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STAFF APPRAISAL REPORT

NIGERIA

REFINERIES REHABILITATION PROJECT

JUNE 8, 1989

Africa Region, Western Africa Department
Industry and Energy Operations Division

CURRENCY EQUIVALENTS

Currency unit = Naira (₦)
US$1 = 4.67 ₦
₦1 = US$0.214
₦1 = 100 Kobos

WEIGHTS AND MEASURES

1 Metric Ton (MT)	= 1,000 Kilograms (kg)
1 Barrel (BBL)	= 0.159 Cubic Meter
1 Metric Ton of Oil (API)	= 7.19 Barrels
1 Ton of Oil Equivalent (TOE)	= 10 Million Kilocalories (39.7 Million BTU)
1 TOE	= 1,000 Kilogram of Oil Equivalent (kg OE)
1 Kilocalorie	= 3.97 British Thermal Units (BTU)
1 Gallon	= 3.785 Liters

ABBREVIATIONS AND ACRONYMS

AGO	- Automotive Gas Oil
API	- American Petroleum Institute
ATK	- Aviation Turbine Kersone
BEICIP	- Bureau D'Etudes Industrielles et De Cooperation De L'Institute Francais Du Petrole
CIF	- Cost Insurance and Freight
DPK	- Dual Purpose Kersone
ELP	- Escarvos Lagos Pipeline
ETSD	- Telecommunication Project
E/P	- Exploration and Production
FGN	- Federal Government of Nigeria
FO	- Fuel Oil
FOB	- Free on Borad
Gas T.A.	- Gas Technical Assistance Project
GDP	- Gross Domestic Product
HHK	- Household Kerosene
HPFO	- High Pour Feul Oil
IBRD	- International Bank for Reconstruction and Development
ICB	- International Competitive Bidding
IOC	- International Oil Company
LIB	- Limited International Bidding
LPG	- Liquid Petroleum Gas
NEPA	- National Electric Power Authority
NNPC	- Nigerian National Petroleum Company
PMS	- Premium Motor Spirit (Gasoline)
PPMC	- Pipeline Products Marketing Company
LPFO	- Low Pour Fuel Oil
UNDP	- United Nations Development Program
UPS	- Uninterrupted Power Supply

FISCAL YEAR

January 1 - December 31

NIGERIA

REFINERIES REHABILITATION PROJECT

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NIGERIA

REFINERIES REHABILITATION PROJECT

LOAN AND PROJECT SUMMARY

Borrower: Nigerian National Petroleum Corporation (NNPC)

Guarantor: Federal Republic of Nigeria

Amount: US$27.7 million equivalent

Terms: The loan will be made to NNPC at the Bank standard variable interest rate for 15 years including 3 years of grace. Federal Government of Nigeria (FGN) would guarantee the loan and NNPC would pay a guarantee fee to FGN equal to 10% of the Bank interest rate. Additionally, NNPC would bear the foreign exchange risk.

Project Description: The main project objectives are to improve:

(a) NNPC's institutional approach to preventive maintenance, decision making on investments and repairs and rehabilitation of its assets;

(b) utilization and efficiency of its existing refineries; and

(c) monitoring and control of environmental pollution on account of oil spillage from its refineries.

The proposed project would comprise for Warri and Kaduna refineries: (i) waste water treatment; (ii) condensate recovery system modification; (iii) laboratory equipment; (iv) workshop on preventive maintenance, corrosion protection and environmental protection to be conducted by experienced professionals; and (v) preparation of engineering studies to review existing facilities and recommend medium/long term requirements of the two refineries to improve their operational efficiencies to international standards. In addition for the Warri Refinery: (i) power generating system study; (ii) replacement of fire water lines; (iii) essential spareparts; and (iv) instrumentation replacement and for the Kaduna Refinery inclusion of a data logging computer. There is also a provision to replenish in the future the stock of essential spares and materials required for the satisfactory operation and maintenance of the two refineries.

Project Benefits and Risks:

The economic benefits from the various project components are expected from: (i) an increase in the capacity utilization of the two refineries; (ii) increases in the general operational efficiency; and (iii) reduced cost of operation and maintenance. The improved operation of the refineries would also have a direct effect on the efficiency of NNPC's Petrochemicals Phase I investments. Since all items included in the project are for improving existing facilities and are well defined in the consultant's report, no major risk is anticipated in the implementation of the proposed project. Since the operation of many of the facilities is essential for the continuous operation of the refinery, the rehabilitation work needs to be scheduled to synchronize with the refinery turn-around program to the maximum extent possible. There could be some delay in the completion of some of the items on this account. The engineering contractor will be asked to prepare a detailed time schedule taking this aspect into account which will be monitored during implementation of the Bank's supervision missions. An added benefit of the project is that it would pave the ground for future Bank operations aimed at the overall rationalization of the petroleum sector in general and NNPC's operations in particular.

Estimated Cost:

		Local	Foreign	Total
		(US$ million equivalent)		
(i)	Warri Refinery	5.9	10.7	16.6
(ii)	Kaduna Refinery	2.1	4.8	6.9
	Base Cost 1/	8.0	15.5	23.5
	Physical Contingency	1.2	2.2	3.4
	Price Contingency	2.3	1.7	4.0
(iii)	Engineering Studies Workshops and Training	-	2.3	2.3
(iv)	Spareparts for annual maintenance, chemicals and catalyst	-	6.0	6.0
	Total	11.5	27.7	39.2

1/ Local taxes and duties are not included.

Financing Plan:

	Local	Foreign	Total	% of Total
	(US$ million)			
IBRD	-	27.7	27.7	71
NNPC	11.5	-	11.5	29
Total	11.5	27.7	39.2	100

Estimated Disbursement:

	IBRD Fiscal Year (US$ million)		
	90	91	92
Annual	22.2	4.3	1.2
Cumulative	22.2	26.5	27.7

Economic Rate of Return: 38 percent for the Warri refinery components and 31 percent for the Kaduna Refinery components.

NIGERIA

REFINERIES REHABILITATION PROJECT

I. THE ENERGY SECTOR

A. Energy Supply and Demand

1.01 Nigeria has substantial and diversified energy resources, including oil, natural gas, hydro potential, coal, and fuelwood. Since the first commercial discovery of oil in 1956, Nigeria has become one of the world's leading oil-exporting countries. Proven recoverable oil reserves, onshore and offshore in the Niger River delta, amount to some 2.2 billion tons and undiscovered recoverable oil reserves may reach an additional 1.1 billion tons. Gas reserves are estimated at about 2.4 trillion cubic meters (85 trillion standard cubic feet), about 2.1 billion tons of oil equivalent, including about 1.2 trillion cubic meters of associated gas (about 1.1 billion tons of oil equivalent). Recoverable undiscovered gas reserves are estimated to be in the order of 1.6 billion tons of oil equivalent, two-thirds of which probably would be non-associated gas.

1.02 Nigeria's installed electric power capacity was about 4,000 MW in 1987, primarily in generating plants of the government-owned National Electric Power Authority (NEPA). A significant amount of captive private generating capacity also exists, mainly as back-up for NEPA. The country's substantial hydro resources total about 11,500 MW in technically feasible potential. Current installed hydro capacity, however, amounts only to about 1,300 MW, with installations totalling an additional 600 MW under construction. The feasibility of any new hydroelectric power projects of major size should be evaluated vis-a-vis other potentially cheaper power sources, particularly gas.

1.03 The most recent estimates of proven, indicated, and inferred coal reserves range between 270 and 980 million tons which are located in the upper southeast of the country. Output reached a peak of more than 900,000 tons per year in the late 1950s. Interrupted completely during the Civil War in 1968-69, production never fully recovered and amounted to only 117,000 tons in 1987. While potential consumption and output could total as much as one million tons, the proper role of coal, if any, vis-a-vis the use of other energy resources, still needs to be evaluated.

1.04 The main fuels utilized by the country's rural population are firewood and charcoal, supplemented by crop residues and dung in the dry Sudan and Sahel regions. While the supply of wood fuels is generally ample in the forested regions of the south, increasingly severe resource constraints are being encountered in the dry central and northern regions of the country.

1.05 The outlook for use of liquefied petroleum gas (LPG) in Nigeria's transport sector and in households also appears promising. Nigerian refineries have the capacity to produce over 350,000 tons per annum (tpa) of LPG, and possible expansion of basic and cracking capacity could increase this to about 450,000 tpa. Additional quantities of LPG could also be extracted from natural gas streams. Current consumption averages 70,000 tpa. Part of it is met by imports because of unreliable supplies from the refineries. Although the potential market could reach about one million tons of oil equivalent (toe) per annum over a relatively short period of time, a substantial amount of the LPG now being produced at refineries is being flared because of an inadequate distribution network.

1.06 Total annual energy consumption in Nigeria is estimated at about 20 million toe; commercial energy accounts for about 60 percent of this total. Petroleum products make up about 70 percent of commercial energy consumption, while the rest is accounted for by gas (20%), hydro and coal (10%). Electricity consumption, which is low for a country with 105 million inhabitants, has increased by less than 6 percent per annum between 1980 and 1987, reaching about 7.3 GWh in 1987. Consumption of petroleum products rose at an annual rate of about 15 percent p.a. from 3.9 million tons in 1976, to over 9.2 million tons in 1982, peaked in 1983 when it reached 9.5 million tons and slowly reduced until 1987, when it reached 8.5 million tons. Together, gasoline and gas oil account for around 60 percent of total petroleum consumption in Nigeria; kerosene, mainly used as a household fuel, accounts for another 22 percent. The Government has come to recognize the importance of substituting liquid fuels with gas to meet domestic needs of large-volume power and industry users, whenever technically and economically feasible. The estimated commercial energy balance is shown in Annex 1-1.

B. Energy Prices

1.07 Inter-fuel prices. Energy prices in Nigeria are determined by the Federal Government through parastatal entities such as the Nigerian National Petroleum Corporation (NNPC) and NEPA. While prices of gasoline and diesel are close to their economic costs (see table below), household kerosene, gas oil prices and electricity tariffs are quite low relative to their border values. The price of LPG is also low, compared to an FOB price abroad. Natural gas is the lowest cost fuel on a heat equivalent basis for high volume uses in urban areas, not considering other advantages it offers as a clean fuel. At present fuel prices, gas is still competitive with low pour fuel oil, its major substitute fuel. If gas is to be priced at un-subsidized levels, and escalated with rising inflation, fuel oil prices need to be brought closer to their economic value to retain the economic relative price structure for Nigeria. The same applies to diesel fuel prices, as diesel is used particularly in private standby electricity generation. Inter-fuel prices will be reviewed in detail by the Energy sector review mission scheduled for FY90 (para. 2.09).

Table I

COMPARISON OF DOMESTIC PRICES WITH LAGOS CIF PRICES

(in US$ at the September 1988 rate of exchange of US$1 = ₦4.67)1/

	Domestic prices July 1988	CIF Lagos prices 2/ July 1988
Gasoline (Premium)	0.09/L 3/	0.14/L 3/
Kerosene (Domestic)	0.03/L	0.13/L
Kerosene (Aviation)	0.22/L	0.13/L
Gas oil	0.08/L	0.12/L
Fuel oil	0.06/L	0.09/L
LPG (FOB)	87.70/T	150.00/T
Crude oil to refineries	4.41/barrel	14.00/barrel

1/ Until December 1988, the foreign exchange market (FEM) was a combination of an auction (fortnightly), and interbank market which operated in response to supply and demand. The average of FEM rates in the auctions of September 1988 was US$1 = ₦4.67. Since the preparation of this report the Naira has undergone considerable devaluation. On January 9, 1989, Nigeria moved from the fortnightly auction system to direct daily sales of official sources of foreign exchange to the banks, and the exchange rate is now established in the interbank market. The exchange rate in the second half March 1989 was about US$1 = ₦7.5

2/ Border prices, plus internal transport and insurance.

3/ Equivalent to US$0.34 and 0.53 per gallon.

C. Institutions

1.0 While Nigeria has a predominantly private market economy, Government institutions and corporations play a dominant role in the various energy supply sectors. This is particularly true in electricity and coal, where the Government has a near monopoly through NEPA and the Nigerian Coal Corporation and, to a slightly lesser degree, in petroleum marketing. All the three existing domestic refineries, and the one under construction, are owned and operated by NNPC. Of the eight major petroleum marketing companies, three (African Petroleum, National and Unipetrol) are controlled by NNPC. Together they hold a market share of about 34% for gasoline, kerosene and gas oil and about 49 percent for other products (fuel oils, base oils, asphalt). The other five (Agip, Mobil, Texaco, Total, Elf) are subsidiaries of international oil companies (IOCs) and have majority ownership by Nigerian nationals (60%). They hold a market share of about 43% for gasoline, kerosene, gas oil and about 51% for other products. The remaining market share is held by small independent companies. The small LPG market is served for 75% by eleven major Nigerian distribution companies, the rest is held by independent companies. The administration of forest lands is a state responsibility, with the Federal Government's Department of Forestry playing an advisory, investment-financing and coordinating role. Given the relative autonomy of the energy-related agencies for each of the 21 states and their divergent interests, major decisions on energy matters are difficult to reach and can be based on political compromises rather than rational economic criteria. However, the National Energy Commission, that coordinates all activities in

the energy sector under the Presidency, has been reactivated in 1988 and one may expect that a more coherent energy policy will be formulated in the future.

1.09 The rapid growth of Government-owned energy supply organizations has led to a scarcity of trained personnel, poor operating records, insufficient maintenance and frequent equipment failures. This is particularly true for organizations such as NEPA which are subject to civil service regulations and wage levels that lag substantially behind private sector ones. As a result, many middle and upper management positions cannot be filled or are filled with unqualified personnel, reducing the overall performance of Government-owned corporations.

1.10 Overall sector planning. The Office of the Petroleum Ministry was created to deal with petroleum and gas related issues previously handled by the Special Advisor. Although the in-house staff and evaluation capacity of the petroleum ministry is limited, it has access to NNPC staff for analysis of petroleum issues. It needs strengthening in conjunction with efforts to enhance the planning and evaluation capacity of NNPC. Also, proper coordination mechanisms with other agencies operating in the energy sector need to be set up.

1.11 Institutions in the oil and gas sector. Oil and gas activities are governed by the Petroleum Decree of 1969. The Petroleum Ministry is responsible for policy direction, and the Petroleum Minister is ex-officio chairman of NNPC. Statutory control of the petroleum industry rests with the Petroleum Inspectorate's Office, which is now separated from NNPC.

