	3.34	3.00	2.70	2.43
288																					
289 OWNERSHIP STRUCTURE																					
290 **********																					
291 GOJ/Petrojam	25.0%																				
292 Foreign Investor	75.0%																				
293 Local Investor	0.0%																				
294																					
295																					
296 MARGIN VOLATILITY		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

1 08/04/91 01:23 PM FILE = FINREF 2.3.1 BASE MARGIN, REDUCED DEMANDPRICE, 75% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE II - CAT CRACKING

298 PETROJAM PROFIT AND LOSS / INCOME STATEMENT
299 **********

		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
300																					
301																					
302 Sales Revenue		255.93	195.64	184.94	209.36	289.82	303.68	322.76	335.38	355.69	369.05	367.29	359.78	361.21	362.23	354.03	367.63	377.25	386.12	396.48	405.54
303 Cost of Sales		231.87	172.71	160.87	183.29	252.61	264.18	280.07	270.98	287.74	299.66	299.24	296.55	295.80	296.35	289.23	301.59	308.94	314.35	321.45	327.23
304																					
305 Gross Margin		24.05	22.93	24.07	26.07	37.20	39.50	42.69	64.40	67.95	69.39	68.05	65.23	65.41	65.88	64.80	66.04	68.31	71.77	75.03	78.31
306 Other Operating Income	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65	8.65
307 Operating Expenses		15.27	13.99	14.17	15.44	19.34	19.34	19.34	19.34	19.35	19.35	19.35	19.34	19.34	19.34	19.34	19.35	19.35	19.35	19.35	19.35
308 Heavy Maintenance Expense		2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30
309																					
310 Income From Operations		14.94	15.08	16.05	16.78	44.01	46.31	49.50	51.21	54.76	55.39	54.06	51.24	51.41	51.89	50.81	52.05	54.32	57.78	61.03	64.31
311																					
312 Interest Income	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52
313 Interest Expense	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
314																					
315 Non-operating Income		4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39
316																					
317 Profit Before Taxes		19.33	19.47	20.44	21.17	48.40	50.70	53.89	55.60	59.15	59.78	58.45	55.63	55.81	56.28	55.20	56.44	58.71	62.17	65.43	68.71
318																					
319 Less Investment Allowan	20.0%	0.00	3.98	12.27	9.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
320 Less Annual Allowance		1.89	3.69	9.45	13.13	11.82	10.64	9.57	8.62	7.76	6.98	6.28	5.65	5.09	4.58	4.12	3.71	3.34	3.00	2.70	2.43
321																					
322 TAXABLE INCOME		16.84	11.80	-1.28	-1.21	36.58	40.06	44.32	46.98	51.39	52.81	52.17	49.98	50.72	51.70	51.08	52.73	55.37	59.16	62.72	66.27
323																					
324 Income Taxes	33.33%	5.61	3.93	-0.43	-0.40	12.19	13.35	14.77	15.66	17.13	17.60	17.39	16.66	16.91	17.23	17.03	17.58	18.46	19.72	20.91	22.09
325																					
326 Net Profit		13.72	15.54	20.87	21.57	36.21	37.35	39.12	39.96	42.02	42.18	41.06	38.97	38.90	39.05	38.18	38.86	40.25	42.45	44.52	46.62
327																					
328 DIVIDENDS as % of net p	80.0%	0.00	12.43	16.69	17.26	28.97	29.88	31.30	31.95	33.61	33.75	32.85	31.18	31.12	31.24	30.54	31.09	32.20	33.96	35.62	37.29
329 PROFIT TO RETAINED EARN	20.0%	13.72	3.11	4.17	4.31	7.24	7.47	7.82	7.99	8.40	8.44	8.21	7.79	7.78	7.81	7.64	7.77	8.05	8.49	8.90	9.32
330																					
331 PRESENT VALUE OF DIVIDENDS @	12.00% DISCOUNT RATE	173.1																			
332 ********** NET PROFIT		228.6																			

1 08/06/91 01:23 PM FILE = FINREF 2.3.1 BASE MARGIN, REDUCED DEMANDPRICE, 75% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE II - CAT CRACKING

BALANCE SHEET

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
ASSETS																					
Current assets																					
Cash in Bank	19.21	-0.80	9.25	10.51	12.50	19.59	35.20	50.74	66.75	82.60	99.12	117.28	134.81	151.20	167.65	184.98	199.90	216.39	225.06	233.20	241.57
Receivables dys 30	18.26	21.04	16.08	15.20	17.21	23.82	24.96	26.53	27.57	29.24	30.33	30.19	29.57	29.69	29.77	29.10	30.22	31.01	31.74	32.59	33.33
Inventories	11.54																				
-Crude/Spikes dys 20		11.69	7.05	6.61	9.23	12.09	12.67	13.31	14.12	14.93	15.67	15.59	15.33	15.33	15.29	14.83	15.34	15.36	15.49	15.42	15.61
- Product dys 20		14.02	10.72	10.13	11.47	15.88	16.64	17.69	18.38	19.49	20.22	20.13	19.71	19.79	19.85	19.40	20.14	20.67	21.16	21.73	22.22
Total Current Assets	49.01	45.74	43.10	42.45	50.41	71.38	89.46	108.26	126.81	146.26	165.34	183.19	199.43	216.01	232.56	248.31	265.60	281.43	293.45	302.93	312.73
Fixed Assets/Plant in Service																					
Gross	15.86	18.86	38.78	100.11	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36	146.36
Less Accum Deprec	5.10	6.27	8.76	15.34	25.01	34.68	44.34	54.01	63.68	73.34	83.01	92.68	101.51	110.21	118.91	127.61	136.11	143.28	146.36	146.36	146.36
Net Assets in Service	10.76	12.60	30.02	84.77	121.35	111.68	102.02	92.35	82.68	73.02	63.35	53.68	44.85	36.15	27.45	18.76	10.26	3.08	0.00	0.00	0.00
Investments in Subsidia	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07
Total Assets	70.85	69.41	84.19	138.29	182.84	194.13	202.55	211.68	220.57	230.35	239.76	247.94	255.35	263.23	271.09	278.14	286.93	295.58	304.52	314.00	323.80

1 08/04/91 01:25 PM FILE = FINREP 2.3.1 BASE MARGIN, REDUCED DEMANDPRICE, 75% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE II - CAT CRACKING

361 LIABILITIES																						
362 **********																						
363 Payables dys.	30	36.70	19.06	14.20	13.22	15.06	19.12	20.07	21.38	22.27	23.65	24.63	24.59	24.21	24.31	24.36	23.77	24.79	25.39	25.86	26.42	26.90
364 Interest on Current Deb		0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22
365		----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
366		36.92	19.28	14.42	13.44	15.29	19.34	20.29	21.60	22.49	23.87	24.85	24.82	24.43	24.53	24.58	23.99	25.01	25.61	26.08	26.64	27.12
367																						
368 Long Term Debt		1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51
369																						
370 Paid in Capital																						
371 GOJ	0%	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66
372 Anchor - Foreign In	100%	0.00	2.49	19.02	69.93	108.31	108.31	108.31	108.31	108.31	108.31	108.31	108.31	108.31	108.31	108.31	108.31	108.31	108.31	108.31	108.31	108.31
373 Local Partner	100%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
374		----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
375 Total		3.66	6.15	22.68	73.58	111.97	111.97	111.97	111.97	111.97	111.97	111.97	111.97	111.97	111.97	111.97	111.97	111.97	111.97	111.97	111.97	111.97
376																						
377 Retained Earnings		28.75	42.47	45.58	69.75	56.06	61.31	68.77	76.60	86.59	92.99	101.43	109.64	117.43	125.21	133.02	140.66	148.43	156.48	164.97	173.88	183.20
378		----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
379 Total Liabilities		70.85	69.41	84.19	138.29	182.84	194.13	202.55	211.68	220.57	230.35	239.76	247.94	255.35	263.23	271.09	278.14	286.93	295.58	304.52	314.00	323.80
380		====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====	====
381 D/E RATIO(LTD/LTD+RE)		5.0%	3.4%	3.2%	3.0%	2.7%	2.4%	2.2%	1.9%	1.8%	1.6%	1.5%	1.4%	1.3%	1.2%	1.1%	1.1%	1.0%	1.0%	0.9%	0.9%	0.8%
382																						
383																						