1.12 Oil and gas are produced by joint ventures between the Federal Government of Nigeria, through NNPC, and several IOCs viz. Shell, Gulf, Mobil, Agip, Texaco, Elf and Pan Ocean. Companies were granted oil mining leases, with the Nigerian Government acquiring participations over time starting with 35 percent in 1973. The present Government equity positions of 80 percent in the joint venture with Shell, and 60 percent with the rest were reached in 1979. The IOCs act as operators in all of these joint ventures.

1.13 In addition to the joint ventures, NNPC has a production sharing contract with Ashland on behalf of the Federal Government of Nigeria, whereby it is entitled to 55 to 67 percent of the profit of Ashland's operations on the level of production. It has also signed service contracts for oil exploration with Elf, Agip and Nigus Petroleum Corp., under which the companies are required to carry out, at their own expense, oil exploration, development and production in specific allocated blocks for a period of time. The contracts establish that, where oil is found in commercial quantity, such oil irrevocably vests on the Federal Government of Nigeria, but the contractors are entitled to the payment of an agreed fee per barrel produced. No petroleum is being produced yet from the service contract areas.

1.14 The Nigerian National Petroleum Corporation (NNPC). In its early years, NNPC mainly oversaw state participation in the producing and marketing oil companies. However, in recent years, it has taken a more active role in exploration, refining and marketing. The corporation has been decentralized and commercialized as of June 1, 1988 and individual units have been given more autonomy, as discussed in chapter III. The organization chart for NNPC is shown in Annex 1-2.

II. PETROLEUM SUBSECTOR

A. Resource Base

2.01 Proven recoverable crude oil reserves on land and offshore in the Niger River Delta were about 2.2 billion tons. Undiscovered, recoverable oil reserves are estimated to be about 1.1 billion tons. The current maximum production capacity is said to be about 110 million tpa (2 million barrels per day), but production would have to start declining in the early 1990s if it took place at maximum capacity. However, this is not the case, as production in the recent years was 547.1 million barrels (Mbb) in 1985, 534.2 Mbb in 1986 and 483.34 Mbb in 1987 (73.4, 71.7 and 64.9 million tons respectively), as a result of OPEC quota restrictions. Such low rates of production, if maintained, would extend the reserve life so that the decline would not set in before the late 1990s.

B. Refining Facilities

2.02 There are three refineries operating in Nigeria, at Port Harcourt, Warri, and Kaduna -- all owned by the Nigerian National Petroleum Company (NNPC). They have a combined crude distillation capacity of 295,000 bpsd (13 million tpa), but only 180,000 bpsd are effective because of operational problems partly connected with power generation and other support facilities in the Warri refinery and lack of demand for lube oil in the Kaduna refinery. A fourth refinery with 120,000 bpsd capacity at Port Harcourt was commissioned in March 1989 mainly for the export market. The project is financed by Nigerian funds and suppliers' credits and will be commissioned in the beginning of 1989. In order to materialize the export of products from Port Harcourt, a 120 km product pipeline to Bonny will be required. NNPC has not yet taken a decision in this matter.

C. Demand for Petroleum Products

2.03 There is a considerable difference between the consumption forecasts of petroleum products made in 1982 and the actual consumption (1982-87), and forecasts up to 1993. Whereas it was estimated in 1982 that the demand for petroleum products would increase at an average annual rate of 7.6% between 1981 and 1995 (27.5% for LPG, 10.6% for fuel and 6.7% for the other products), the variation in actual consumption was -1.5%, on average annual rate from 1982 to 1987 [+12.0% for LPG, +2.3% for fuel oil, -2.3% for gasoline, +8.4% for household kerosene, -8.5% for diesel] and the forecast is still a negative growth at -1.4% on average annual rate from 1987 to 1993 [+11.4% for LPG, -2.8% for fuel oil, -3.8% for gasoline, +1.2% for household kerosene, +1.5% for diesel]. The 1982 forecasts were based on expected sharp reductions of growth rates, compared to the 18.4% average annual increase from 1974 to 1981 during the oil boom, but did not anticipate as sharp a downturn as actually took place. The present forecasts, made by NNPC for its five-year plan, extrapolate the low-growth trend of the last five known years, because the Nigerian Government has made the decision to stop subsidizing domestic consumption, and has increased petroleum prices (by an average of 18%) in April 1988, which will have a marked incidence on consumption. A summary of petroleum products consumption and future demand is presented in Annex 2-1.

2.04 The Government and NNPC rightly emphasize the need to increase the consumption of LPG, as it could displace household kerosene and motor vehicle fuels. The cause of its present relative scarcity is not only the lack of storage and transportation facilities, which are certainly obstacles to increased consumption, but especially the refineries' inefficiency since they function unevenly and below capacity. An impact of the proposed project, in the long and medium terms, would be to increase reliability of LPG supplies to the domestic market. However, gasoline and diesel consumption will slow down because of the low economic growth. Kerosene consumption has grown at a 9% annual rate over the past five years, because at a subsidized price it was competitive with woodfuel. Following the recent increase in prices, a short-term shift towards a larger consumption of woodfuel is expected, that should be reverted in the future, when supplies of LPG can displace wood fuel consumption. The potentially large bunker market is still untapped for lack of an aggressive marketing policy.

D. Petroleum Product Supplies

2.05 Production, imports and exports. The present output of products from the three refineries is about 6.1 million tons. In 1987, imports of refined products were about 5.4 million tons, while exports of refined products (mainly surplus high-pour fuel oil and some LPG) were 900,000 tons. Exports of refined products to neighboring countries were small, at about 140,000 tons. The major supplementary import needs are for gasoline, kerosene and automotive gasoil. In addition, the bulk of the specialty products and part of lubes and greases have to be imported, in spite of the Kaduna refinery's capacity to meet domestic demand. By increasing the output of the two refineries, the proposed project would improve their profitability. Production from the three refineries and imports pending commissionning of the fourth refinery are summarized in Annex 2-2.

E. Petroleum Product Distribution and Marketing

2.06 Following the severe shortages of petroleum products in the interior of the country during 1974 and 1975, the Government decided to embark on the construction of 3,000 km of pipelines, linking the refineries to storage terminals (depots) located in 19 towns, and commissioned most of them in 1980 and 1981. The refineries of Port Harcourt, Warri and Kaduna are supplied with national crude oil, the Kaduna refinery is also supplied with imported Venezuelan oil through the pipeline originating in Escravos and going through Warri. The white products (gasoline, kerosene and diesel) are then transported through four systems of pipelines of 6 to 16 inches in diameter to the 19 depots throughout Nigeria, from where the marketing companies take the products to their depots and pump stations, by rail tank cars and trucks. The other products, including LPG, are transported by rail and road, directly to retail outlets and bulk consumers.

F. Petroleum Product Pricing

2.07 Petroleum products ex-refinery and pump prices are determined by the Federal Government through NNPC. The ex-refinery prices are low in comparison with international prices (CIF Lagos). In April 1988, the Government made the decision to increase the prices gradually to international levels (para. 2.03). The breakdown of the current pump prices is given in Annex 2-3.

G. Importance of the Petroleum Subsector in the Nigerian Economy

2.08 Crude oil production represented 15.0 percent and 13.5 percent of the gross domestic product (GDP), in 1986 and 1987 respectively. Taking into account refining, and trade and transportation involved in the distribution of petroleum products, the subsector is estimated to represent about 20 percent of the GDP, less than a decade ago when the prices of crude oil were much higher. Investments in the petroleum industry are about ₦2.8 billion (US$600 million) a year, compared to about ₦8 billion (US$1.7 billion) for the Gross fixed capital formation of the economy as a whole. The total investment to date in the refining industry alone is about US$2,500 million. To calculate the receipts in foreign currency from crude oil exports, it is estimated that, out of the average price of US$18.50 per barrel for Nigerian crude in 1987, US$2 are paid as a royalty to the IOCs and US$3 are the cost of production. Even though revenues from crude oil production are split about 70 percent for the Nigerian Government and 30 percent for the IOCs, the Government recoups most of the IOCs' share through taxation. The net earnings in foreign currency are thus about US$13.50 per barrel. As exports of crude oil were 445.7 Mbb in 1986 and 390.5 Mbb in 1987, the foreign currency receipts came to about ₦28 billion (US$6.0 billion equivalent) in 1986 and ₦25 billion (US$5.3 billion equivalent) in 1987, compared to ₦83 and ₦85 billion for the total GDP, in 1986 and 1987 respectively.

H. Energy Policy

2.09 Petroleum exports will remain Nigeria's dominant source of foreign exchange for the foreseeable future. The mainstay of the energy policy is therefore to undertake necessary long-term investment in the oil sector to ensure that productive capacity is maintained. At the same time, in order to increase exports, domestic petroleum consumption must be reduced, and this leads to pricing energy products at economic levels and encouraging liquid fuel substitution into gas via the public investment program, which is under way. Increased reliability on gas priced at an economic level implies that tariffs of electricity which is a major gas consumer must be raised towards long run marginal cost. At the same time reliability of electricity supply needs improvement through proper investment program. In order to transform NNPC to a market oriented entity, its various operating units are being commercialized under the restructuring program implemented in June 1988 (para. 3.03). The future Bank mission that will help the Government define an Energy sector strategy will develop an inter-fuel pricing policy by comparing the advantages of using gas and alternative fuels for electricity generation and domestic consumption and by assessing the potential domestic and export market for LNG.

I. Bank's Role in the Sector

2.10 Bank involvement in Nigeria's energy sector has until recently been mainly in the power subsector, to which six loans totalling US$407.5 million have been made. The main objectives of the Bank in the power sector were to contribute to consolidation of sector development and operation through the establishment of NEPA, to help make NEPA financially viable through tariff increases, and to strengthen the competence of staff through training. Although some progress has been made toward the physical development of the power system, serious weaknesses remain in the institutional development of NEPA, affecting reliability of the system and NEPA's financial viability. These are to be addressed under a proposed power system maintenance and rehabilitation project.

2.11 Bank involvement with Nigeria's gas sector started with the Bank/UNDP Energy Assessment mission in 1982 which identified policy options for utilization of gas reserves, analyzed investment priorities, provided a framework for technical assistance and advised on the implementation of energy programs. The mission's findings clearly showed the important role that gas could play in Nigeria's future, particularly by substitution for liquid fuels and preserving Nigeria's fuel oil export capacity. The Bank's efforts have increased awareness within the Nigerian Government of the need to resolve complex issues in the country's energy sector, including the need for energy price adjustments. The Energy assessment will be updated by the proposed Bank Energy sector review mission.

2.12 The Bank has continued to provide a framework for the resolution of important sectoral issues, in the context of project discussions, about the gas utilization program. The Bank has contributed to the development of a policy framework for attracting the IOCs to make investments in non-associated gas field development, for setting economic criteria for recovery of associated gas being flared, and for establishing the long run marginal cost (LRMC) principle as a basis of consumer pricing, to induce appropriate inter-fuel substitution and economic efficiency. However, so far there has been no implementation of the LRMC principle. The Bank also contributed to the dialogue on pricing of petroleum products in general. The first significant price adjustments were made in April 1988. Through the public sector investment review mission, the Bank has helped the Nigerian Government and NNPC evaluate energy sector investment plans and define a program of more realistic investments in the power and petroleum subsectors, in keeping with the Government's tight budgetary position.

2.13 The Bank's first loan to NNPC, for the Gas Technical Assistance (T.A.) Project, approved in May 1984 and became effective in September 1986, was designed to help accelerate the utilization of Nigeria's gaseous fuel resources. The project also emphasizes institution building, including training and operating assistance, to enable NNPC to manage, operate and maintain efficiently the existing facilities. As of March 1989, only US$1.1 million were disbursed out of the loan amount of US$18.4 million. The implementation of this project has been slow due to: (a) a slow start of project implementation due to the unfamiliarity of NNPC with the Bank's procedures; (b) complexity due to some ten different project components to be implemented by different departments of NNPC; and (c) the reorganization of NNPC which after two years has just been completed and is now under implementation. As a result of agreements reached by the Bank's supervision mission in February 1989, commitment to the implementation schedule for the key project components has been secured from the relevant managers, and the initial hurdles, especially concerning procurement, have been overcome. Three of the project components amounting to about US$3.5 million have now been processed and expected to be committed within about 3 months. Disbursements should therefore pick up with respect to the redefined and agreed components of the Project.

2.14 For the future, the Bank wou'd continue to act as a sounding board for important policy decisions in the energy sector (para. 2.09), help to define investment priorities, as is the case for the proposed refineries rehabilitation project, and help identify, prepare and finance, as well as mobilize co-financing for priority investments, such as the petrochemical and the Oso condensate projects.

III. THE BORROWING AGENCY

THE NIGERIAN NATIONAL PETROLEUM CORPORATION

A. Organization, Functions and Staffing

3.01 The NNPC was established on the 1st of April 1977 in accordance with the provisions of the NNPC Act No. 33 ("the Act"). The rationale behind NNPC's establishment was basically to provide for effective government participation and control of the oil industry in all its ramifications, with a view to ensuring optimal utilization of Nigeria's depletable petroleum resources. Subject to the provisions of the decree, NNPC is charged with the following responsibilities:

i) exploring, prospecting for, or otherwise acquiring and disposing of petroleum;

ii) refining, treating, processing and generally engaging in handling of petroleum for manufacture and production of petroleum products and its derivatives;

iii) purchasing and marketing of petroleum products and derivatives;

iv) providing and operating pipelines, tankership or other facilities for the conveyance of crude oil, natural gas, and their products and derivatives;

v) carrying out research in connection with petroleum and its derivatives and promoting commercial activities derived from it;

vi) to enter into contracts or partnership with any company, firm or person to facilitate the discharge of the above responsibilities;

vii) to train managerial, technical and other staff for the purpose of running its operations and for the petroleum industry in general;

viii) amongst other duties, the inspectorate arm, which is now separate from NNPC, is charged with the responsibility for issuing permits and licences for all activities connected with petroleum exploration, refining, storage, marketing, transportation and distribution thereof;

The Act establishes NNPC's formal hierarchical structure - a Board of Directors (whose chairman is the Petroleum Minister and whose members are the Managing Director, the two Deputy Managing Directors, two representatives of the Ministries of Finance and Petroleum Resources, and five other members from the business community), a managing director, two

deputy managing directors, sector coordinators and managers and departmental heads. At the apex of the structure is the Federal Executive Council which reserves the right to undertake a general review of the affairs of the corporation and any of its subsidiaries. The Board of Directors regulates the conditions of service, the granting of pensions, gratuities and other retirement benefits among other things.