1 08/06/91 01:23 PM FILE = FINREF 2.3.1 BASE MARGIN, REDUCED DEMAND&PRICE, 75% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE II - CAT CRACKING

SOURCES AND APPLICATIONS OF FUNDS

SOURCE OF FUNDS	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Net from Operations	13.72	15.54	20.87	21.57	36.21	37.35	39.12	39.94	42.02	42.18	41.06	38.97	38.90	39.05	38.18	38.86	40.25	42.45	44.52	46.62
Depreciation	1.17	2.49	6.58	9.67	9.67	9.67	9.67	9.67	9.67	9.67	9.67	8.83	8.70	8.70	8.70	8.50	7.17	3.08	0.00	0.00
Loans	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Equity	2.49	16.53	50.90	38.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BALANCING ITEM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Sources	17.37	34.57	78.35	69.63	45.88	47.01	48.79	49.61	51.68	51.85	50.73	47.80	47.60	47.75	46.88	47.36	47.42	45.53	44.52	46.62
APPLICATION OF FUNDS																				
Increase in Working Capital	14.37	2.22	0.33	6.12	16.91	17.14	17.49	17.65	18.07	18.10	17.88	16.62	16.48	16.51	16.34	16.27	15.22	11.57	8.90	9.32
Capital Investments/Construct	3.00	19.92	61.33	46.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Principal Repayment yrs 10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interest Repayment (part of operatin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dividend Payment - GOJ Treasu	0.00	3.11	4.17	4.31	7.26	7.47	7.82	7.99	8.40	8.44	8.21	7.79	7.78	7.81	7.64	7.77	8.05	8.49	8.90	9.32
Dividend Payment - Foreign Pa	0.80	9.32	12.52	12.94	21.73	22.41	23.47	23.96	25.21	25.31	24.64	23.38	23.34	23.43	22.91	23.32	24.15	25.47	26.71	27.97
Dividend Payment - Local Part	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Applications	17.37	34.57	78.35	69.63	45.88	47.01	48.79	49.61	51.68	51.85	50.73	47.80	47.60	47.75	46.88	47.36	47.42	45.53	44.52	46.62

1 08/04/91 01:23 PM FILE = FINREF 2.3.1 BASE MARGIN, REDUCED DEMAND&PRICE, 75% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE II - CAT CRACKING

447 IMPORTATION COSTS NON-PETROJAM- US$M
448 **********

449	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
450 PRIVATE/MARKETING COMPANIES	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
451 ----------																				
452 PROPANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
453 BUTANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
454 MOGAS, LEADED	29.25	22.44	17.91	16.38	14.71	12.73	10.34	7.68	4.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
455 MOGAS, UNLEADED	3.25	5.61	7.67	10.92	14.71	19.09	24.13	29.91	36.53	43.93	44.76	45.60	46.65	47.71	48.59	50.14	52.15	54.13	56.19	58.32
456 KERO/TURBO	28.35	26.88	23.03	24.61	26.54	28.73	31.14	33.75	36.62	39.64	40.58	41.54	42.69	43.87	44.91	46.81	48.60	50.65	52.80	55.05
457 AUTO DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
458 MARINE DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
459 HEAVY FUEL OIL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
460 ASPHALT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
461																				
462	60.86	52.93	48.61	51.92	55.97	60.55	65.61	71.13	77.21	83.58	85.35	87.15	89.34	91.58	93.50	97.25	100.75	104.79	108.99	113.37
463																				
464																				
465 MAJOR CONSUMERS IMPORTS																				
466 ----------																				
467 PROPANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
468 BUTANE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
469 MOGAS, LEADED	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
470 MOGAS, UNLEADED	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
471 KERO/TURBO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
472 AUTO DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
473 MARINE DIESEL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
474 HEAVY FUEL OIL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
475 ASPHALT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
476																				
477	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
478																				
479 TOTAL NON-PETROJAM IMPORT COS	60.86	52.93	48.61	51.92	55.97	60.55	65.61	71.13	77.21	83.58	85.35	87.15	89.34	91.58	93.50	97.25	100.75	104.79	108.99	113.37
480																				

1 08/04/91 01:23 PM FILE = FINREF 2.3.1 BASE MARGIN, REDUCED DEMANDPRICE, 75% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE II - CAT CRACKING

482 PRIVATE/MARKETING COMPANIES
483 **********
484 MARGINAL FINANCIAL ANALYSIS
485 ----------

		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
487 REVENUES																					
488 ----------																					
489 PROPANE		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
490 BUTANE		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
491 MOGAS, LEADED		30.07	23.19	18.58	16.98	15.22	13.15	10.67	7.70	4.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
492 MOGAS, UNLEADED		3.34	5.80	7.97	11.32	15.23	19.73	24.89	30.80	37.57	45.12	45.99	46.87	47.95	49.05	49.97	51.87	53.61	55.64	57.74	59.92
493 KERO/TURBO		29.37	25.93	24.11	25.73	27.70	29.92	32.37	35.02	37.96	41.01	41.99	43.00	44.19	45.43	46.52	48.47	50.32	52.44	54.65	56.96
494 AUTO DIESEL		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
495 MARINE DIESEL		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
496 HEAVY FUEL OIL		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
497 ASPHALT		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
498																					
499		62.78	54.91	50.66	54.03	58.15	62.80	67.93	73.52	79.68	86.13	87.98	89.87	92.14	94.48	96.50	100.34	103.93	108.08	112.39	116.88
500 COSTS																					
501 -----																					
502 Importation		60.86	52.93	48.61	51.92	55.97	60.55	65.61	71.13	77.21	83.58	85.35	87.15	89.34	91.58	93.50	97.25	100.75	104.79	108.99	113.37
503 Terminalling $/BBL	0.67	1.25	1.29	1.33	1.38	1.42	1.46	1.51	1.56	1.61	1.66	1.71	1.76	1.82	1.88	1.94	2.00	2.07	2.13	2.20	2.27
504																					
505		62.11	54.22	49.94	53.30	57.39	62.01	67.12	72.69	78.82	85.23	87.06	88.91	91.16	93.46	95.44	99.25	102.81	106.92	111.19	115.64
506																					
507 MARGINAL PROFIT BEFORE TAX		0.67	0.69	0.71	0.74	0.76	0.79	0.81	0.84	0.87	0.89	0.92	0.95	0.99	1.02	1.05	1.09	1.12	1.16	1.20	1.24
508																					
509 INCOME TAX	33.33%	0.22	0.23	0.24	0.25	0.25	0.26	0.27	0.28	0.29	0.30	0.31	0.32	0.33	0.34	0.35	0.36	0.37	0.39	0.40	0.41
510																					
511 MARGINAL PROFIT AFTER TAX		0.45	0.46	0.48	0.49	0.51	0.52	0.54	0.56	0.58	0.60	0.62	0.64	0.66	0.68	0.70	0.72	0.75	0.77	0.80	0.83
512																					
513 PROFIT REPATRIATION	50.00%	0.22	0.23	0.24	0.25	0.25	0.26	0.27	0.28	0.29	0.30	0.31	0.32	0.33	0.34	0.35	0.36	0.37	0.39	0.40	0.41
514																					
515 NET PRESENT VALUE OF MARGINAL PROFIT	12.00%	4.10																			
516																					