3.02 NNPC is charged with the execution of agreements entered into by the Federal Government with foreign oil companies. The Federal Government of Nigeria through NNPC has participating interest in joint oil exploration and production ventures with IOCs (para. 1.12). NNPC, on behalf of the Federal Government of Nigeria, has also entered into a production sharing agreement with Ashland Oil (Nigeria) and service contracts for oil exploration with other IOCs (para. 1.13). NNPC operates in the domestic market for its own account, but all export revenues accrue to the Federation account.

3.03 As part of a program of commercialization of parastatals under the Government Structural Adjustment Program (SAP), NNPC was radically restructured in 1988 by a Board decision, with a view to transforming it into a commercialized, integrated international company (see Annex 1-2). This development is expected to facilitate effective control, faster reaction to conditions in the market place, efficient management and minimum political interference. The conversion of NNPC from a cost centre organization which is entirely dependent on government for capital funding to one that is profit driven, commercial in orientation and independent of government financial grant, is a major transformation. Hitherto, NNPC has been largely dependent on government for capital funding through grants from the Federal Ministry of Finance and Economic Development and Federal Government guaranteed loans. NNPC is now commercialized and is expected to raise loans on the strength of its balance sheet from commercial/merchant banks and other financial institutions within and outside Nigeria to finance its investment programs. Government interest in the new business organization will be based largely on equity participation. Under the Board of Directors that delegates its authority to the Managing Director for day-to-day operations, there are now three lines of delegation, one for corporate services under a deputy managing director, applied to the head office and all the subsidiaries (previous departments); one for the management of the operations of the wholly owned subsidiaries (including the refineries) and the NNPC-controlled distribution subsidiaries, under another deputy managing director; and one for joint ventures in exploration and production, under a coordinator. Because of the great number of operating subsidiaries, they will be grouped into three units with a coordinator for each, reporting to the deputy managing director (operations). The new organization chart shows the different business units of the corporation and has trimmed down the span of control so as to ensure greater delegation and efficiency in management and administration. It establishes operating business units as profit centres. These business units are scheduled to operate as autonomous units in line with defined missions, objectives, targets and goals, so as to enhance the commercial objective of the Corporation. Like organizations in the public sector, NNPC and its various business units will be subject to government policies

and regulations. Since the restructuring of NNPC is only in its initial stages, the exact implementation of all these goals cannot be assessed for another year or so.

3.04 The magnitude of employment in NNPC is related to its growing role in the Nigerian economy. As the Corporation diversified from participation in crude oil production to manufacturing and marketing of petroleum products and derivatives, the manpower requirements grew with it. In 1979, 3,072 persons were in the employment of the Corporation. By 1981 the figure had increased two-fold to 6,000, due mainly to the construction of the Warri and Kaduna refineries. NNPC's total staff strength today stands at over 14,000, and is projected to increase by about 25% in the next five years in view of NNPC's new development programs and expansion of existing activities.

3.05 The current planning cycle of NNPC covers five years. Following the first corporate planning projection, for the period 1988 to 1992, made in 1987, a second one is currently under preparation, with the help of Arthur Andersen & Company, for the period 1989-1993. It will still be supported by many policy assumptions concerning prices, the scope of NNPC's investment program and financing, and debt servicing, to be discussed and settled with the Government later on. The strategic planning process is thus increasingly a tool for the formulation of development lines of the petroleum sector and for the preparation of policy decisions.

B. Accounting Systems

3.06 Since 1983 basic accounting systems have been set up in NNPC concerning general accounting and collection of data from NNPC's various branches, cash management and budget preparation and control (budget performance reports are obtained within three months after any month closing date). Considerable work remains to be done to implement fully existing procedures and to develop additional control systems. Under the ongoing Gas T. A. project, implementation of cost accounting practices similar to those widely adopted by most major commercial oil companies on a world wide basis is underway. This will entail a major reorganization of accounting, as it implies introducing tighter closing schedules for general accounting, accelerating the payment process with adequate controls, implementing the capital expenditure procedure devised by the newly established corporate planning division, improving project controls and cash flow planning, and establishing a reliable system of fixed asset accounting. A major training program for accountants is included in the Gas TA project.

C. External and Internal Auditing

3.07 NNPC's external auditors, Peat, Marwick and Ani, Ogunde (Nigeria), a partnership between a Nigerian and a U.S. firm acceptable to the Bank, and Muhtari Dangana, also acceptable to the Bank, are issuing NNPC's audited financial statements. With the implementation of the restructuring, each NNPC subsidiary will produce its own financial statements, which will be subject to independent audit. This will apply to the Warri and Kaduna subsidiaries, which will execute the proposed project. Audited financial statements of NNPC would be submitted to the Bank within

six months of closing of the financial year; they would include the audited financial statements of the Warri and Kaduna refineries. The internal audit department will take on an increased importance, as a central control function for the new commercialized and integrated structure of NNPC (para. 3.03), to ensure adherence, by the new semi-autonomous decentralized centres, to NNPC's policies, guidelines and operating and administrative procedures. In order to carry out efficiently those functions, training is being provided to key specialists under the ongoing Gas T.A. project (para. 2.13).

D. Past Accounts

3.08 NNPC's accounts can be shown for the Head Office alone (i.e., for the Corporation), or for the Corporation and subsidiaries (i.e., for the Group), or for an enlarged Group including joint ventures with foreign IOCs. Subsidiaries are petroleum distribution companies in which NNPC holds a majority of the capital, so their accounts should be included in NNPC's consolidated accounts, whereas it is misleading to include joint ventures in which NNPC is only acting on behalf of the Federal Government. Nevertheless, NNPC's 1985 audited accounts included joint ventures while the 1986 consolidated audited accounts correctly only include the subsidiaries' accounts. However, as planning projections are presented for the Corporation alone, for the sake of consistency the Corporation's accounts will be discussed without the subsidiaries (accounts for the Group are presented in Annexes 3-1 to 3-5).

Table II

Summarized Balance Sheets

(In Nairas billion)

	1985	1986	1987
Current Assets	3.00	4.04	4.72
Fixed Assets	2.61	3.40	5.65
Total Assets	5.61	7.44	10.37
Current Liabilities	0.65	1.11	1.35
Long Term Liabilities	0.13	0.68	2.02
Total Liabilities	0.78	1.79	3.37
Equity	4.83	5.65	7.00
Total Liabilities and Equity	5.61	7.44	10.37

3.09 Although the NNPC 1987 accounts have been finalized, they have not been communicated to the Bank because the ownership of non-commercial activities, to be excluded from the accounts as part of the commercialization program, has not yet been discussed with the Government.

Therefore, the only available accounts for 1987 are part of the planning exercise 1988-92 which is incomplete. Healthy characteristics of NNPC's balance sheets are high current assets to current liabilities ratios, of almost 4 in 1986 and 3.5 in 1987, high net working capital to net fixed assets ratios, of 86% in 1986 and 60% in 1987, high equity (including capital grants) to debt and equity ratios, of 89% in 1986 and 78% in 1987, and a comfortable cushion of cash and short term investments, that constitute 62% of the net current assets in 1986. Another feature of NNPC's balance sheets is the almost equal sharing of the fixed assets between net operating assets (mainly the three refineries and the oil and gas pipeline system) and works in progress in 1986, an equilibrium which was tipped in 1987 in favour of works in progress, because of heavy investments planned in exploration and petrochemicals (Port Harcourt).

Table III

Summarized Income Statements

(In Nairas billion)

	1985	1986	1987
Revenues:	2.24	3.46	4.66
Of which: Petroleum Products	(2.06)	(3.24)	(4.20)
Expenditures:	2.04	2.83	3.71
Of which: Taxes	(0.19)	(0.27)	(0.40)
Income after tax	0.20	0.63	0.95

3.10 The Nigerian currency unit, Naira, lost much of its value as expressed in dollars from 1985 to 1987, going down from US$1.3 to 0.25. However, since domestic sales are only reflected in NNPC's revenues (exports accrue to the Federation Account), and since domestic product prices have not increased in line with the devaluation of the Naira, NNPC's net income only increased from Nairas 0.63 to 0.95 billion (for total sales of petroleum products of ₦3.24 and 4.66 billion), from 1986 to 1987. Rates of return on net fixed assets in operation were over 40% and 30% respectively. It should be noted, however, that fixed assets are not revalued. It was agreed at negotiations that NNPC would revalue the fixed assets of the two refineries, as necessary. Moreover, part of the increase in gross margin in 1987 and 1988 is due to the fact that the cost of crude oil to NNPC refineries was reduced from ₦20.58/bbl to ₦11.75/bbl (US$5 to US$2.5/bbl).

E. Projections for the Planning Period 1988-92

3.11 Projected NNPC (Corporation) income statements, cash flow statements and balance sheets are shown in Annex 3-5. From 1989 on, the gross margin on petroleum products is projected to increase by 11% annually. Operating costs related to petroleum products are expected to

increase sharply in 1989 to ₦7.07 billion, from a level of ₦1.96 billion in 1988, as the cost of crude oil to NNPC increases to international levels (from US$2.5/bbl in 1988 to US$17.5 in 1989 and US$18.5/bbl in 1992, calculated by NNPC to increase from ₦11.75/bbl to ₦79.8 and ₦115.26/bbl). Revenues from petroleum products are expected to increase correspondingly from ₦4.05 billion in 1988 to ₦9.80 billion in 1989 and will go on increasing to ₦14.08 billion in 1992, while the demand is expected to remain about stagnant in spite of price increases. Other causes for an increase in revenues are gas sales expected from the completion and commissioning of the Escravos-Lagos pipeline (ELP) (from ₦0.18 billion in 1987 to ₦0.53 and 1.18 billion in 1988 and 1989, and following up to ₦2.33 billion in 1992), and sales of petrochemicals, following the completion of the new Port Harcourt refinery in the first quarter of 1989. Income after depreciation is expected to be sufficient to pay for the sum of corporate tax (increasing from ₦0.40 billion in 1988 to ₦0.53 billion in 1989 and up to ₦1.13 billion in 1992), a new petroleum profit tax (from ₦80 million in 1989 to ₦173 million in 1992), and dividends (from ₦360 million in 1989 to ₦840 million in 1992).

F. Investment Program

3.12 The investment program is enormous, as NNPC is expected to invest ₦15.6 billion in five years (about US$3 billion), which compares to net fixed assets in operation of about US$2.5 billion (the amount is estimated, as the breakdown between assets in operation and works in progress is not available). A capital review process started in 1988 with the introduction of capital spending policies and procedures typical of international oil companies, as part of the strategic planning exercise. The objective of the capital review process, being implemented, is to give the highest priority to projects essential for efficiency improvement, safety, loss prevention and environmental control, and to projects necessary to maintain cash flow, and to complete viable on-going projects. Projects were thereby required to meet return on investment targets ranging from 15% (for low risk and maintenance projects) up to 25% and higher (for higher risk projects such as exploration) as well as meet payback targets. Before being included in the strategic plan, each major project is supposed to be subjected to an economic and financial analysis and funding must be available for it. The capital review process is likely to reduce the dimension of the investment program, when projects are all subjected to its economic criteria.

Table IV

NNPC Investment Program

(In Nairas thousand)

	1988	1989	1990	1991	1992	5 yrs 88/92
Explor. & product. gas & crude	111,500	170,900	298,400	216,900	180,100	977,800
Gas	1,005,000	704,200	224,900	148,100	25,800	2,108,000
Pipelines, differ. phases	354,200	483,000	585,400	508,700	47,700	1,979,000
PPMC, prod. mkg, butane/transport.	123,200	70,700	346,900	237,300	170,900	949,000
Refineries	1,576,056 1/	114,100	112,700	95,2000	0	1,898,056
Petrochem., end ph I & ph II	105,000	433,300	493,800	1,161,000	1,380,200	3,573,300
Liq Natural Gas	175,000	191,200	357,200	1,520,300	853,500	3,097,200
ETSD telecom	366,000	56,700	59,400	24,600	35,000	541,700
Adm. Pers. D	37,000	72,000	57,300	30,000	3,000	199,300
Movables	73,100	42,600	48,000	47,000	48,100	258,800
Total	3,926,056	2,338,700	[illegible]84,000	3,989,100	2,744,300	15,582,156

Source: NNPC

1/ The cost of completion of the new Port Harcourt refinery under construction is included (N1,315 million).

3.13 The basic program (Basic I) totals N7.7 billion and provides funds required to complete major ongoing projects, like ELP (N1.8 billion) and the telecommunication project (ETSD: N0.3 billion) which is expected to achieve an efficient nationwide telecommunication network. Other projects include those required to maintain existing operations, improve operational efficiency and safety of the refinery, pipeline and marketing depot operations, and initiate low-risk crude oil production from NNPC licensed areas (E/P:N0.6 billion) and NNPC's share (about 50%) in the execution of the Liquefied Natural Gas project, to be undertaken by an international consortium (LNG: N3.1 billion).

3.14 A second category of projects (Basic II) totals N5.2 billion. The main projects on that list are petrochemicals phase II (N3.5 billion), pipeline phase III (N0.7 billion), butanisation-merox (N0.6 billion) and crude-coastal tankers (N0.4 billion). In addition, the investment program includes special projects for N1.4 billion that need not meet return on investment criteria, as they are considered to be in the national interest: the main projects in that category are pipeline phase IV and exploration in new areas.

3.15 The application of the rules of the capital review process (para. 3.12) will be less stringent on the Basic I program, than on Basic II. The latter will be reduced as the successive corporate planning exercises (the second five-year exercise is presently under way) become more sophisticated and the program is confronted with financing requirements. The decision to implement special projects, as they are financed primarily on Government funds, will be made at the Government level.

3.16 Financing for the 1988-92 plan will be provided by NNPC's own funds (₦1.6 billion accumulated in current assets at the end of 1987, ₦5.9 billion generated from operations over the planning period), an additional foreign loan for the new Port Harcourt refinery, and Government funding for ₦6.8 billion (₦2.3 billion as equity contribution, ₦3.1 billion as LNG escrow and ₦1.4 billion for special projects). The plan has not provided for the replacement of existing investments in refineries, pipelines and related capital assets which will require investments of the order of about seven or eight times the historical cost. Replacement of such assets must eventually be taken into account in product pricing, debt/equity structure and dividend policy decisions.

3.17 It is assumed that the foreign loans and capital grants outstanding at the end of 1987 will be converted to equity in 1988. It implies that the debt service will be taken over by the Government and that NNPC will pay ₦3 billion dividends to the Government over the five-year period. The financing for the five-year program would come from the Government (₦6.8 billion) and from funds generated from operations, after payment of taxes and dividends (₦7.5 billion). It is not clear whether those projections are consistent with the pricing policy of the Government and with the demand elasticity of petroleum products. A more elaborate projection is expected from the current 1989-93 corporate planning exercise. The structure of the balance sheet at the end of 1992 would be profoundly different from that of 1987, since the ratio of current assets to net fixed assets would have been reduced from 61% to 18% and there would be no long term debt.

G. Refineries

3.18 In the new NNPC structure, the two refineries of Kaduna and Warri, to be rehabilitated under the proposed project, will be part of two separate wholly-owned subsidiaries of NNPC, together with the associated petrochemicals activities. The refineries at Port Harcourt will form part of a separate company. The financial statements of the refineries in the past (Annex 3-1 and 3-2) had little significance since they had no sales and the subsidies provided by the head office (their revenues) were calculated to cover their expenses. In the future, in order to assess their performance, it is necessary to calculate the cost of the refining process, i.e., the cost of the added value by the refineries to the cost of crude oil, that can be compared internationally. Prior to the reorganization NNPC did not have a system of keeping precise individual accounts for each of its operations spread all over the country. As one of the main objectives of the reorganization, NNPC in the future will operate as a commercial organization and each operating entity will become a cost centre. Under the ongoing Gas T.A. Project, the services of Arthur Andersen and Co. are being used to prepare an efficient accounting system in order to implement the objectives of the reorganization. As such precise operating costs of each refinery

apportioned to its refining activities would be available only when the 1988 accounts are finalized. However, on the basis of NNPC's best estimates of operating costs apportioned to the refining activities of the two refineries, the economic viability of their operations was evaluated. The evaluation indicates that the operation of the two refineries, even with the present inefficiencies, is profitable to Nigeria vis-a-vis finished product imports on the basis of sunk cost of existing investments and import/export parity prices for products and crude. The details of this evaluation are presented in Annex 3-3.

3.19 The operation of the two refineries, however, are inefficient compared to similar refineries in Western Europe. For instance the operating cost of the Warri Refinery at its present level of capacity utilization as presented in Annex 3-3 amounts to about US$22 per ton as against about US$13 per ton for a similar West European refinery operating at 70 percent capacity. Assuming that the capacity utilization of the Warri Refinery can be improved to about 4.9 million tons after rehabilitation, resulting from the engineering studies included in the proposed project, the operating cost is estimated to be about US$15.2 per ton which is about 17 percent higher than the West European cost. The main reason for this increased operating cost is the high level of energy consumption (10.7% of the crude throughput). Similarly, the Kaduna refinery operating cost is estimated to be about US$28 per ton at its 3.294 million ton operating level as against about US$24 per ton for a similar refinery in Western Europe. The main reason for this higher cost in Kaduna Refinery is again the high level of energy consumption (15.7% of the crude throughput). The proposed engineering studies will review this aspect in detail so that a second phase rehabilitation project could include measures for improving energy efficiency in the two refineries.

3.20 The main investments in the refineries, in the 1988-92 program excluding the completion of the Port Harcourt refinery (about ₦580 million or US$100 million equivalent), are the gas turbine and the fourth boiler in Warri (beginning of the period), the butane merox treating unit (beginning of the period) and the asphalt package (end of the period) in Kaduna, and the naphta hydro treating unit and the feeder switch (end of the period) in Port Harcourt. Those investments are mainly related to maintenance and are, because of that, included in the Basic I program.

IV. THE PROJECT

A. Genesis

4.01 The refineries at Warri and Kaduna experience difficulties in achieving full operational efficiency at their design capacities. Even though they are modern refineries built in the 1980 by experienced contractors (SNAMPROGETTI of Italy in Warri and CHIYODA of Japan in Kaduna), operational problems arose from the very beginning with respect to a number of support facilities such as the turbo generator, waste water treatment, steam condensate recovery, and fire water lines in the Warri refinery and waste water treatment and steam condensate recovery in the Kaduna refinery. Besides, the Kaduna refinery has a lube base oil manufacturing complex which is operating at around fifty percent of the design capacity due to low domestic demand and lack of export potential since the refinery is located more than 1000 kilometers inland. The underutilization of capacities in the two refineries has been the main reason for substantial import of petroleum products for domestic consumption.

4.02 World Bank missions visited these refineries and had detailed discussions with the NNPC officials, the contractors (SNAMPROGETTI and CHIYODA), and the NNPC's consultants, BEICIP of France, in September and November 1987 on a rehabilitation scheme to improve capacity utilization. BEICIP which has provided Consultancy Services to the Warri Refinery Project Management team during its construction was asked to provide a report identifying the reasons for the malfunctioning, remedial measures required, and estimate cost of engineering services, contracting and hardware required to rectify each item. The study was financed by the Bank under the ongoing Gas T.A. Project. BEICIP's report was jointly reviewed by the officials of NNPC and the Bank in February 1988, and the scope and cost of the rehabilitation program included in the proposed project was finalized. The proposed project is planned to tackle the immediate necessities in the off-sites and utility systems in the two refineries. The problems connected with the process technology and plant and machinery in the main battery limits will be covered by the engineering studies included in the project.

B. Project Objectives

4.03 The main objectives of the proposed project are:

(i) to complement the Bank's earlier institution building efforts with NNPC under the Gas T.A. project to strengthen NNPC's management effectiveness and investment planning capacity to focus on repairs and rehabilitation of its assets and to improve the capacity utilization of existing facilities which hinge on suitable preventative maintenance procedures, funding and spare parts inventory planning;

(ii) to rectify the malfunctioning of various support facilities in order to increase capacity utilization and operational efficiency in the two refineries at Warri and Kaduna;

(iii) to improve and institutionalize the preventive maintenance system and corrosion protection program in the two refineries to reduce malfunctioning/break-down of support facilities, and ensure that the problems being corrected will not recur in the future; and

(iv) to improve the functioning of the waste water treatment systems to cope with the increased load of contaminated water in the two refineries and to reduce environmental pollution to normal industry standards.

C. Project Description

4.04 Warri Refinery:

(i) Power generating system study. It was agreed at negotiations that the originally planned turbine vibration study for the three turbo sets would be expanded to cover the entire power generating system with a view to arriving at guaranteed solutions to the identified problems. Such guaranteed solutions can only be obtained if the original supplier of the turbine is entrusted with a single point responsibility for rectifying the entire system because the internal parts of the turbines may have been severely damaged due to deposits and erosion. In the past NNPC had engaged other turbine manufacturers and independent consultants, but did not succeed in getting satisfactory solutions. After reviewing the circumstances, including the possibility of a conflict of interest in appointing the original suppliers to carry out the study, it was agreed that the only way to get guaranteed solutions to this problem would be to engage the original supplier with single point responsibility, and NNPC would negotiate terms and conditions satisfactory to the Bank for the proposed study.

(ii) Modification to the Waste Water Treatment: The existing system does not have the capacity to handle the total waste water of the refinery especially after the substantial increase in crude oil storage capacity built for supplying crude to the Kaduna refinery. Furthermore, some of the equipment are faulty, probably because of inadequate maintenance and poor operating practices. The proposed modifications will include facilities segregating storm water and oil contaminated water, replacement of efficient water lifting pumps, installation of new oil separators to reduce the load in the existing waste water treatment unit, installation of motor driven oil scrapers, installation of a new waste water treating section exclusively to treat oily water from tank farm, new pumps for disposal of treated water, new pumps for storm water handling, rehabilitation of sludge treating and incineration facilities, replacement of a number of worn out pumps and installation of two new slop tanks. All operational procedures would be reviewed and modified to the extent

required, and an efficient monitoring system would be introduced. It was agreed that the NNPC would establish limit for pollutants and maintain pollution control measures as per industry norms and limits, by July 1, 1991.

(iii) Replacement of Underground Fire Water Lines: The carbon steel pipes used for fire water circulation are buried underground throughout the refinery without cathodic protection. The pipes are severely corroded and the safety of the refinery and personnel is compromised. All the underground fire water pipes would be replaced with overground pipes except in a few areas in the process units and road crossings where glass reinforced thermosetting resin pipes will be used.

(iv) Modification to the Condensate Recovery System: Due to unreliable power supply, the refinery uses an unusual number of steam driven standby pumps making the steam consumption very high and steam header collecting the exhaust steam overloaded. Until the power supply is made reliable, the refinery steam consumption cannot be substantially reduced; therefore, the proposed modification is to reduce the overloading and improve the efficiency of the existing system. The modification job would include a new steam header to gather the exhaust steam, installation of a heat exchanger between exhaust steam and demineralized water, a new air cooled condenser to produce exhaust steam condensate to supplement boiler feed water and installation of two active charcoal filters to remove oil traces from process condensate.

(v) Replacement of Inefficient Instruments: The existing field transmitters for pressure, flow and level instruments have become unsuitable for tropical climate conditions causing frequent failures and loss of process control. Also, the existing uninterrupted power supply (UPS) is connected only to one busbar of switchboards which can cause power cut to the instruments during maintenance shutdown or failure of one busbar. To rectify these defects the field transmitters would be replaced and new UPS units installed with power supply from another busbar of each substation.

(vi) Maintenance Spare Parts: When new equipment and machineries were purchased for debottlenecking the refinery facilities, necessary spare parts for those items were not purchased to keep the expenditure low. Without these essential spare parts the operation of the refinery could be interrupted at any moment causing costly damages in maintenance and loss of production. The exact requirement will be reviewed item by item; only an estimated fixed amount is included (the expenditure will be limited to this amount) in the proposed project.

(vii) Laboratory Equipment: Some of the laboratory equipment, necessary for day-to-day quality control have become obsolete or worn out. Spares and services for some are not available due to the obsolescence of the equipment. In view of the importance of quality control, an estimated fixed amount to cover the essential items are included in the proposed project.

4.05 Kaduna Refinery

(i) Modification to the Waste Water Treatment: The existing facilities for waste water treatment are overloaded and deficient on account of deficiency in design, failure of some equipment and lack of operational care. The first stage oil separation is insufficient causing complete failure of the biological treatment facilities. Oil leaks through all sections of the treatment facilities due to permanent overloading and design deficiencies in the flocculation section. The remedial measures included in the proposed project are a new flocculation-floatation unit to treat process waste water, an activated sludge system to reduce phenol content, a new oil separator equipped with mechanical skimmer, a new flocculation-floatation unit to process oily sewer water, and modification to the sludge processing unit and other existing facilities. All operational procedures will be reviewed and modified to the extent required and an efficient monitoring system would be introduced. It was agreed that the NNPC would establish limit for pollutants and maintain pollution control measures as per industry norms and limits, by July 1, 1991.

(ii) Modification to the Condensate Recovery System: The refinery has been experiencing difficulties in recovering condensate to complement boiler feed water due to defective steam traps, deficiency in the steam trap assembly design, lack of inspection and maintenance of steam-traps, and insufficient steam flash pots. The program is to rectify these defects by providing around 250 steam-trap manifolds with condensate recovery system, installation of condensate headers between steam-trap manifolds and flash pots, providing insulation and aluminium cladding for the lines upstream of each steam-trap, and installation of flash pots with pumps, instruments and corresponding discharge lines to the existing condensate recovery system. Necessary spare parts for the existing steam traps would also be provided.

(iii) Laboratory Equipment: Some of the laboratory equipment, necessary for day-to-day quality control, have become obsolete or worn out. Spares and services for some of them are not available due to obsolescence. In view of the importance for quality control, an estimated fixed amount to cover the essential items are included in the proposed project.

(iv) Data Logging and Shipment Computer: The existing computer has become obsolete and deficient in operation. Some of the equipment are so obsolete that their replacement may not be possible or will result in excessive cost and limited services. Therefore, after reviewing the options with the refinery operating personnel, the consultants recommended a new system which includes data acquisition of 1200 inputs (expandable), data logging of all inputs, monitoring of all units with alive graphics, computation of heat and material balance, management control, invoicing of shipment, etc.

4.06 Studies, Workshop and Training

(i) The proposed project represents the first step of a comprehensive rehabilitation program for the two refineries at Warri and Kaduna. It would deal with the immediate needs of some of the off-site facilities and utility system. The long-term requirement of the refineries to achieve design capacity and operational improvements would be defined by diagnostic operations studies followed by detailed engineering studies for which funds are included in the proposed project. It was agreed at negotiations that, not later than June 30, 1989, NNPC would complete diagnostic operations studies with terms of reference satisfactory to the Bank, and promptly thereafter furnish to the Bank the results of the said studies. NNPC would, not later than December 31, 1989, complete the engineering studies, with terms of reference satisfactory to the Bank, including the preparation of cost estimates to define the long term requirements for the refineries of Warri and Kaduna in order to achieve design capacity and to design operational improvements, and promptly thereafter furnish to the Bank the results of the said studies. Consultants for the engineering studies would be selected by February 28, 1989.

(ii) A workshop on preventive maintenance, corrosion protection and environmental protection will be conducted by experienced professionals in the Warri refinery training center for the benefit of personnel from the two refineries and other organizations such as petrochemicals, fertilizers, etc. It was agreed at negotiations that NNPC would establish and maintain by July 1, 1990, preventive maintenance schemes satisfactory to the Bank to improve the operational efficiency in the two refineries.

(iii) Many staff members, trained by the contractors at the time of the refinery commissioning, have been dispersed for other projects and the quality of the personnel filling these gaps is not satisfactory. Therefore, specialized

training would be provided for NNPC personnel in refinery operating economics, energy and utilities conservation, preventive maintenance, inventory control, corrosion protection, inspection of equipment and machinery, pollution control, project planning and project monitoring. It was agreed at negotiations that NNPC would prepare the training program in consultation with the Bank by October 1, 1989.