1 08/04/91 01:34 PM FILE = FINREF 2.3.1 BASE MARGIN, REDUCED DEMANDSPRICE, 75% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE II - CAT CRACKING
519 BANK OF JAMAICA
520 **********
521
522 MARGINAL CASH FLOW ANALYSIS WITH 25% GOJ OWNERSHIP OF PETROJAM
523 ----------
524 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010
525 ----
526 SOURCES
527 **********
528 Current Account
529 ----------
530 Petrojam Export Sales 39.27 0.00 0.00 6.97 79.97 80.96 82.37 93.12 97.93 106.79 97.14 95.56 87.55 80.77 65.64 78.23 76.36 69.70 65.86 60.72
531
532 Capital Account
533 ----------
534 Equity Investment in Petrojam 2.49 16.53 50.90 38.39 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
535 Loan - Capital Investment 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
536 ----------
537 TOTAL 41.76 16.53 50.90 45.35 79.97 80.96 82.37 93.12 97.93 106.79 97.14 95.56 87.55 80.77 65.64 78.23 76.36 69.70 65.86 60.72
538 ==========
539 APPLICATIONS
540 **********
541 Current Account
542 ----------
543 Petrojam Purchases of Crude 209.64 128.63 120.67 168.54 220.64 231.16 242.90 257.72 272.46 285.97 284.56 279.75 279.69 279.04 270.67 280.04 280.30 282.67 281.41 284.82
544 Petrojam Product Purchases 22.23 44.09 40.20 14.75 11.98 13.02 17.17 13.26 15.28 13.69 14.68 14.80 16.11 17.30 18.56 21.55 28.64 31.68 40.04 42.40
545 Heavy Maintenance Expen 50.0% 1.25 1.25 1.25 1.25 1.25 1.25 1.25 1.25 1.25 1.65 1.65 1.65 1.65 1.65 1.65 1.65 1.65 1.65 1.65 1.65
546 Operating Expense 20.0% 3.05 2.80 2.83 3.09 3.87 3.87 3.87 3.87 3.87 3.87 3.87 3.87 3.87 3.87 3.87 3.87 3.87 3.87 3.87 3.87
547 Marketing Companies Product P 60.86 52.93 48.61 51.92 55.97 60.55 65.61 71.13 77.21 83.58 85.35 87.15 89.34 91.58 93.50 97.25 100.75 104.79 108.99 113.37
548 Major consumers Product Purch 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
549 Interest on Foreign Loan 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
550 Dividend Repatriation - Forei 0.00 9.32 12.52 12.96 21.73 22.41 23.47 23.96 25.21 25.31 24.64 23.38 23.34 23.43 22.91 23.32 24.15 25.47 26.71 27.97
551 Dividend Repatriation - Mktg. 0.22 0.23 0.24 0.25 0.25 0.26 0.27 0.28 0.29 0.30 0.31 0.32 0.33 0.34 0.35 0.36 0.37 0.39 0.40 0.41

```
  1  08/06/91 01:34 PM      FILE = FINREF 2.3.1 BASE MARGIN, REDUCED DEMANDEPRICE, 75% FOREIGN
  2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
  3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE II  -  CAT CRACKING
553 Capital Account
554 -------------------
555 Petrojam Capital Goods        2.49  16.53  50.90  38.39   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
556 Principal Repayment           0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
557                              ------------------------------------------------------------------------------------------------------------------------------------------
558           TOTAL              299.75 255.78 277.22 291.12 315.68 332.52 354.54 371.47 395.57 414.36 415.05 410.91 414.33 417.21 411.51 428.04 439.73 450.51 463.08 474.50
559                              ==========================================================================================================================================
560
561 NET FOREIGN EXCHANGE FLOWS     -258   -239   -226   -246   -236   -252   -272   -278   -298   -308   -318   -315   -327   -336   -346   -350   -365   -381   -397   -414
562                              ******************************************************************************************************************************************
563
564 PRESENT VALUE OF NET FOREIGN EXCHANGE CASH  12.00%        -2070
565
566 DISCOUNTED BARRELS OF JAMAICA TOTAL DEMAND  90.93 ,FOREX $22.76 PER BARREL
567
```

1 08/04/91 01:36 PM FILE = FINREF 2.3.1 BASE MARGIN, REDUCED DEMANDPRICE, 75% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE II - CAT CRACKING
569 MINISTRY OF FINANCE
570 **********
571
572 FISCAL FLOWS WITH 25.00GOJ OWNERSHIP
573 ----------

		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
574																					
575		----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
576	Sources																				
577	----------																				
578	Import Duty	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
579	Income Tax - Petrojam	5.61	3.93	-0.43	-0.40	12.19	13.35	14.77	15.66	17.13	17.60	17.39	16.66	16.91	17.23	17.03	17.58	18.46	19.72	20.91	22.09
580	Income Tax - Marketing Compan	0.22	0.23	0.24	0.25	0.25	0.26	0.27	0.28	0.29	0.30	0.31	0.32	0.33	0.34	0.35	0.36	0.37	0.39	0.40	0.41
581	Dividends from Petrojam Opera	0.00	3.11	4.17	4.31	7.24	7.47	7.82	7.99	8.40	8.44	8.21	7.79	7.78	7.81	7.64	7.77	8.05	8.49	8.90	9.32
582		----------																			
583	TOTAL	5.84	7.27	3.98	4.16	19.69	21.08	22.87	23.93	25.82	26.34	25.91	24.77	25.01	25.38	25.01	25.71	26.88	28.60	30.21	31.83
584		==========																			
585	Applications																				
586	----------																				
587	Equity Investment 0.00%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
588		----------																			
589	TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
590		==========																			
591																					
592	NET CASH FLOW	5.84	7.27	3.98	4.16	19.69	21.08	22.87	23.93	25.82	26.34	25.91	24.77	25.01	25.38	25.01	25.71	26.88	28.60	30.21	31.83
593		**********																			
594																					

595 NET PRESENT VALUE 12.00124.08

1 08/04/91 01:23 PM FILE = FINREF 2.3.1 BASE MARGIN, REDUCED DEMANDPRICE, 75% FOREIGN
2 JAMAICA ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY
3 PETROLEUM SECTOR FINANCIAL ANALYSIS - CASE II - CAT CRACKING
598 OFFSHORE PARTNER WITH 75.00% OWNERSHIP
599 **********
600
601

602 US$ CASH FLOWS		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
603 ----------		----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
604 Sources																					
605 ----------		0.00	7.43	8.91	8.23	12.33	11.35	10.62	9.68	9.09	8.15	7.08	6.00	5.35	4.79	4.18	3.80	3.52	3.31	3.10	2.90
606 Dividend Repatriation		0.00	9.32	12.52	12.96	21.73	22.41	23.47	23.96	25.21	25.31	24.64	23.38	23.36	23.43	22.91	23.32	24.15	25.47	26.71	27.97
607																					
608		0.00	9.32	12.52	12.96	21.73	22.41	23.47	23.96	25.21	25.31	24.64	23.38	23.36	23.43	22.91	23.32	24.15	25.47	26.71	27.97
609	CUMUL PV	0.00	7.43	16.34	24.57	36.90	48.25	58.87	68.55	77.64	85.79	92.87	98.87	104.22	109.01	113.20	117.00	120.52	123.83	126.93	129.83
610 Applications	PAYBACK PT	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
611 ----------	CUMUL PV	2.22	15.40	51.63	76.03																
612 Equity Investment 76.03		2.49	16.53	50.90	38.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
613	YRLY PV	2.49	15.40	36.23	24.40																
614		1993.6																			
615 NET CASH FLOW		-2.49	-7.21	-38.38	-25.44	21.73	22.41	23.47	23.96	25.21	25.31	24.64	23.38	23.36	23.43	22.91	23.32	24.15	25.47	26.71	27.97
616																					
617 RETURN ON EQUITY			25.3%																		
618 PRESENT VALUE OF NET CASH FLOW @			12.00%		53.80																
619 PAYBACK PERIOD OF DCF			6.2 YEARS																		

JAMAICA

ENERGY SECTOR STRATEGY AND INVESTMENT PLANNING STUDY

VOLUME II

PART B

EVALUATION OF FUEL ETHANOL PRODUCTION

CONSULTANTS' REPORT

TABLE OF CONTENTS

I. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS 1
Conclusions 1
Recommended Strategy 2

II. OVERVIEW AND BACKGROUND 4

III. ISSUES AFFECTING FUEL ETHANOL ECONOMICS 6
World Price of Oil 6
Availability of Cheap European Wet Ethanol 6
U.S. Gasoline Tax Relief to Blenders 7
U.S./World Requirements for Oxygenated Fuels 7
Caribbean Basin Initiative 8
Competition in the Caribbean 8
Petronol 10
Petrojam Ethanol 11
Forecasts 14
Cash Flow Analysis 14
Conclusion I 15
Conclusion II 16
Conclusion III 16

Annexes

3.1 Market Forecast for Fuel Ethanol Demand
4.1 PCJ Jamaica Fuel Grade Ethanol P roduction Economic Analysis Model

I. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

1.1 This report analyzes economic costs and benefits of the production of wet alcohol from Petronol at Bernard Lodge and dry, fuel-grade ethanol from Petrojam Ethanol at the oil refinery site in Kingston. It includes a summary of the capacity, configuration and production cost structure of each plant as well as an analysis of the major issues which affect the economics of fuel ethanol production. These issues are:

(a) World Price of Oil

(b) Availability of Cheap European Wet Ethanol

(c) U.S. Gasoline Tax Relief to Blenders

(d) U.S. and World Requirements for Oxygenated Fuels

(e) Caribbean Basin Initiative

1.2 The objective of this analysis is to serve as a guide to the GOJ strategy for divestment of these ethanol facilities. The approach to the analysis was to prepare a cash flow framework projecting 10 years of ethanol production, which incorporated the base "most probable" assumptions as to production costs, volumes and sales prices within the context of the actual physical plant and the issues outlined above. Sensitivities to the main input cost and revenue factors were then performed to examine the range of possible outcomes. Private sector generators who may wish to purchase the wet and/or dry alcohol facilities will be faced with the same underlying economic conditions but will also consider their own particular financial circumstances in assessing the commercial opportunity.

Conclusions

1.3 The revenue side of the Caribbean ethanol dehydration business has been stabilized by the extension to the year 2000 of U.S. duty-relief for fuel ethanol under the Caribbean Basin Initiative. This is further supported by expected strong growth in the U.S. requirement for oxygenates in gasoline as required to meet regulations under the Clean Air Act.

1.4 At current and anticipated "most probable" factor costs and prices the Petronol operation is a much higher cost supplier of CBI-qualifying wet ethanol to Petrojam Ethanol than other Caribbean supplies. This high cost situation is exacerbated by the anticipated requirement for an investment of some $4 million in treatment facilities for the waste "stillage" from the operation. Because of Petronol's relatively high production cost structure, combined with this capital investment, the price of other Caribbean supply could increase several times current levels and still be competitive with Petronol wet ethanol as CBI-qualifier for Petrojam Ethanol.1/

1/ *The use of the names Petronol and Petrojam Ethanol serves only to designate the wet and dry ethanol production facilities and does not imply that these facilities should continue as public sector operating under GOJ.*

1.5 The cost side of the Caribbean dehydration business is less certain since it is critically dependent on the supply of low-cost European wet ethanol, sold under distress circumstances in order to reduce a huge surplus of wine-sourced alcohol generated by EEC farm subsidy programs. The Caribbean ethanol business will be killed by a lack of this supply or even a supply at prices that are as little as 10 or 12 cents per gallon higher than recent landed costs of 57 cents per gallon.

1.6 It is not economically viable to produce fuel ethanol for blending to gasohol in Jamaica at current or anticipated international oil prices. This viability would depend on oil prices more than doubling present levels.

1.7 All other factors being equal it is recognized that a secure supply of CBI-qualifying wet ethanol feedstock, even at high cost, is critical to the viability of the Jamaican dehydration operation. Unless sufficient quantities can be secured from other Caribbean sources, the retention of the Petronol operation could be justified on a standby, security basis.

1.8 The economic and commercial aspects of the fuel ethanol business are uncertain and specialized and are made more difficult by the critical impact of U.S. and European Government programs. There are specialized, dedicated operators in the business who may view the combination of PCJ facilities in a different light from that of a strictly economic analysis. Such operators may have access to cheaper, integrated supplies of feedstock molasses or wet ethanol and have different strategies for meeting CBI value-added requirements. In addition, potential purchasers of the oil refinery are unlikely to want to be encumbered by an operation which is outside of their mainstream business interests.

Recommended Strategy

1.9 As part of the GOJ privatization program, it is recommended that PCJ request offers simultaneously for purchase of both the Petronol and Petrojam Ethanol facilities. Bidders should be given the option of offering for both plants individually or together. It is quite possible that the Petronol plant would be bought for relocation; however, the Petrojam Ethanol facility could be operated in its present location under a service agreement with the refinery operator. Care must be taken to ensure that the sale and operation of the ethanol distillery at the reinery should not become prejudicial to the sale of the refinery.

1.10 In order that GOJ would maximize its revenues from the sale of both ethanol and petroleum refining assets, the timing and modality of both divestitures and attendant requests for proposals would have to be coordinated closely to ensure that:

(a) the presence of the Petrojam Ethanol facility on the refinery site is not an encumbrance to a potential sale of the refinery assets to an operator not wishing to be involved with ethanol.

and/or that simultaneously,

(b) the present PCJ ethanol production assets are available for purchase as a package with the refinery, in the event that a potential buyer of the refinery would view the ethanol business as an attractive add-on to petroleum refining.

II. OVERVIEW AND BACKGROUND

2.1 PCJ is the owner of two ethanol operations in Jamaica:
Petronol - a producer of wet ethanol in connection with the Bernard Lodge sugar estate near Kingston; and **Petrojam Ethanol** a producer of dehydrated, fuel-grade ethanol from wet ethanol feedstock at the Petrojam refinery site in Kingston. In addition there is a private producer of dehydrated ethanol, **Tropicana**, located in Kingston.

The planning for establishment of Jamaican ethanol operations had its genesis in the early 1980s and evolved in the context of several historical circumstances:

(a) a strong U.S. demand for fuel-grade ethanol at relatively high prices; the strong prices to domestic producers were encouraged both by federal and state gasoline tax relief,(an effective price subsidy) and higher fuel prices prior to the 1986 world oil price decline.

(b) the U.S. administration's Caribbean Basin Initiative (CBI), promulgated in 1984, which granted Caribbean-sourced fuel ethanol duty-free entry into the U.S. The intent of the legislation was to facilitate Caribbean economic development by allowing duty-free access to the U.S. for certain Caribbean-produced commodities provided there was at least 35% Caribbean value-added to the commodity.

(c) the existence of an enormous European wine ethanol surplus "lake", encouraged by EEC farm subsidy programs. Periodic sales of parcels from this surplus are made by the European authorities at prices that are a fraction of the farmer's costs and much lower than the economic cost of producing from sugar operations.

2.2 The Tropicana International plant was the first facility established to take advantage of the above conditions; it was commissioned in 1984 with a capacity of 20 million usg per year, designed to dehydrate 85% wet alcohol, producing 99.5% fuel grade for the U.S. market. The objective was to import cheap European wine alcohol and turn it into fuel grade for the U.S. market while meeting the CBI value-added requirement. It appears that Tropicana has been able to meet this 35% requirement, within its own production cost structure, without having to purchase any Caribbean wet alcohol feedstock.

PCJ decided to take advantage of the same opportunities through three separate initiatives:

(a) through Petrojam the creation of Petrojam Ethanol Limited, and the construction in 1986 of a 50 million usg per year dehydration facility at the Petrojam refinery site; the plant was commissioned in December 1986.

(b) the creation of subsidiary Petronol Limited and its acquisition of the Bernard Lodge sugar factory and subsequent rehabilitation of existing plant equipment and installation (in 1986) of a fermentery and distillery at the factory site for production of wet alcohol. The objective was to provide firm supplies of wet alcohol to the Petrojam facility, for qualification under the CBI local value-added requirement. The plant capacity is 15 million usg per year of wet ethanol.