4.07 Replenishment of Spare Parts and Materials Stock. Both Warri and Kaduna refineries suffer considerable production losses since essential spare parts, catalysts, and chemicals are not purchased in an expeditious manner due to the difficulty in arranging sufficient foreign exchange. In Warri this also affects the operations of the petrochemical plant. In order to overcome this difficulty, it was agreed at negotiations that NNPC would establish a foreign exchange account. This "NNPC Refineries" account, to be opened and maintained in dollars in a commercial bank on terms and conditions satisfactory to the Bank and to be managed by NNPC's Corporate finance services, would be initially funded with proceeds of the proposed loan in an amount corresponding to the estimated foreign exchange needs for essential spare parts, chemicals and catalysts during a twelve month period (US$6.0 million for the two refineries). The account would be continuously replenished, once the goods are received in the refineries, by purchasing necessary foreign exchange through the auction system within three months. Use of the account would be exclusively reserved for purchasing spare parts needs for maintenance, and chemicals and catalysts for the normal operation of the two refineries. The account would be audited annually by independent auditors appointed by NNPC and acceptable to the Bank and the audit report would be submitted to the Bank within six months after closing of the account, on 31 December of each year. It was further agreed that NNPC, not later than July 1, 1990, would pay US$6,000,000 equivalent into the NNPC Refineries account and thereafter not later than January 1 and July 1 of each year would pay into the NNPC Refineries account amounts sufficient to replenish that account to the limit of the imprest of US$6,000,000 equivalent.

D. Project Management and Implementation

4.08 The Warri and Kaduna refineries of NNPC would be responsible for the implementation of the rehabilitation program. It was agreed that the refineries would be required to appoint a Project management team with a full-time Project Manager, assisted, as and when required, by engineers from various disciplines, a procurement specialist and a cost accountant to manage the implementation of its respective items. The Project management team would have functions and terms of reference acceptable to the Bank. The refineries would also retain engineering consultants on terms and conditions satisfactory to IDA to assist in the implementation. At the NNPC Headquarters, the Head of the Corporate Planning and Development Division will co-ordinate with the two refineries.

E. Project Schedule

4.09 Some of the items included in the proposed project involve detailed engineering, procurement, transportation to the refinery location, site fabrication, erection, and commissioning. They will take about 36 months for completion. The implementation schedule for various components is shown in Annex 4.1. Since the replacement of the fire water lines in Warri Refinery and some of the modifications to the waste water treatment facilities in Kaduna Refinery cannot wait until the loan is made effective, it was agreed that NNPC would go ahead with expenditures of up to US$2.6 million to implement these items prior to the Board presentation, starting after November 1, 1988. It is recommended that this amount would be retroactively financed from the proposed IBRD loan (para 4.22).

F. Project Cost Estimates

4.10 The estimated total cost of the project is US$39.2 million of which US$27.7 million equivalent is in foreign exchange and US$11.5 million equivalent is in local cost. The consultants, after conducting basic design and enquiries with prospective vendors, estimated the cost of the various items and engineering and construction services required for the proposed project. The detailed project cost estimates are shown in Annex 4.2 and summarized in the table below.

Table V

Summary Project Cost Estimates

	Local	Foreign	Total
	(US$ million Equivalent)		
Warri Refinery	5.9	10.7	16.6
Kaduna Refinery	2.1	4.8	6.9
Base Cost 1/	8.0	15.5	23.5
Physical Contingency	1.2	2.2	3.4
Price Contingency	2.3	1.7	4.0
Engineering Studies, Workshops and Training	-	2.3	2.3
Spare parts for Annual Maintenance, Chemicals and Catalyst	-	6.0	6.0
Total	11.5	27.7	39.2

1/ Local taxes and duties are not included.

4.11 The cost estimates are considered to be realistic. They are exclusive of duties and taxes. The estimated costs include physical contingency of 15 percent, price contingency of 10 percent for foreign costs and 25 percent for local costs.

G. Financing Plan

4.12 The proposed Bank loan of US$27.7 million equivalent would meet 100 per cent of the foreign exchange cost. The proposed financing plan is as follows:

Table VI

	Local	Foreign	Total	% of Total
	(US$ million equivalent)			
IBRD	-	27.7	27.7	71
NNPC	11.5	-	11.5	29
TOTAL	11.5	27.7	39.2	100

4.13 The loan would be made available to the NNPC at the prevailing Bank interest rate with a repayment period of 15 years including a grace period of 3 years. Additionally, NNPC would pay to the Government a guaranty fee of 10% of that rate. The foreign exchange risk would be borne by NNPC. NNPC would finance local costs of US$11.5 million equivalent from its internal cash generation.

H. Procurement

Table VII

PROCUREMENT ARRANGEMENT
(US$ Million Equivalent)

	ICB	LIB	Other	Total
A. IBRD LOAN:				
1. Warri Refinery	10.5	0.7	2.3 1/	13.5
2. Kaduna Refinery	5.4	0.2	0.3 2/	5.9
3. Engineering Studies	-	-	1.9 3/	1.9
4. Workshop and Training	-	-	0.4	0.4
5. Spare parts for annual maintenance chemicals and catalysts.	3.0	-	3.0 4/	6.0
Subtotal	18.9	0.9	7.9	27.7
B. Local currency from NNPC for Civil work, site fabrication and erection:				
1. Warri Refinery	8.5	-	-	8.5
2. Kaduna Refinery	3.0	-	-	3.0
Subtotal	11.5	-	-	11.5
Total, A+B	30.4	0.9	7.9	34.2

1/ Power generating study by the original suppliers, spare parts for existing equipment, and laboratory equipment matching with the existing items.

2/ Laboratory equipment matching with the existing items.

3/ Engineering studies for the two refineries will be carried out by the original builders on the basis of negotiated contracts satisfactory to the Bank.

4/ Proprietary items, matching spare parts for existing equipment, and licensed catalysts and chemicals.

4.14 The procurement of various equipment and materials to be financed by the Bank that are not proprietary items or need not match existing equipment for purposes of standardization would be through international competitive bidding (ICB) in accordance with Bank guidelines. To the extent practicable, contracts for goods would be grouped in bid packages estimated to cost the equivalent of US$50,000 or more each. However, items or groups of items estimated to cost less than the equivalent of US$100,000 could be procured on conditions satisfactory to the Bank by limited international bidding (LIB). Consultants for the diagnostic operations studies for the two refineries will be selected on a short list of international oil companies operating in Nigeria. Engineering studies to review all the existing facilities in the two refineries and to recommend the medium/long-term requirements of the two refineries would be carried out by direct contracting with the original contractors, who are better qualified for the job than other engineering firms unfamiliar with the plant and machinery, on terms and conditions satisfactory to the Bank. Consultants for conducting the workshop and training would be selected by inviting limited international bidding on terms and conditions satisfactory to the Bank, the short lists would include qualified Nigerian consultants to the extent practicable. Procurement arrangements for the overall financing and for the proposed Bank loan are summarized in the above table. Procurement arrangements for the two refineries are indicated in paras. 4.15 to 4.21.

4.15 Power generating study: AEG-KANIS of West Germany, the original supplier of the turbo-sets, and Warri Refinery would negotiate a service contract on terms acceptable to the Bank to conduct all necessary inspections and appraise the entire power generating system, including the turbo set foundation, grouting, anchoring bolts, internals, pipings attached to the turbo sets and the quality of the boiler feed water with a view to submitting a comprehensive proposal to rectify the vibration problem. The proposal would include detailed scope of work, engineering design, material list, specifications, and estimated cost. AEG would subcontract the services of experienced specialists, acceptable to NNPC, for activities for which AEG is not specialized. They would be able to guarantee their respective scope of work in the event of execution.

4.16 Modification to the waste water treatment, replacement of underground fire water lines, modification to the condensate recovery system, and replacement of inefficient instruments would be carried out by inviting quotations from internationally reputed Engineering Contractors selected through ICB for the design, detailed engineering, procurement, inspection, construction supervision, construction and commissioning so that the overall responsibility for the quality and efficient implementation of the project would remain with the main contractor. Experienced local sub-contractors are available to assist the main contractor for site fabrication and local construction. The bidding document will seek to maximize such local inputs to the extent possible. Warri Refinery Project Manager would prepare the tender document and finalize it in consultation with the Bank.

4.17 Spare parts and laboratory equipment immediately required would be procured directly by the Warri Refinery. Single items costing less than US$100,000 which cannot be grouped together with others would be purchased through limited international bidding (LIB) by calling for quotations from at least 3 internationally recognized suppliers. Proprietary items or spare parts for existing equipment which cannot be obtained from alternative suppliers would be purchased by single source procurement.

4.18 Modifications to the waste water treatment and condensate recovery system would be implemented through ICB as explained in para 4.16 above. The Kaduna Refinery Project Manager would prepare the tender document and finalize it in consultation with the Bank.

4.19 Laboratory equipment would be procured directly by the Kaduna Refinery as explained in para. 4.17 above.

4.20 The data logging and shipment computer would be procured by ICB by inviting quotations for design of the system, supply of hardware and software, installation, commissioning and training of required number of personnel.

4.21 All tender documents for goods worth above US$100,000 would be submitted to the Bank for review prior to distribution to the bidders. In view of the technical complexity of the nature of the items (waste water treatment, condensate recovery and fire water distribution system for Warri Refinery and wastewater treatment and condensate recovery and the computer system for Kaduna Refinery), it is proposed to follow a two stage bidding procedure in that the bidders will be asked to submit the technical proposals which will be evaluated and cleared with the Bank. The bidders would be instructed by NNPC to submit one copy of the technical part of the bidding document for the Bank's review. Thereafter, the bidders will be asked to submit their price proposals. It was agreed that all contracts worth above US$100,000 would be submitted to the Bank for review prior to signature.

I. Retroactive Financing

4.22 Advance contracting and retroactive financing of up to US$2.6 million for expenditures after November 1, 1988 for the replacement of the fire water lines in Warri Refinery and modification to the waste water treatment in Kaduna Refinery would be done since the condition of these items is so deteriorated that they cannot wait until the loan is made effective (para. 4.09).

J. Allocation and Disbursement of Bank Loan

4.23 The allocation of the proposed loan is shown in the table below. The estimated quarterly disbursement schedule is shown in Annex 4.3. It has been prepared on the basis of the implementation schedule for individual project components, given that there is no previous disbursement profile for these types of projects in Nigeria. To facilitate project implementation, NNPC will open a special account in the amount of US$3.0 million to be used for expenditures made by NNPC under the proposed project. The account will be held in a commercial bank, and operated on terms and conditions satisfactory to the Bank. Withdrawal

applications will be submitted with full supporting documents, except for contracts of less than US$100,000 equivalent, and individual training programs which will be reimbursed on the basis of statements of expenditures (SOEs). Supporting documents related to SOEs will be retained in a central location by NNPC, and made available for review by visiting missions. As part of the annual audit of NNPC, external auditors acceptable to the Bank would specifically review accounts and submit their reports within 6 months of the close of each fiscal year. The audit reports would make specific reference to the audit of SOEs and provide an opinion on the use of the special account.

Table VIII

IBRD Loan Allocation
(US$ million Equivalent)

		Disbursement
Equipment and Materials	13.1	100% of foreign expenditures and 90% of local expenditures
Engineering and Project Management	2.4	100% of foreign expenditures and 90% of local expenditures
Spare Parts for Annual Maintenance, Chemicals and Catalysts	6.0	100% of foreign expenditures and 90% of local expenditures
Studies, Workshop and Training	2.3	100% of foreign expenditures and 90% of local expenditures
Contingencies	3.9	
TOTAL	27.7	

K. Environmental and Safety Aspects

4.24 In general, environmental pollution from petroleum refining could occur through gaseous effluent and liquid waste. Gaseous effluent consists of gases containing sulphur oxides, hydrogen sulfide, mercaptans and particulate matters. Since Nigerian refineries, except to some extent the Kaduna refinery, process low sulphur Nigerian crude oils, pollution due to sulphur compounds is limited, and is well below the industry norms. Emission of particulate matter containing catalyst fines from the catalytic cracking units are minimized by the use of effective cyclones. However, liquid waste released from both the refineries contain oil and phenols, presumably, beyond the standard industry norms. There is no regular measurement and recording to quantify these pollutants. The additions and modifications proposed in the project will reduce the pollutants to normal industry norms, and periodical analysis of the waste water and recording the results in all the refineries will be made mandatory. To increase the awareness of the environmental pollution among the refinery and petrochemical industry staff, a workshop on pollution control by specialists will be conducted in Warri (para. 4.06).

L. Project Monitoring and Reporting Requirements

4.25 Various indicators for monitoring project implementation and the operations of Warri and Kaduna refineries were agreed with NNPC during negotiations (Annex 4.4). These will be highlighted in the quarterly progress reports to the Bank. It was agreed at negotiations that within six months after the completion of the project, NNPC would prepare a "Project Completion Report" on the basis of an outline to be agreed with the Bank.

V. PROJECT JUSTIFICATION AND RISKS

A. Project Justification

5.01 The proposed project, particularly the rehabilitation components, would correct the problems in the support facilities of the two refineries so that they can be operated with improved reliability and capacity utilization. Delays in the rectification of these problems have caused product shortages which are met through imports. The savings in imports on account of the project implementation produce an internal rate of return of 38 percent for Warri Refinery and 31 percent for Kaduna Refinery.

5.02 From the institutional standpoint, the proposed project would enhance the commercial orientation of the two refineries and institutionalize the preventive maintenance system and pollution control measures. The refinery personnel will be trained to maintain the facilities and monitor the operational results in the future.

B. Economic Returns

5.03 The proposed project has components which are mainly intended to rehabilitate the existing facilities, increase the safety aspects and effect pollution control. Justification for such components should be mainly on the basis of safe operating practices and the needs for environmental protection. Wherever the operational efficiency is increased to effect improved productivity and cost reduction, it is taken into account in evaluating the economic viability of the investment. The economic return for the investments in the two refineries are summarized in the table below; the details are presented in Annex 5.1.

	Economic Return, %	NPV at 10% Discount (US$ million)
Warri Refinery	38	36
Kaduna Refinery	31	13

C. Project Risks

5.04 Since all the items included in the project are for improving existing facilities and the project preparation is well advanced and the project components are identified with specific details, no major risk is anticipated in the implementation of the proposed project. Since the operations of many of the facilities is essential for the continuous operation of the refinery, the rehabilitation work needs to be scheduled to synchronize with the refinery turn-around program to the maximum extent possible. There could be some delay in the completion of some of the items on this account. The engineering contractor will be asked to prepare a detailed time schedule taking this aspect into account, which will be monitored during implementation by the Bank's supervision missions.