(c) through Petrojam the creation of Petrojam Belize with, among other petroleum product marketing objectives, the goal of establishing an additional source of CBI wet alcohol feedstock; pursuant to this, Petrojam in 1986 leased a closed sugar factory, and formulated plans to rehabilitate and install a fermentery/distillery with a production capacity of 9 million usg per year of wet ethanol. Under re-structuring of PCJ this operation is being divested.

III. ISSUES AFFECTING FUEL ETHANOL ECONOMICS

World Price of Oil

3.1 Dry ethanol as a 10% blend in gasoline, known as "gasohol", has a blending value that approximates the price of finished unleaded regular gasoline. Compared with standard specification gasoline, the lower energy content of ethanol is compensated by its much higher octane blending value. At crude oil prices prevailing since 1986, in the $20 per barrel range for reference West Texas Intermediate, the economic cost of regular gasoline is about $ 0.60 per usg ex USGC refineries. This is much lower than the economic resource cost of biomass-sourced dry ethanol from dedicated plants. It is estimated that the cheapest, most efficient sources make dry ethanol for about $1.10 per usg, while most plants are more in the $1.40 -$1.50 per usg range. Since most of the cost is that of biomass/sugar, there may be localized, landlocked situations where production from byproduct molasses at low opportunity value could result in costs lower than this, but these are generally hampered by the lack of scale in dehydration, gasoline logistics and gasoline blending. It is concluded that oil prices in the $40 to $50 per barrel range would be required to justify unsubsidized, large-scale biomass-produced ethanol as a gasoline blending agent or substitute.

Availability of Cheap European Wet Ethanol

3.2 Abundant sources of grape-based wet ethanol have been available in Europe as a result of government agricultural support programs. The alcohol "lake" amounted to some 300 million usg of stocks in mid -1990 and the 1991 projected surplus is some 100 million usg. The EEC Commission for Agriculture is making new efforts to dispose of the stocks and to reduce the ongoing conversion of wine into alcohol. Conditions governing wine distillation have become more restrictive over the years in an attempt to dissuade farmers from overproduction. The incentives to reduce this subsidy distortion are enormous. It is estimated to cost the EEC some $6.00 per usg to purchase and store this alcohol, while the netbacks on disposal sales have been in the $0.25 to $0.30 per usg range. This is imposing a tremendous burden on EC taxpayers which the EC is attempting to reduce under the Common Agricultural Policy.

3.3 Petrojam Ethanol has benefited from this cheap source of wet ethanol for production of fuel-grade exports to the U.S., maximizing the proportion in its total feedstock as limited by the need to meet CBI value-added. It submits tenders to the EEC for purchase of the alcohol in storage at the various farmers' inland locations. In addition to this purchase price it must pay a "fobbing" cost which covers the gathering, handling, movement to port and storage in port, preparatory to loading aboard ship; to this must be added marine freight and cargo insurance for landing in Kingston. A cost structure for 1990 purchases of some 11 million usg is provided as Table 3.1.

TABLE 3.1: EUROPEAN WET ETHANOL COST STRUCTURE
PETROJAM 1990 PURCHASES

	$/usg
EC Purchase Price	0.27
"Fobbing" Cost	0.19
Marine Freight & Ins	0.11
Total cif Kingston	0.57

U.S. Gasoline Tax Relief to Blenders

3.4 The U.S. Federal Government provides blenders of "gasohol" a gasoline tax relief of 5.4 cents per gallon (CPG) of saleable product. Since gasohol contains 10% dry ethanol, this translates into a gross subsidy of 54 cents per gallon of dry ethanol. This subsidy is intended to make U.S. farm-based producers viable at current oil prices and ethanol production costs. Foreign producers (EXCEPT CBI) are excluded from the benefits of this subsidy by a 54 cpg duty on imported fuel ethanol. Most of the gasohol blenders are inland in farm states and there are costs of storage, handling, transport and blending in order to get to a saleable "rack" distribution point. There are also the profit margins of these handling and blending operators. It is estimated that these total costs and profit margins between a USGC landed ethanol and the inland blender's rack currently amount to 19 cpg; this results in a net subsidy effect on the USGC price of ethanol of 35 cpg above the price of unleaded regular gasoline. An inland blender should therefore be willing to pay a USGC supplier of ethanol $0.35 per usg higher than gasoline bulk supply price, and break even on his sales of gasohol at his rack, given his total acquisition costs and tax credit. Thus, for a CBI producer the market price of ethanol in the USGC is equal to USGC gasoline price plus 35 cpg.

U.S./World Requirements for Oxygenated Fuels

3.5 Current gasoline demand in the U.S. is some 7.2 million bpd, with a total average ethanol content of about 0.8%, representing 880 million usg per year of fuel-grade ethanol. Ethanol as well as other alcohols and ethers (collectively known as "oxygenates") have useful properties as blending agents in gasoline in the reduction of hydrocarbon and carbon monoxide exhaust emissions, while at the same time maintaining high octane levels. The passage of the Clean Air Act (CAA) in November 1990, established a permanent role for oxygenates in U.S. gasoline for the foreseeable future. Based on current economic cost and blending value, the most attractive oxygenate is methyltertiarybutylether (MTBE). Based on projected requirements for oxygenates under the provisions of the Act, however, there is anticipated to be a shortfall in MTBE supply in the short/medium term. Based on this inability to meet

oxygenate demand from MTBE alone, ethanol is considered as the next best alternative, especially at tax-relief prices.

3.6 ANNEX 3.1 provides a forecast of U.S. gasoline demand as well as an estimate of required ethanol content in order to meet CAA standards; this is based on an anticipated U.S. and worldwide shortage in MTBE, and a continuing tax credit to ethanol. It is also supported by the fact that the tax credit is also granted on ethanol as feedstock to ethyltertiarybutylether (ETBE) production, an oxygenate which has superior blending properties to MTBE. As indicated total fuel ethanol requirement is expected to expand from current levels 880 million usg to some 3000 million usg by the year 2001.

Caribbean Basin Initiative

3.7 In 1989 the U.S. Congress passed the Steel Trade Liberalization Act that, inter alia, extends the duty-free status of ethanol produced in the Caribbean and shipped to the U.S. Until the year 2000, CBI countries can ship a total maximum of the greater of 60 million usg per year or 7% of the U.S. domestic fuel ethanol market, providing they meet 35% value-added (% of FOB sales price) in the Caribbean. Any sales beyond this "base quantity " maximum up to 35 million usg additional would still gain duty-free access providing 30% by volume of the wet alcohol feedstock originates in the Caribbean. The next 35 million usg must meet a 50 % Caribbean feedstock minimum in order to gain duty relief.

3.8 As indicated in ANNEX 3.1, the limit of 7% of U.S. market is projected to expand from 62 million usg in 1991 to 130 million usg in 1995 and 208 million usg by the year 2001. This extension to the year 2000 combined with projected increased allowable volumes is expected to stabilize the Caribbean ethanol industry. CBI producers may now make long-term commitments to supply ethanol for oxygenated fuel requirements under the CAA. Based on current projections there will be no lack of market for CBI ethanol and the 35% value added constraint is expected to remain the governing factor for the foreseeable future.

Competition in the Caribbean

3.9 Due to the short time frames in which U.S. import regulations previously placed Caribbean produced ethanol, competition has been slow to develop in the region. The barriers to entry in this industry, however, are relatively low; and if attractive returns are achievable, Petrojam should expect increased competition. The primary constraints to production in a more competitive environment will likely be the secure sourcing of low cost feedstock and, in light of the new U.S. legislation, sufficient Caribbean-produced wet ethanol. The current production capacities of Caribbean ethanol producers are shown in Table 3.2.