VI. AGREEMENTS AND RECOMMENDATIONS

6.01 **Agreements were obtained at negotiations on the following:**

(i) NNPC would cause the fixed assets of the two refineries to be revalued, as necessary (para. 3.10);

(ii) NNPC would establish by July 1, 1991, limit for pollutants and maintain pollution control measures as per industry norms and limits (para 4.04 (ii) and 4.05 (i));

(iii) NNPC would complete diagnostic operations studies in the two refineries with terms of reference satisfactory to the Bank by June 30, 1989 and the subsequent implementing engineering studies by December 31, 1989 (para 4.06 (i));

(iv) NNPC would establish and maintain thereafter by July 1, 1990, preventive maintenance schemes in the two refineries satisfactory to the Bank (para 4.06 (ii));

(v) NNPC would prepare, by October 1, 1989, for the Bank review a training program for the refinery personnel in preventive maintenance and pollution control (para 4.06 (iii));

(vi) NNPC would utilize the funds provided by the Bank (US$6.0 million equivalent) to establish a NNPC Refineries account in a commercial bank on terms and conditions satisfactory to the Bank (para 4.07);

(vii) The Warri and Kaduna refineries would appoint project management teams with full-time Project Managers, and functional engineers, cost accountant, etc., appointed as and when necessary (para 4.08);

(viii) All contracts and agreements worth above US$100,000 would be submitted to the Bank for review prior to their signature (para 4.21);

6.02 Based on the above agreements, the proposed project is suitable for the proposed IBRD loan of US$27.7 million equivalent. The proposed loan would be lent to NNPC at the Bank standard variable interest rate for 15 years including three years of grace. Retroactive financing of US$2.6 million for the replacement of the fire water lines in the Warri Refinery and modification to the waste water treatment in Kaduna Refinery is also recommended (para 4.22), and is included in the amount mentioned above.

NIGERIA

REFINERIES REHABILITATION PROJECT

COMMERCIAL ENERGY BALANCE, 1985
(thousand toe)

	Primary Energy				Petroleum Products									
	Natural Gas	Coal	Crude Oil	Hydro-power a/	LPG	Gasoline	Kerosene	Gas Oil	High Pour Fuel Oil	Low Pour Fuel Oil	Aviation Spirit	Total Petroleum Products	Elec-tricity	Line Totals
Gross Supply														
Production	12,233	81	74,633	872	--	--	--	--	--	--	--	--	--	87,819
Imports	--	--	--	--	10	1,926	527	25	--	--	2	2,790	--	2,490
Primary Exports	--	(10)	(66,043)	--	--	--	--	--	--	--	--	--	--	(66,053)
Total Gross Supply	12,233	71	8,590	872	10	1,926	527	25	--	--	2	2,790	--	24,256
Conversion														
Petroleum Refining	(215)	--	(7,806)	--	60	2,235	1,237	2,321	726	1,442	--	8,021	--	0
Electricity Generation	(1,766)	--	--	(872)	--	--	--	(171)	--	(160)	--	(331)	2,817	0
Conversion/Own Use	--	--	(784)	--	--	--	--	--	--	--	--	--	(1,396)	(2,180)
Transmission/ Distribution Losses	--	--	--	--	--	--	--	--	--	--	--	--	(568)	(568)
Net Supply	10,252	71	--	--	70	4,161	1,764	2,175	726	1,282	2	10,180	853	21,354
Other Adjustments														
Secondary Exports	--	--	--	--	(1)	(43)	(70)	(100)	(595)	(897)	--	(1,706)	--	(1,706)
Balancing Items	(9,994) b/	--	--	--	--	17	64	129	116	1	--	327 c/	--	(9,667)
Net Domestic Demand	258	71	--	--	69	4,135	1,760	2,204	247	384	2	8,801	853	9,983
Final Demand														
Households	--	--	--	--	69	--	1,338	--	--	--	--	1,407	459	1,866
Transport	--	28	--	--	--	4,135	422	2,204	--	--	2	6,763	--	6,791
Industry/Commerce	258	43	--	--	--	--	--	--	247	384	--	631	394	1,326

a/ Converted at a thermal replacement value of 2700 kcal per kwh.
b/ Flared.
c/ Stock changes and bunkers.

Annex 1-1

SOURCE: Updated Energy Assessment

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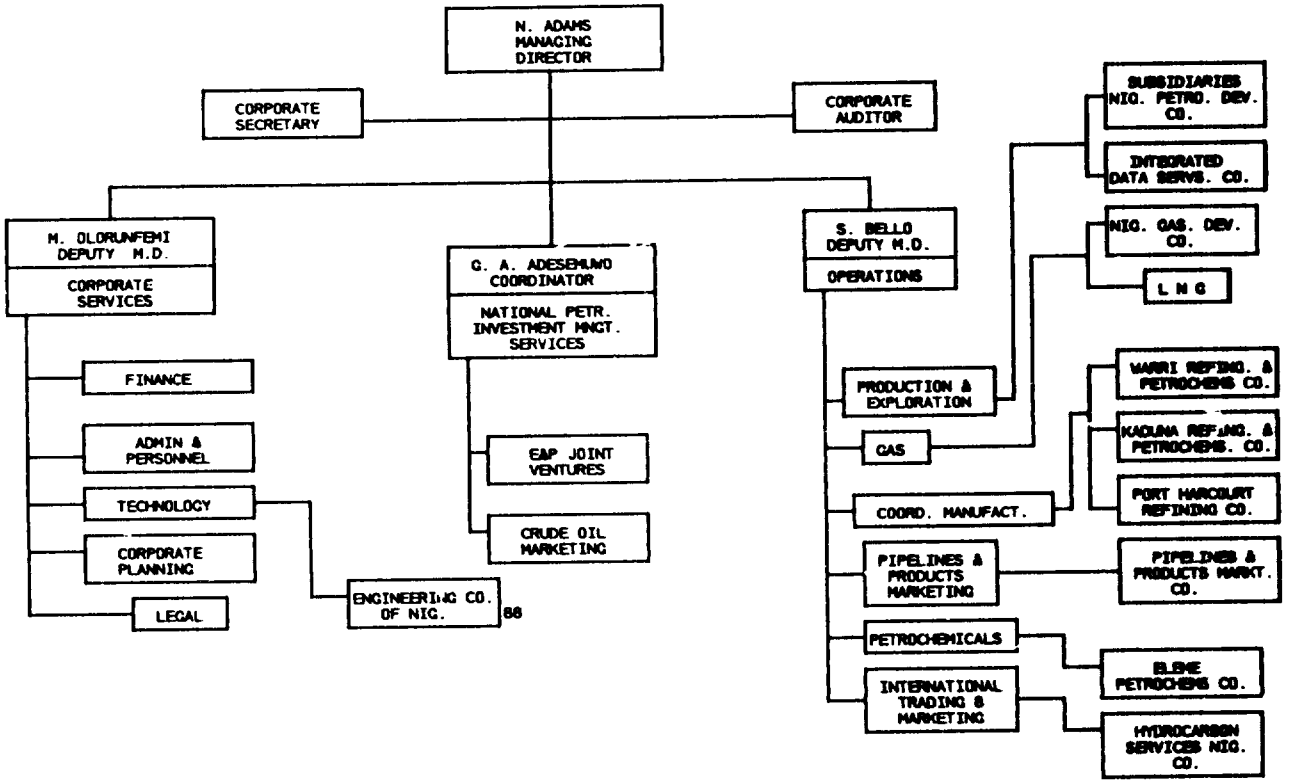
November, 1988

NIGERIA

REFINERIES REHABILITATION PROJECT

ORGANIZATION CHART: NNPC JUNE, 1988



SOURCE: NNPC

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REFINERIES REHABILITATION PROJECT

PETROLEUM PRODUCTS: PAST CONSUMPTION

(000 METRIC TONS)

YEAR / PRODUCTS	1982	1983	1984	1985	1986	1987	AVERAGE ANNUAL VARIATIONS 1987/1982 IN %
LIQUEFIED PETROLEUM GAS (BUTANE) LPG	51.140	52.993	64.096	65.345	73.5	90.0	12.0
PREMIUM MOTOR SPIRIT PMS	4,043.911	4,181.443	3,941.984	3,976.759	3,622.1	3,607.6	-2.3
HOUSEHOLD KEROSENE HHK	1,040.122	1,152.029	1,224.542	1,214.997	1,518.9	1,556.9	8.4
AVIATION TURBINE KEROSENE - ATK	445.764	493.727	524.849	520.714	404.1	383.9	-2.9
AUTOMOTIVE GAS OIL AGO	2,439.989	2,347.672	2,347.672	2,1[illegible] 035	1,651.1	1,568.5	-8.5
FUEL OIL (LOW POUR AND (HIGH POUR) F.O.	1,181.759	1,263.808	872.797	798.382	1,143.1	1,326.0	2.3
TOTAL	9,202.685	9,491.672	8,976.040	8,731.232	8,412.8	8,532.9	-1.5

Bitumen and asphalt and others account for 598.360 T in 1981

280.659 T in 1985
960.840 T in 1986
347.201 T in 1987

SOURCE: NNPC

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November, 1988

NIGERIA

REFINERIES REHABILITATION PROJECT

PETROLEUM PRODUCTS - FUTURE DEMAND

(000 METRIC TONS)

YEAR	1988	PROJECTED ANNUAL CHANGE 1988/1987 IN %	1989	1990	1991	1992	1993	PROJECTED AVERAGE ANNUAL VARIATIONS 1993/1987 IN %
LIQUIFIED PETROLEUM GAS (BUTANE) LPG	97.0	7.7	109.0	122.0	137.0	153.0	172.0	11.4
PREMIUM MOTOR SPERIT PMS	3,341.1	-7.4	3,089.0	2,895.0	2,793.0	2,786.0	2,864.0	- 3.8
HOUSEHOLD KEROSENE HHK	1,595.8	2.5	1,635.7	1,594.8	1,620.6	1,646.9	1,673.6	1.2
AVIATION TURBINE KEROSEN ATK	364.7	-5.0	346.5	329.2	321.0	313.0	305.2	- 3.7
AUTOMOTIVE GAS OIL AGO	1,490.1	-5.0	1,415.6	1,486.4	1,560.7	1,638.7	1,720.6	- 1.5
FUEL OIL F.O.	1,538.2	16.0	1,030.0	910.0	930.0	1,020.0	1,120.0	- 2.8
TOTAL	8,426.8	1.2	7,625.8	7,337.4	7,362.3	7,557.6	7,855.4	- 1.4

SOURCE: NNPC

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REFINERIES REHABILITATION PROJECT

IMPORTS OF PETROLEUM PRODUCTS AND EXPORTS OF CRUDE OIL FOR OFFSHORE PROCESSING

PRODUCT IMPORTS (IN METRIC TONS)

1983	-	3,870,772.294
1984	-	2,431,117.494
1985	-	2,611,440.166
1986	-	2,891,286.030
1987	-	3,499,198.960
		15,303,814.944

CRUDE OIL FOR OFFSHORE PROCESSING (BARRELS)
(MAINLY IN EUROPE: CRUDE OIL SENT FOR PROCESSING, TO REFINERIES ABROAD)

1983	-	47,473,793
1984	-	37,707,395
1985	-	28,136,350
1986	-	34,952,127
1987	-	40,062,836
		188,332,501

Imported Products Include:

Gasoline) 85%
Kerosene)

Gas oil)
LPG) 15%
Base oils)

SOURCE: NNPC

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NIGERIA

REFINERIES REHABILITATION PROJECT

1987 SALES

(ACTUALS)

PRODUCTS	VOLUME (TONS)	VALUE (NAIRAS)
LIQUEFIED PETROLEUM GAS LPG	79,222.863	8,734,813.29
PREMIUM MOTOR SPIRIT PMS	3,681,678.535	1,687,004,027.03
DUAL PURPOSE KEROSENE DPK	1,630,895.723	136,028,687.13
AVIATION TURBINE KEROSENE ATK	496,788.028	150,426,441.75
DAK	146,599.841	725,242.07
AUTOMOTIVE GAS OIL AGO	1,891,637.588	570,909,272.38
LOW POUR FUEL OIL LPFO	946,880.555	187,673,206.73
HIGH POUR FUEL OIL HPFO	950,151.490	250,454,679.39
ASPHALT	139,906.294	20,770,490.12
WAX	4,324.93	4,177,856.04
TINNED KERO	(877,200) TT'	3,332,316
BASE OIL (LUBES)	169,456.19	77,510,269.91
TOTAL		N 3,097,747,301.84

SOURCE: NNPC

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November, 1988

NIGERIA

REFINERIES REHABILITATION PROJECT

1988 PETROLEUM PRODUCT DISTRIBUTION COSTS

PRODUCT	EX GATE COST (REFINERY) (FOR DUTY PURPOSE ONLY)	GOVERNMENT, EXCISE DUTY PAYABLE	TRANSPORTATION THROUGH DEPOTS NNPC'S MARINE/ PPL DELIVERY	EX DEPOT/ REFINERY COST TO WHOLE-SALERS	MARGINS TO MARKETING COM-PANIES INCLUD-ING TRANSPORTAT. COSTS	PETROLEUM EQUALIZAT. FUND MARGIN	PRICES AT PUMP STATIONS
LIQUEFIED PETROLEUM GAS (BUTANE) LPG	N70.86/T	N3.543/T	N28.597/T	N103/T	N297/T	-	N400/T
PREMIUM MOTOR SPIRIT (PMS)	30.05K/L	1.378K/L	4.022K/L	35.45K/L	6.11K/L	0.44K/L	42K/L
AVIATION TURBINE KEROSENE (ATK)	95.49K/L	-	1.96K/L	97.45K/L	6.11K/L	0.44K/L	104K/L
HOUSE HOLD KEROSENE (HHK)	4.28K/L	0.125K/L	4.045K/L	8.45K/L	6.11K/L	0.44K/L	15K/L
AUTOMOTIVE GASOIL (AGO)	23.15K/L	0.883K/L	4.417K/L	28.45 K/L	6.11K/L	0.44K/L	35K/L
FUEL OIL (LPFO, HPFO)	21.92K/L	0.546K/L	0.984K/L	23.45 K/L	6.11K/L	0.44K/L	30K/L

N1 = 100 KOBO
P.E.F. = Petroleum Equalization Fund for Uniform pricing of products nation wide.