TABLE 3.2: CARIBBEAN/CBI ETHANOL PRODUCERS

Producer/Country	Wet Ethanol Capacity (Millions USg)	Present Status
Petrojam/Jamaica	50	Fully operational
Tropicana/Jamaica	20	Fully operational
Ligas/Costa Rica	35	Fully operational
Subtotal	105	
Allied Ethanol/Bahamas	40	Not operational
Chem Fuels/ Virgin Islands	10	Not operational
Total	155	

Source: Petrojam Limited

3.10 Total operational production capacity of the CBI countries amounts to 13% current consumption levels in the U.S., which could trigger the more stringent CBI-content requirements discussed above. However, in 1990, CBI ethanol imports by the U.S. amounted to only 1.4% of the total U.S. consumption. In addition total 1993-94 projected allowable CBI market in the U.S. will exceed the total production capability of existing operational plants.

IV. ECONOMICS OF PCJ FUEL ETHANOL PRODUCTION

4.1 In addition to the general/regional issues outlined above the specific factors which affect the final economics and viability of the PCJ operations in Jamaica are the capacity, configuration and cost structure of the two plants. In order to examine the viability of the plants it was necessary also to prepare base, "most probable" forecasts (over 10 years 1992 through 2001) for the output value of dry ethanol sold into the USGC as well as for major input costs such as Caribbean molasses, Caribbean wet ethanol, and European wet alcohol. These data are structured in a cash flow framework which permits the analysis of various production configuration options for the base case as well as the examination of sensitivities of the results to different assumptions from the base.

Petronol

4.2 Table 4.1 contains a summary of the production cost structure estimated for Petronol as well as capacity, feedstock definition and capital elements such as estimated breakup sale value as a re-usable plant and estimated future capital requirements for adequate waste treatment. Although, in principle, all the Petronol costs qualify as CBI value-added, in practice Petrojam has indicated that it would be unlikely that the U.S. Customs would accept total wet ethanol feedstock costs in excess of typical recent Caribbean-sourced cost of $1.25 per usg. This has been used as a maximum allowable CBI-qualifying figure in these calculations.

4.3 As indicated, Petronol's rated capacity is 15 million usg per year, but it has never approached anything close to this in actual operations. The 1990 production amounted to 1.1 million usg, only 7% of plant capacity.

4.4 It was assumed that the Bernard Lodge sugar operation would be shut down and the Petronol fermentery/distillery would have to obtain its own external supplies of feedstock, energy and other factor inputs. The feedstock is assumed to be Caribbean-sourced molasses. One tonne of 50% sugars molasses is required to produce 79 usg of wet ethanol. The cost is assumed to be $80.00 per tonne at the plant. This reflects recent imported molasses prices, after correction for sugar content, and is slightly lower on an adjusted sugar content basis than the spot price of tank truck lots recently traded in the USGC (New Orleans). The Caribbean is a net exporter of molasses, and the USGC a net importer. It is reasonable, therefore, to expect a lower opportunity value for molasses in the Caribbean than the New Orleans spot price. The energy costs were taken from recent 1990 Petronol operating accounts but are consistent with the cost of heavy fuel oil at $20.00 per barrel based on a typical coefficient of energy

use in such a plant. All the other costs are based on adjusted operating costs and are in line with the cost structures of similar plants elsewhere.2/

4.5 Two capital elements have been identified in connection with the Petronol facility:

(a) Breakup sale value - based on the prospects for disassembly, coding of components, transport to a new site and re-assembly for operation, the facility should sell (net of the costs of the foregoing) at some $3.0 million; this is based on a value before deducting these costs, equivalent to depreciated replacement value.

(b) Waste treatment investment - at full capacity operation it is estimated that the biological oxygen demand of the effluent "stillage" is equivalent to the waste from a city of 300 thousand inhabitants. There is no waste treatment facility at the moment; the capital cost of an appropriate plant is estimated at roughly $4 million.

Petrojam Ethanol

4.6 Table 4.2 contains a summary of the capacity, yield and cost structure for the Petrojam dry ethanol facility. A maximum capacity of 40 million usg per year has been assumed since the smaller, 10 million usg/yr plant is nearing the end of its serviceable life. The yield of dry ethanol from wet is assumed to be 95.1%.

4.7 Not all the actual cash costs, such as administration and selling expenses qualify as CBI value-added. On the other hand, there are some non-cash internal transfer costs, such as the leasing costs for land and equipment paid by Petrojam Ethanol to Petrojam Limited which can be included in value-added.

2/ *In any event, molassis and steam have resource values determined by their opportunity cost or international markets (molasses) or power generation for sale to JPS.*

Table 4.1: PETRONOL JAMAICA LIMITED
COST OF PRODUCTION OF WET ETHANOL

bases, assumptions:

Derived from jan -dec 1990 accounts with modifications:

- Feedstock cost adjusted to reflect cost of molasses $80.00 Per tonne for 50% sugars
- Total water & steam cost consistent with estimated $.18/usg Required for hfo alone at current prices

Fixed US$,thous/yr	
Labour & admin	150
Maintenance	32
Other	18
Total Fixed	200
Variable US$/usg	
Feedstock Molasses	1.01
Materials, Chemicals	0.08
Water & Steam	0.23
Electricity	0.01
Maintenance	0.03
Product handling	0.02
Other	0.01
Total Variable	1.39

TABLE 4.2: PETROJAM ETHANOL LIMITED
PRODUCTION COSTS, EXCLUDING FEEDSTOCK

BASES, ASSUMPTIONS:

DERIVED FROM APR/90 -FEB/91 ACCOUNTS WITH AN ADD-ON OF $100 THOUSAND/YR TO MAINTENANCE FOR SUSTAINING OF PLANT.

FIXED US$thou/YR	
1 CBI CASH	
LABOUR	316
MAINTENANCE	150
OTHER	50
TOTAL CBI CASH	516
2 NON-CBI CASH	
ADMINISTRATION SELLING	200
OTHER	30
TOTAL NON-CBI CASH	230
TOTAL FIXED CASH	746
3 CBI NON-CASH	
RENTAL OF EQUIPMENT, LAND	700
TOTAL FIXED CBI	1216

VARIABLE US$/usg	
ALL CBI	
MATERIALS,CHEMICALS	0.03
WATER, STEAM, ELEC	0.09
OTHER	0.01
TOTAL VARIABLE	0.13

Forecasts

4.8 Price of Dry Ethanol to the USGC - It is assumed that the U.S. gasoline tax relief to gasohol blenders provides an effective net subsidy to dry ethanol, over regular gasoline value in the USGC of $0.35 per usg at present will stay constant in real terms over the forecast period in relation to the base gasoline price forecast contained in the petroleum sector volume (Vol. II-A). The Kingston to USGC freight, at $.05 per usg in 1991 is assumed to escalate at 3% p.a. in real terms to 1997 and remain constant thereafter. For any sensitivity cases of gasoline prices above the base level, it is assumed that the subsidy is reduced the same amount as the price increase until it reaches zero; only then is it assumed that radically higher oil prices would have the effect of increasing the U.S. ethanol price.

4.9 Molasses price - it was assumed that the $30.00/tonne price at the Petronol plant remains constant in real terms over the forecast period. This roughly parallels the World Bank commodity forecast for the international sugar price over the same period which is quite flat in real terms.

4.10 Caribbean wet ethanol price - there are several sources of wet ethanol for export in the Caribbean; plants in Costa Rica, Panama, El Salvador and Guatemala have all exported on a regular basis. Such exports, surplus to local uses, are generally sold as feedstock for dehydration to fuel grade for sale into the USGC. The recent (1991) price to Petrojam of Caribbean, CBI-qualifying feedstock was $1.25 per usg. On the basis that prices in the future will be adjusted to move the material into dehydration markets, the future prices were forecast to move in relation to projected USGC gasoline price movements over the period, starting with a base $1.25 per usg for 1991.

4.11 European wet ethanol price - The price of European wet alcohol is projected to be related to the USGC gasoline price since one of the dispositions for this surplus alcohol is as CBI-qualifying feedstock for fuel alcohol production, with a starting value of $0.27 per usg for 1991. The fobbing cost, $0.19 per usg, and marine freight $0.11 per usg are assumed to be constant in real terms over the forecast period.