SOURCE: NNPC

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November, 1988

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REFINERIES REHABILITATION PROJECT

WARRI REFINERY

INCOME STATEMENTS AS OF 31 DECEMBER
(IN NAIRAS THOUSAND)

	1985	1986	1987
Subventions for Operations	37,997.0	37,840.0	122,760.4
Sundry Income	1,328.9	928.6	2,770.3
Total Revenue	39,325.9	38,768.6	125,530.7
Expenditures			
Personnel	15,854.7	15,680.7	17,876.6
Consultants	995.0	5,564.9	6,520.9
Materials, chemicals, spare parts	17,389.6	13,373.1	22,854.9
Other services	3,505.2	9,716.1	7,621.3
Plant maintenance and rehabilitation	-	-	36,360.7
Depreciation	1,893.6	2,000.0	2,197.7
Total Expenditures	39,638.1	46,334.8	93,432.1
Net Income (Loss)	(312.2)	(7,566.2)	32,098.6

NIGERIA

REFINERIES REHABILITATION PROJECT

WARRI REFINERY

FUNDS FLOW STATEMENTS AS OF 31 DECEMBER
(IN NAIRAS THOUSAND)

	1935	1986	1987
SOURCE OF FUNDS			
Net Income	(312.2)	(7,566.2)	32,098.6
Depreciation	1,893.6	2,000.0	2,197.7
Sources from Operations	1,581.4	(5,566.2)	34,296.3
Head Office Current Account	(19.8)	2,417.9	2,462.6
Long Term Creditors	5,562.0	11,392.8	(29,892.4)
Total Sources	7,123.6	8,244.5	6,866.5
APPLICATION OF FUNDS			
Acquisition of Fixed Assets and Capital Projects	7,123.6	8,244.5	6,866.5
Net Inflow of Funds	0	0	0
Represented by:			
Variations in Working Capital:			
Inventories	(5,200.4)	6,713.9	9,458.3
Short Term Creditors	4,305.8	(3,382.6)	(19,452.0)
Cash and Banks	894.6	(3,331.3)	9,993.7
Variations in Working Capital	0	0	0

NIGERIA

REFINERIES REHABILITATION PROJECT

WARRI REFINERY

BALANCE SHEETS AS OF 31 DECEMBER
(IN NAIRAS THOUSAND)

	1985	1986	1987
Long Term Assets			
Net Fixed Assets	17,015.0	21,540.0	27,332.1
Works in Progress	5,234.7	7,059.5	5,890.6
Total Long Term Assets	22,249.7	28,599.5	33,222.7
Current Assets			
Inventories	30,499.4	34,678.4	44,136.7
Debtors and Staff Loans	6,453.5	5,228.6	30,573.5
Cash in Hand and in Bank	7,951.1	4,619.8	14,613.4
Total Current Assets	44,904.0	44,526.8	89,323.6
Current Liabilities and Creditors	3,753.8	15,072.5	29,931.3
Net Current Assets	41,150.2	29,454.3	59,392.3
Total Long Term and Net Current Assets	63,399.9	58,053.8	92,615.0
Financed by:			
Accumulated Reserves	61,071.6	53,505.4	85,604.1
Head Office Current Account	2,328.3	4,548.4	7,010.9
Total Long Term Liabilities	63,399.9	58,053.8	92,615.0

NIGERIA

REFINERIES REHABILITATION PROJECT

KADUNA REFINERY

INCOME STATEMENTS AS OF 31 DECEMBER
(IN NAIRAS THOUSAND)

	1985	1986	1987
Subventions	45,358.7	74,899.6	104,430.0
Sundry Income	1,115.5	1,375.9	2,147.5
Total Revenue	46,474.2	76,275.5	106,577.5
Expenditures			
Personnel	15,867.8	17,796.3	20,627.8
Consultants	-	-	-
Materials, Chemicals, Spare Parts	11,446.8	18,503.3	21,959.9
Other Services	11,280.9	12,091.9	6,581.3
Plant Maintenance	975.6	5,819.8	105.3
Depreciation	32,553.7	32,693.5	33,103.2
Total Expenditures	72,124.8	86,904.8	82,377.5
Net Income	(25,650.6)	(10,629.3)	24,200.0

NIGERIA

REFINERIES REHABILITATION PROJECT

KADUNA REFINERY

FUNDS FLOW STATEMENTS AS OF 31 DECEMBER
(IN NAIRAS THOUSAND)

	1985	1986	1987
SOURCES OF FUNDS			
Net Income	(25,650.6)	(10,629.3)	24,200.0
Depreciation	32,553.7	32,693.5	33,103.2
Sources from Operations	6,903.1	22,064.2	57,303.2
Long Term Creditors	-	(14,661.7)	(53,833.7)
Total Sources	-	7,402.5	3,469.5
APPLICATION OF FUNDS			
Acquisition of Fixed Assets	-	7,402.5	3,469.5
Net Inflow of Funds	-	0	0
Represented by:			
Variations in Working Capital:			
Inventories	-	(1,736.2)	10,209.3
Short Term Creditors	-	(8,270.4)	(25,689.7)
Cash and Banks	-	10,006.6	15,480.4
Variations in Working Capital	-	0	0

NIGERIA

REFINERIES REHABILITATION PROJECT

KADUNA REFINERY

BALANCE SHEETS AS OF 31 DECEMBER
(IN NAIRAS THOUSAND)

	1985	1986	1987
Long Term Assets			
Net Fixed Assets	310,849.1	280,073.2	250,391.1
Works in Progress	148.8	633.5	312.1
Total Long Term Assets	310,997.9	280,706.7	250,703.2
Current Assets			
Inventories	22,634.3	20,898.1	31,107.3
Debtors and Staff Loans	11,261.2	21,352.6	45,417.4
Cash in hand and in Bank	4,701.2	14,707.9	30,188.3
Total Current Assets	38,596.7	56,958.6	106,713.0
Current Liabilities and Creditors	7,155.1	5,855.1	1,406.0
Net Current Assets	31,441.6	51,103.5	105,307.0
Total Long Term and Net Current Assets	342,439.5	331,810.2	356,010.2
Financed by:			
Accumulated Fund	342,439.5	331,810.2	356,010.2

NIGERIA

REFINERIES REHABILITATION PROJECT

ECONOMIC VIABILITY OF WARRI AND KADUNA REFINERIES

A. WARRI REFINERY

Assumptions:

(i) Crude processed: 2.516 million tons of Nigerian crude produced locally.

(ii) Crude transportation: delivered at the refinery by pipeline transfer.

(iii) Crude oil freight incurred: Nil

(iv) Crude oil price assumed: opportunity price i.e., Average 1988 spot price for export reported in Platts oilgram.

(v) Product prices: Average 1988 spot prices ex-Northwest Europe plus freight to Nigeria in 35,000 DWT clean tankers and insurance and ocean loss at 0.7% of the FOB plus freight value.

(vi) Refinery fuel consumption and losses, product pattern, and operating costs are estimated on the basis of data collected from NNPC on the 1986 actual operation (the year in which maximum capacity utilization was achieved).

(vii) Price of fuel oil is assumed at spot price FOB for low sulphur fuel oil in Northwest Europe minus a discount to compensate for the extra freight to Nigeria.

(viii) Price of LPG which is not usually quoted in the Platts oilgram was estimated on the basis of actual prices at which it is imported in recent times in the region.

(ix) The operating cost of the refinery (fixed and variable) was estimated from its 1986 operating cost apportioned to the refinery activities as per NNPC's best estimates.

(x) Nigerian Naira was converted to United States dollars at the 1986 average exchange rate of ₦1.54 per US$ for estimating the operating cost in 1986 in US$.

(xi) All existing investments are considered sunk costs.

(xii) Terminal cost for product import includes cost of personnel, utilities, chemicals, etc. for operation and maintenance of product unloading, storage and handling facilities.

Economic Evaluation:

(a) Product-Pattern and Sales realization:

	Million Tons	US$/Ton	US$ Million
LPG	0.028	210	5.880
Mogas	0.735	218	160.230
Kerosene/jetfuel	0.239	166	39.674
Diesel (gas oil)	0.684	151	103.284
Fuel oil	0.491	82	40.262
Carbon blackfeed	0.053	90	4.770
Propylene	0.018	250	4.500
Fuel consumption & loss	0.268	-	-
Total	2.516	-	358.600

(b) Terminal operating costs for products import:

Personnel and Administration	5.000
Utilities, Chemicals, etc.	1.000
Maintenance, Repairs, etc.	3.500
Subtotal products terminal operating cost	9.500

(c)	Total Cost of product imports (a+b)		368.100
(d)	Cost of Crude oil processed	2.516 112.11	282.069
(e)	Operating cost of the refinery: variable operating cost (chemicals, catalysts, utilities, etc).		4.855
	Fixed operating costs:		
	- Labour		9.260
	- Maintenance		14.371
	- Overheads		5.108
	Subtotal fixed operating cost		28.739
	Total operating cost of the refinery (variable + fixed)		33.594
(f)	Total cost of crude oil processing in the refinery (a+e)		315.663
(g)	Savings from the refinery operation vis-a-vis product import (c-b)		52.437

B. KADUNA REFINERY

Assumptions:

(i) Crude oil processed: 55% Nigerian crude supplied from the Warri terminal and 45% imported from Venezuela - total quantity processed in 1987 is 3.294 million tons.

(ii) Crude oil transportation: both the Nigerian and Venezuelan crudes are transported by a common pipeline from Warri to Kaduna.

(iii) Inland transportation cost of crude oil and products are not taken into account -- both are assumed landed at the coast since imported products have to be transported to Kaduna by rail/road which involves considerable extent of local cost and the import parity comparison would not be realistic on that basis.

(iv) crude oil price: for the Nigerian crude, its opportunity price i.e., spot price for export as reported in Platts oilgram and for the Venezuelan crude, its actual price CIF, Escravos were assumed.

(v) Fuel product prices: spot prices ex-Northwest Europe plus freight to Nigeria in 35,000 DWT clean tankers and insurance and ocean loss at 0.7% of the FOB plus freight value.

(vi) For lube base oils, US Gulf Coast FOB prices and transportation in bulk are assumed.

(vii) Price of fuel oil is assumed at spot FOB price for low sulphur in Northwest Europe minus a discount to compensate for the extra freight to Nigeria.

(viii) Price of LPG which is not usually quoted in the Platts oilgram was estimated on the basis of actual prices at which it is imported in recent times in the region.

(ix) Prices of Paraffin Wax and sulphur were also based on market information on actual sales in recent times.

(x) Price of asphalt is estimated on the basis of FOB high sulphur fuel oil plus transportation in bulk in heated tankers.

(xi) The operating cost of the refinery (fixed and variable) was estimated from its 1988 operating cost apportioned to the refinery activities as per NNPC's best estimates.

(xii) Nigerian Naira was converted to US$ at the 1988 average exchange rate of N5 per US$ for estimating the operating cost in 1988 in US$.

(xiii) All the existing investments are considered sunk cost.

(xiv) Terminal cost for product import includes cost of personnel, utilities, chemicals, etc. for operation and maintenance of product unloading, storage and handling.

Economic Evaluation:

(a) Product-Pattern and Sales realization:

	Million Tons	US$/Ton	US$ Million
LPG	0.007	210	1.470
Mogas	0.893	218	194.674
Kerosene/jetfuel	0.428	166	71.048
Diesel (gas oil)	0.632	151	95.432
Fuel oil	0.580	82	47.560
Lube base oil	0.100	260	26.000
Wax	0.016	450	4.500
Asphalt	0.120	130	7.200
Sulphur	0.006	150	0.900
Refinery fuel comsumption and loss	0.512	-	-
Total	3.294	-	459.884

(b) Terminal operating costs for products import:

Personnel and Administration	5.000
Utilities, Chemicals, etc.	1.000
Maintenance, Repairs, etc.	3.500
Subtotal products terminal operating cost	9.500

(c) Total Cost of product imports (a+b) 469.384

(d) Cost of Crude oil processed:

Nigerian crude	1.812	112.11	203.143
Venezuelan crude	1.482	109.26	161.956
Total cost of crude oil processed			365.099

(e) Operating cost of the refinery:

variable operating cost (chemicals, catalysts, utilities, etc).	18.050
Fixed operating costs:	
- Labour	6.673
- Maintenance	23.201
- Overheads	1.694

		US$ Million
	Subtotal fixed operating cost	31.568
	Total operating cost of the refinery (variable + fixed)	49.618
(f)	Total cost of crude oil processing in the refinery (a+e)	414.717
(g)	Savings from the refinery operaiton vis-a-vis product import (c-b)	54.667

NIGERIA

REFINERIES REHABILITATION PROJECT

NIGERIAN NATIONAL PETROLEUM CORPORATION AND ITS SUBSIDIARIES

INCOME STATEMENTS AS OF 31 DECEMBER
(IN NAIRAS MILLION)

	1985	1986	1987 1/
Sales of Petroleum Products	2,840.6	4,668.8	
Other Income	198.3	160.9	
Total Income	3,038.9	4,829.7	
Expenditures			
Crude Oil and Product Purchases	901.4	2,068.3	
Depreciation	203.8	244.9	
Other Expenses	696.3	311.3	
Total Expenditures	1,801.5	2,624.5	
Net Income Before Statutory Payment to Federal Government	1,237.4	2,205.2	
Income Tax and Other Government Duties	1,007.0	1,539.9	
Minority Interest	14.0	13.3	
Net income for the year	216.4	652.0	

1/ 1987 accounts are not available. See explanation in paragraph 3.09.

NIGERIA

REFINERIES REHABILITATION PROJECT

NIGERIAN NATIONAL PETROLEUM CORPORATION AND ITS SUBSIDIARIES

FUNDS FLOW STATEMENTS AS OF 31 DECEMBER
(IN NAIRAS MILLION)

	1985	1986	1987 1/
SOURCE OF FUNDS			
Net Income Before Statutory Payments to Federal Government	1,237.4	2,205.2	
Depreciation	203.8	244.9	
Funds Generated from Operations	1,441.2	2,450.1	
Grants from Federal Government	145.0	222.0	
Loans	36.6	541.3	
Sundry	(2.2)	(35.5)	
Total Sources	1,620.6	3,177.9	
APPLICATION OF FUNDS			
Statutory Payments to Federal Government	1,007.0	1,539.9	
Fixed Assets	546.7	976.2	
Sundry	48.1	15.8	
Total Applications	1,601.8	2,531.9	
Net Inflow of Funds	18.8	646.0	
Represented by Variations in:			
Inventories	(42.4)	334.6	
Accounts Receivable	425.6	475.4	
Accounts Payable	272.1	(603.2)	
Short Term Investments	(447.8)	(111.1)	
Bank and Cash	(99.7)	451.1	
Bank Overdraft	(89.0)	99.2	
Net Increase in Working Capital	18.8	646.0	

1/ 1987 accounts are not available. See explanation in paragraph 3.09.