Cash Flow Analysis

4.12 Base Case - ANNEX 4.1 provides a copy of the spreadsheet input assumptions and output results for the base case analysis of PCJ ethanol economics. The first section documents the capacity, cost, sales volume and price forecast assumptions. The cash flow results are shown for three different sales and EEC supply configurations, each with the variation of Caribbean wet ethanol supply from outside Jamaica or from Petronol. Two configurations have been examined assuming (i) continued availability of EC wet alcohol or (ii) no EC feedstock. Two additional variants have been considered in combination with the configuration (a) sell off Petronol or (b) operate Petronol and add waste treatment facilities.

4.13 Configuration I- Sell into the USGC under CBI, with EEC feedstock and either

(a) Caribbean supply for CBI value-added, sell off Petronol
OR

(b) Petronol supply for all CBI value-added, invest in waste treatment facilities.

4.14 As indicated by the cash flow results case (a), obtaining all Caribbean supply would be much more profitable than retaining Petronol. The net present value of I(a) is $21 million versus $10 million for I(b). Sensitivities of the economics of this configuration to changes in input prices were calculated:

4.15 Sensitivity to Caribbean wet ethanol price - the price of this input would have to increase to 6.5 times the base forecast values before the NPV of case I (a) would drop to the $14 million level of case 1 (b). Even if the capital effects are excluded from the comparison of I(a) and I(b), i.e. case I(a) is not credited with the revenue from the breakup sale of Petronol, and case I(b) is not charged with the waste treatment investment, the Caribbean wet ethanol price would have to increase to 1.7 times the base values in order to equalize NPV with the Petronol case I(b).

Conclusion I

4.16 It is recognized that there are security of supply considerations which must be considered in the economic comparison between a captive, local supply of CBI-qualifying feedstock and an external Caribbean source. In other words, with the present high economic incentives to dehydrate ethanol from EEC feed stock for sale in the U.S. the crucial factor is to qualify for the CBI treatment at almost any cost of CBI feedstock because the qualifying amount is small. Providing the CBI value-added supply risk can be eliminated through procurement of assured supplies Caribbean regional wet ethanol under term arrangements, it would be more profitable to supply the CBI requirement from these sources and discontinue operation of Petronol. Considering the high cost of running Petronol, including the anticipated waste treatment investment, the amount of upside price flexibility for assuring Caribbean supply is enormous.

4.17 Sensitivity to European wet ethanol price - the NPV of case I(a) would drop to zero, i.e. a break-even operation on Petrojam Ethanol, with an increase in landed price of European wet ethanol to 1.2 times the base forecast values, all other factors maintained at base values. Assuming constant prices of fobbing and freight this implies that the EEC purchase price could rise from present level of $0.27 per usg to about $0.40 per usg, an increase of 50%, before eliminating the positive cash flow.

4.18 Configuration II - Sell into the USGC under CBI, with no European feedstock available. Assume only case (a) Caribbean feedstock viable because of analysis in I. The base case is naturally very negative at -$64 million NPV. Sensitivity analysis indicates that the Caribbean wet ethanol price would have to drop by 30% from assumed base values, before achieving a zero NPV, break-even operation.

Conclusion II

4.19 The continued availability of European wet alcohol at prices typical of 1990/91 values, combined with the CBI tax relief, could result in a highly profitable operation for an ethanol dehydrator. Although the revenue side appears secure to the year 2000 under CBI, EC alcohol supply is uncertain under present arrngements. European supply must be available at reasonable prices, well below full economic biomass resource costs or the Caribbean dehydration business is dead. A serious operator would obviously attempt to secure supplies on term arrangements at no worse than current prices plus 10% or 20% maximum. He would also operate the plant at maximum capacity, as assumed in the cash flow analysis for 1993 and beyond.

4.20 Configuration III - Blend all Jamaican gasoline as gasohol with 10% ethanol supplied from Petrojam Ethanol. It should be noted that the scale of operations would be very low at 8.7 million usg in 1992, increasing to 11.3 million usg in 2001. Setting gasoline import parity value as the fob sales revenue price to the USGC market for dry ethanol, the NPV in both the Caribbean and Petronol supply cases are highly negative. The USGC price for gasoline would have to increase 2.1 times base values to achieve break-even using Caribbean wet ethanol feedstock; with Petronol feedstock the break-even would be achieved with a multiplier of 2.6 times the base USGC price. This analysis was provided primarily as a confirmation that biomass ethanol at full economic costs requires a world oil price roughly double present levels before it becomes viable as a gasoline blending agent.

Conclusion III

4.21 Based on current or foreseeable international oil prices Petrojam Ethanol would not be viable as a producer of fuel ethanol for blending to local gasohol.

**MARKET FORECAST FOR FUEL ETHANOL DEMAND, U.S.
AND CORRESPONDING ALLOWANCE FOR IMPORTS
UNDER CARIBBEAN BASIN INITIATIVE**

BASES:
- FORECAST OF US GASOLINE DEMAND PER G.H. UNZELMAN "ENVIRONMENTAL IMPACT ON FUEL COMPOSITION 1990 DECADE" FROM AKZO CATALYST SEMINAR, PHILADELPHIA, OCT 2,1990
- INABILITY TO MEET OXYGENATE DEMAND WITH MTBE ALONE
- CONTINUANCE OF 7% ALLOWANCE FOR CBI SUPPLY
- CBI EXTENDS BEYOND 2000, THROUGH FORECAST PERIOD.

	TOTAL US GASOLINE DEMAND KBD	ETHANOL CONTENT OF US GASOLINE	TOTAL US FUEL ETOH MM GAL/YR	TOTAL CBI ALLOWANCE MM GAL/YR
1991	7200	0.80%	883	62
1992	7284	1.00%	1117	78
1993	7369	1.20%	1356	95
1994	7456	1.40%	1600	112
1995	7543	1.60%	1850	130
1996	7631	1.80%	2106	147
1997	7720	2.00%	2367	166
1998	7811	2.15%	2574	180
1999	7902	2.30%	2786	195
2000	7995	2.40%	2941	206
2001	8088	2.40%	2976	208
2002	8183	2.40%	3011	211
2003	8279	2.40%	3046	213
2004	8375	2.40%	3081	216
2005	8473	2.40%	3118	218
2006	8573	2.40%	3154	221
2007	8673	2.40%	3191	223
2008	8774	2.40%	3228	226
2009	8877	2.40%	3266	229
2010	8981	2.40%	3304	231

PCJ JAMAICA FUEL-GRADE ETHANOL PRODUCTION
ECONOMIC ANALYSIS MODEL

ASSUMPTIONS, BASES

PETRONOL CAPACITY	MMusg/yr	15.0 WET ETHANOL
PETROJAM ETHANOL CAPACITY	MMusg/yr	40.0 DRY ETHANOL
YIELD OF DRY ETOH FROM WET, BY VOL		95.1%
PETRONOL PRODUCTION COSTS(ALL CBI VA QUALIFYING UP TO LIMIT OF		$1.25 /usg)
FIXED	MM$/YR	0.20
VARIABLE	$/usgal	1.39
PETROJAM ETHANOL PRODUCTION COSTS		
FIXED -CASH	MM$/YR	0.75
FIXED -CBI QUAL	MM$/YR	1.22
VARIABLE(ALL CBI)	$/usgal	0.13
PETRONOL CAPITAL ELEMENTS		
NET BREAKUP SALE VALUE		$3.0 MILLION
WASTE TREATMENT PLANT		$4.0 MILLION
SENSITIVITIES VS. BASE		
USGC MOGAS ULR PRICE		100%
CARIB WET ETOH PRICE		100%
EEC WET ETOH PRICE		100%
SALES VOLUME DRY ETOH TO US		100%

		1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
PRICES											
USGC MOGAS ULR	$/BBL	25.16	22.28	23.08	24.15	25.36	26.67	28.08	29.60	31.10	30.77
USGC MOGAS ULR	$/usgal	0.60	0.53	0.55	0.58	0.60	0.63	0.67	0.70	0.74	0.73
GASOHOL SUBSIDY, GROSS	$/usgal	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54
TERM,TRANSP,PROFIT,QUAL	$/usgal	-0.19	-0.19	-0.19	-0.19	-0.19	-0.19	-0.19	-0.19	-0.19	-0.19
NET SUBSIDY EFFECT USGC	$/usgal	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35
USGC ETOH VALUE	$/usgal	0.95	0.88	0.90	0.93	0.95	0.98	1.02	1.05	1.09	1.08
FREIGHT, KINGSTON-USGC	$/usgal	0.05	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.06
ETOH FOB KINGSTON	$/usgal	0.90	0.83	0.84	0.87	0.90	0.93	0.96	0.99	1.03	1.02
ETOH FOR JAM GASOHOL	$/usgal	0.63	0.56	0.58	0.61	0.63	0.66	0.70	0.73	0.77	0.76
CARIBBEAN FEEDSTOCK	$/usgal	1.11	1.03	1.06	1.09	1.12	1.16	1.20	1.24	1.28	1.27
EUROPEAN FEEDSTOCK	$/usgal	0.54	0.52	0.53	0.53	0.54	0.55	0.56	0.57	0.58	0.58
SALES	MMusg	20.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
FEEDSTOCK REQ	MMusg	21.0	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1
SALES REVENUE	MM$	17.9	33.1	33.8	34.7	35.8	37.0	38.4	39.8	41.2	40.9
CBI VA REQUIREMENT 35.0%	MM$	6.3	11.6	11.8	12.2	12.5	13.0	13.4	13.9	14.4	14.3
PETROJAM OP COSTS											
CASH	MM$	3.3	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9
CBI QUALIFYING	MM$	3.8	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4
REMAINING CBI REQUIREMENT	MM$	2.5	5.2	5.4	5.8	6.2	6.6	7.0	7.5	8.0	7.9

Note: MM = thousands
$ = 1991 US$

I SELL INTO USGC, UNDER CBI, EEC FEED AVAILS
(a) SUPPLY CBI VA EX-CARIB, SELL PETRONOL

QUANTITY EX-CARIB	MMusg	2.2	5.0	5.2	5.3	5.5	5.7	5.9	6.1	6.3	6.2
QUANTITY EX EEC	MMusg	18.8	37.1	36.9	36.8	36.6	36.4	36.2	36.0	35.8	35.8
CASH FLOW SUMMARY	MM$										
SALES REVENUE		17.9	33.1	33.8	34.7	35.8	37.0	38.4	39.8	41.2	40.9
PETRONOL SALE		3.0									
EEC FEEDSTOCK		-10.2	-19.4	-19.5	-19.7	-19.8	-20.0	-20.2	-20.4	-20.6	-20.8
CARIB FEEDSTOCK		-2.5	-5.2	-5.4	-5.8	-6.2	-6.6	-7.0	-7.5	-8.0	-7.9
PETROJAM CASH OP COSTS		-3.3	-5.9	-5.9	-5.9	-5.9	-5.9	-5.9	-5.9	-5.9	-5.9
NET CASH FLOW		5.0	2.6	2.9	3.4	3.9	4.5	5.2	5.9	6.6	6.3
NPV @ 15.0%	21.4										

(b) SUPPLY CBI VA EX PETRONOL

QUANTITY EX-PETRONOL	MMusg	2.0	4.2	4.4	4.6	4.9	5.3	5.6	6.0	6.4	6.3
QUANTITY EX EEC	MMusg	19.1	37.9	37.7	37.5	37.2	36.8	36.5	36.0	35.6	35.7
CASH FLOW SUMMARY	MM$										
SALES REVENUE		17.9	33.1	33.8	34.7	35.8	37.0	38.4	39.8	41.2	40.9
PETRONOL INVESTMENT		-4.0									
EEC FEEDSTOCK		-10.3	-19.8	-19.9	-20.0	-20.1	-20.2	-20.3	-20.5	-20.5	-20.7
PETRONOL FEEDSTOCK		-3.0	-6.0	-6.3	-6.6	-7.0	-7.5	-8.0	-8.6	-9.1	-9.0
PETROJAM CASH OP COSTS		-3.3	-5.9	-5.9	-5.9	-5.9	-5.9	-5.9	-5.9	-5.9	-5.9
NET CASH FLOW		-2.6	1.4	1.7	2.2	2.7	3.3	4.1	4.8	5.6	5.2
NPV @ 15.0%	9.9										

II SELL INTO USGC UNDER CBI, NO EEC FEED
(a) SUPPLY ALL FEED EX-CARIB, SELL PETRONOL

CASH FLOW SUMMARY	MM$										
SALES REVENUE		17.9	33.1	33.8	34.7	35.8	37.0	38.4	39.8	41.2	40.9
PETRONOL SALE		3.0									
CARIB FEEDSTOCK		-23.4	-43.5	-44.4	-45.7	-47.1	-48.7	-50.3	-52.1	-53.9	-53.5
PETROJAM CASH OP COSTS		-3.3	-5.9	-5.9	-5.9	-5.9	-5.9	-5.9	-5.9	-5.9	-5.9
NET CASH FLOW		-5.8	-16.3	-16.6	-16.9	-17.2	-17.6	-17.9	-18.2	-18.6	-18.5
NPV @ 15.0%	-76.6										

(b) SUPPLY MAX FEED EX PETRONOL, REST CARIB

CASH FLOW SUMMARY	MM$										
SALES REVENUE		17.9	33.1	33.8	34.7	35.8	37.0	38.4	39.8	41.2	40.9
PETRONOL INVESTMENT		-4.0									
PETRONOL FEEDSTOCK		-21.1	-21.1	-21.1	-21.1	-21.1	-21.1	-21.1	-21.1	-21.1	-21.1
CARIB FEEDSTOCK		-6.7	-28.0	-28.6	-29.4	-30.3	-31.3	-32.4	-33.5	-34.7	-34.4
PETROJAM CASH OP COSTS		-3.3	-5.9	-5.9	-5.9	-5.9	-5.9	-5.9	-5.9	-5.9	-5.9
NET CASH FLOW		-17.2	-21.9	-21.8	-21.6	-21.5	-21.3	-21.0	-20.7	-20.4	-20.5
NPV @ 15.0%	-103.5										

III SUPPLY TO JAMAICAN GASOHOL BLENDING

TOTAL GASOLINE DEMAND	MMBL	2.07	2.13	2.19	2.26	2.33	2.40	2.47	2.54	2.62	2.70
ETHANOL FOR 100% GASOHOL	MMusg	8.69	8.95	9.21	9.49	9.78	10.07	10.37	10.68	11.00	11.33
CASH FLOW SUMMARY											
(a) ALL FEED EX CARIB											
SALES REVENUE		5.5	5.0	5.3	5.7	6.2	6.7	7.2	7.8	8.5	8.6
CARIB FEEDSTOCK		-10.2	-9.7	-10.2	-10.8	-11.5	-12.2	-13.0	-13.9	-14.8	-15.1
PETROJAM CASH OP COSTS		-1.9	-1.9	-1.9	-2.0	-2.0	-2.0	-2.1	-2.1	-2.2	-2.2
NET CASH FLOW		-6.6	-6.6	-6.8	-7.1	-7.3	-7.6	-7.9	-8.2	-8.5	-8.7
NPV @ 15.0%	-36.4										
CASH FLOW SUMMARY											
(b) ALL FEED EX PETRONOL											
SALES REVENUE		5.5	5.0	5.3	5.7	6.2	6.7	7.2	7.8	8.5	8.6
PETRONOL FEEDSTOCK		-12.9	-13.3	-13.7	-14.1	-14.5	-14.9	-15.4	-15.8	-16.3	-16.8
PETROJAM CASH OP COSTS		-1.9	-1.9	-1.9	-2.0	-2.0	-2.0	-2.1	-2.1	-2.2	-2.2
NET CASH FLOW		-9.3	-10.2	-10.3	-10.3	-10.3	-10.3	-10.2	-10.1	-10.0	-10.3
NPV @ 15.0%	-50.5										