NIGERIA

REFINERIES REHABILITATION PROJECT

NIGERIAN NATIONAL PETROLEUM CORPORATION AND ITS SUBSIDIARIES

BALANCE SHEETS AS OF 31 DECEMBER
(IN NAIRAS MILLION)

	1985	1986	1987 1/
Long Term Assets			
Net Fixed Assets	2,158.7	2,044.4	
Works in Progress	617.3	1,460.2	
Long Term Investments	74.4	72.0	
Total Long Term Assets	2,850.4	3,576.6	
Current Assets			
Net Accounts Receivable	1,279.7	1,755.0	
Short Term Investments	1,164.7	1,053.6	
Inventory	388.8	723.5	
Cash and Bank Balances	273.1	724.2	
Total Current Assets	3,106.3	4,256.3	
Current Liabilities			
Accounts Payable	307.8	911.0	
Tax Provision	374.6	366.1	
Bank Overdraft	110.1	10.9	
Total Current Liabilities	792.5	1,288.0	
Net Current Assets	2,313.8	2,968.3	
Long Term and Net Current Assets	5,164.2	6,544.9	
Financed by:			
Capital Grants	2,885.5	3,107.5	
Capital Reserves	526.0	520.7	
Revenue Reserves	1,535.4	2,152.0	
Minority Interest	70.5	76.5	
Long Term Debt	146.8	688.2	
	5,164.2	6,544.9	

1/ 1987 accounts are not available. See explanation in paragraph 3.09.

NIGERIA

REFINERIES REHABILITATION PROJECT

NIGERIAN NATIONAL PETROLEUM CORPORATION AND ITS SUBSIDIARIES

AND JOINT VENTURES

INCOME STATEMENTS AS OF 31 DECEMBER
(IN NAIRAS MILLION)

	1985	1986	1987 1/
Oil and gas sales	9,370.7	10,461.4	
Other income	1,104.0	501.1	
Total income	10,474.7	10,962.5	
Expenditures	2,526.6	3,920.5	
Net income before statutory payments to Federal Government	7,948.1	7,042.0	
Income tax and other Government duties	6,787.1	3,910.2	
Minority interest	14.0	13.3	
Net income for the year	1,147.0	3,118.5	

1/ 1987 accounts are not available. See explanation in paragraph 3.09.

NIGERIA

REFINERIES REHABILITATION PROJECT

NIGERIAN NATIONAL PETROLEUM CORPORATION

ACTUAL AND PROJECTED INCOME STATEMENTS
(In Naira thousand)

	Actuals		Projections				
	1986	1987	1988	1989	1990	1991	1992
Revenues							
Refined products	3,238,793	4,195,018	4,055,198	9,798,364	11,012,761	12,314,846	14,078,158
Petrochemicals	-	-	264,835	281,591	296,671	310,454	1,650,058
Crude oil	-	-	142,290	178,003	196,560	220,808	416,569
Natural gas	65,600	130,428	528,380	1,180,159	1,383,512	1,856,380	2,328,311
J.V. mgt service fees	-	-	48,344	53,768	61,959	71,238	81,936
Data services	-	-	4,785	8,674	15,553	16,199	23,220
Tins and drums	-	-	28,500	37,380	41,111	45,220	49,750
Marine income	-	-	19,430	39,200	43,400	48,200	53,500
Other income	153,291	332,235	190,357	148,314	145,327	143,336	142,882
Total revenues	3,457,684	4,657,681	5,282,119	11,725,453	13,195,854	15,026,681	18,824,382
Costs							
Operating costs							
Crude oil - local refineries	1,114,834	675,289	868,564	7,069,830	8,112,100	9,070,500	10,450,000
Offshore processing	790,537	858,608	547,468	-	-	-	-
Products purchases (offshore)	309,053	809,490	542,659	-	-	-	-
Duties	60,904	59,592	104,636	203,800	224,180	246,600	271,260
Royalties	-	-	30,000	35,601	39,312	46,236	87,234
Dry holes expenses	-	-		16,660	29,030	52,751	45,574
Natural gas (J.V. partn.)	28,800	39,725	246,827	510,842	620,182	822,765	1,379,150
Refinery materials	37,330	49,131	124,670	135,340	160,790	183,300	208,970
Petrochemical materials			27,918	88,816	99,474	111,411	292,780
Marine costs	39,503	44,856	104,581	111,000	123,210	136,730	151,810
Other operating costs	202,362	315,363	551,917	591,040	620,070	677,288	1,008,658
Total operating costs	2,583,323	2,912,054	3,149,240	8,762,929	10,028,348	11,347,581	13,895,436
General and administrat. costs							
Depreciation	220,505	228,105	453,471	759,854	876,139	952,139	1,206,235
Other indirect costs	108,750	367,188	302,683	430,991	472,940	518,066	645,623
Total gen. & adm. costs	329,255	595,293	756,154	1,190,845	1,349,079	1,470,205	1,851,858
Exchange gains	(349,216)	(201,091)	-	-	-	-	-
Total costs	2,563,362	3,306,256	3,905,394	9,953,774	11,377,427	12,817,786	15,747,294
Net income	894,322	1,351,425	1,376,725	1,771,679	1,818,427	2,208,895	3,077,088
Corporate tax	266,301	402,048	525,916	666,674	698,609	855,155	1,130,682
Petroleum profit tax	-	-	80,000	85,865	39,210	17,328	172,846
Dividends	-	-	360,000	480,000	600,000	720,000	840,000
Yearly retained earnings	628,021	949,377	410,809	539,140	480,608	616,412	933,560

SOURCE: NNPC and Mission Estimates
AFTIE
November, 1988

NIGERIA

REFINERIES REHABILITATION PROJECT

NIGERIA NATIONAL PETROLEUM CORPORATION

ACTUAL AND PROJECTED FUNDS FLOW STATEMENTS
(In Naires thousand)

	Actuals		Projections					
	1986	1987	1988	1989	1990	1991	1992	5 yrs 88/92
Net income	894,322	1,351,425	1,376,725	1,771,679	1,818,427	2,208,895	3,077,088	10,252,814
Depreciation	220,505	228,105	453,471	759,854	876,139	952,139	1,206,235	4,247,838
Total funds from opers.	1,114,827	1,579,530	1,830,196	2,531,533	2,694,566	3,161,034	4,283,323	14,500,652
Funds from Federal Govt.								
Cap. grants & rev. reeve.	187,897	397,633	-	-	-	-	-	-
Foreign loans	541,324	1,348,526	-	-	-	-	-	-
New equity	-	-	400,000	462,500	462,500	462,500	462,500	2,250,000
New P. H. Ref. For. loan	-	-	1,269,256					1,269,256
Special projects	-	-	64,800	70,800	622,600	535,400	97,800	1,391,400
LNG escrow	-	-	175,500	191,200	357,400	1,520,400	853,600	3,096,100
Total funds available	1,844,048	3,325,689	3,739,752	3,256,033	4,137,066	5,679,334	5,697,223	22,509,408
Applications								
Taxes and dividends								
Corporate tax	266,301	402,048	525,916	666,674	698,609	855,155	1,130,682	3,877,036
Petroleum profit tax	-	-	80,000	85,865	39,210	17,328	172,846	395,249
Dividends	-	-	360,000	480,000	600,000	720,000	840,000	3,000,000
Total	266,301	402,048	965,916	1,232,539	1,337,819	1,592,483	2,143,528	7,272,285
Investments	28,406	(51)						
Capital program								
Expl. & prod. gas & crude	61,522	764,021	111,500	170,900	298,400	216,900	180,100	977,800
Gas	-	-	1,006,000	704,200	224,900	148,100	25,800	2,108,000
Pipelines, diff. phases	2,604	99,157	354,200	483,000	585,400	508,700	47,700	1,979,000
PPMC, mkg, transp.	-	-	123,200	70,700	346,900	237,300	170,900	949,000
Refineries	55,483	-	1,576,056	114,100	112,700	95,200	0	1,898,056
P.chem., end ph.I & ph.II	734,049	1,478,047	105,000	433,300	493,800	1,161,000	1,380,200	3,573,300
L Natural Gas	-	-	175,000	191,200	357,200	1,520,300	853,500	3,097,200
ETSD telecommunications	-	-	366,000	56,700	59,400	24,600	35,000	541,700
Adm. Pers. D	-	-	37,000	72,000	57,300	30,000	3,000	199,300
	86,631	106,505	-	-	-	-	-	-
Movables	41,601	33,072	73,100	42,600	48,000	47,000	48,100	258,800
Total	981,890	2,480,802	3,926,056	2,338,700	2,584,000	3,989,100	2,744,300	15,582,156
Total application of funds	1,276,597	2,882,799	4,891,972	3,571,239	3,921,819	5,581,583	4,887,828	22,854,441
Working capital variation	567,451	442,890	(1,152,220)	(315,206)	215,247	97,751	809,395	(345,033)

SOURCE: NNPC and Mission Estimates
AFTIE
November, 1988

NIGERIA

REFINERIES REHABILITATION PROJECT

NIGERIA NATIONAL PETROLEUM CORPORATION

ACTUAL AND PROJECTED BALANCE SHEETS
(In Naira thousand)

	Actual		Projections				
	1986	1987	1988	1989	1990	1991	1992
Gross fixed assets							
Exploration and production	254,916	1,018,987	1,130,437	1,301,337	1,599,737	1,816,637	1,996,737
Refineries and petrochemicals	2,409,459	3,887,506	5,568,562	6,115,962	6,722,462	7,978,662	9,358,862
Pipelines (POD and GAS)	1,046,745	1,145,902	2,506,102	3,692,302	4,502,602	5,159,402	5,232,902
Other assets	568,973	675,478	1,376,678	1,767,278	2,588,078	4,400,278	5,462,678
Movables	171,668	204,740	277,840	320,440	368,440	415,440	463,540
Total	4,451,761	6,932,563	10,858,619	13,197,319	15,781,319	19,770,419	22,514,719
Less accumulated depreciation	1,199,195	1,427,300	1,880,771	2,640,625	3,516,764	4,468,903	5,675,138
Net fixed assets	3,252,566	5,505,263	8,977,848	10,556,694	12,264,555	15,301,516	16,839,581
Investments and l.t. receiv.	145,904	145,853	145,853	145,853	145,853	145,853	145,853
Net current assets	2,924,308	3,367,198	2,214,978	1,899,772	2,115,019	2,212,770	3,022,165
Total l.t. assets and wkg cap.	6,322,778	9,018,314	11,338,679	12,602,319	14,525,427	17,660,139	20,007,599
Financed by:							
Shareholders equity	NIL	NIL	7,196,065	7,658,565	8,121,065	8,583,565	9,046,065
Foreign loans	673,153	2,021,679	-	-	-	-	-
Capital grants	3,107,497	3,505,130	-	-	-	-	-
Capital reserves	520,279	520,279	520,279	520,279	520,279	520,279	520,279
Fed. Gvt. - special projects	-	-	64,800	135,600	758,200	1,293,600	1,391,400
Fed. Gvt. - LNG escrow	-	-	175,500	366,700	724,100	2,244,500	3,098,100
Retained earnings	2,021,849	2,971,226	3,382,035	3,921,175	4,401,783	5,018,195	5,951,755
Total l.t. liabilities	6,322,778	9,018,314	11,338,679	12,602,319	14,525,427	17,660,139	20,007,599

SOURCE: NNPC and Mission Estimates
AFTIE
November, 1988

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NIGERIA

REFINERIES REHABILITATION PROJECT

PROJECT IMPLEMENTATION SCHEDULE

Project Schedule, in months:	0	9	18	27	36
A. Warri Refinery					
(i) Power Generating System Study	N /	SE	/ DR/		
(ii) Waste Water Treatment Modifications	ENG TP/	T /	F TR /	ER TEST	/
(iii) Fire Water Lines Replacement	ENG TP/	T /	F TR /	ER TEST	/
(iv) Condensate Recovery Modifications	ENG TP/	T /	F TR /	ER TEST	/
(v) Instrument Replacement	ENG TP/	T /	F TR /	ER TEST	/
(vi) Spare Parts	TP/ T /	F TR	/	ER	/
(vii) Laboratory Equipment	TP/ T /	F TR	/	ER	/
B. Kaduna Refinery					
(i) Condensate Recovery Modifications	ENG TP/ T /	F TR	/ER TEST	/	
(ii) Waste Water Treatment Modifications	ENG TP / T /	F TR /	ER TEST	/	
(iii) Laboratory Equipment	TP / T /	F TR /	ER /		
(iv) Data Logging and Shipment Computer	TP / T /	F TR /	ER /		
C. Studies, Workshop and Training	TP / T /	ST WS	TG /	TG CONT /	

N :	Negotiations	TR:	Transport
SE:	Studies/Evaluation	ER:	Erection
DR:	Discussion/Report	Test:	Testing
Eng:	Engineering	ST:	Studies
TP:	Tender preparation	WS:	Workshop
T:	Tendering	TG:	Training
F:	Fabrication	TG Cont.:	Training Continued

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REFINERIES REHABILITATION PROJECT

PROJECT COMPONENTS AND COST ESTIMATES

Project Items	--- Foreign Exchange Cost --- Engineering	Material	Total	(Local cost) Site Fab.&Constr.
	---------- US$ millions equivalent---------			
A. Warri Refinery				
1. Power Generating System Study	0.242	-	0.242	0.006
2. Waste Water Treatment	0.516	2.797	3.313	1.025
3. Fire Water Lines	0.168	1.382	1.550	2.039
4. Condensate Recovery	0.405	1.670	2.075	0.811
5. Instrumentation	0.146	1.333	1.479	-
6. Spare parts	-	1.600	1.600	2.039
7. Laboratory Equipment	-	0.428	0.428	-
Base Cost	1.477	9.210	10.687	5.920
Physical Contingency	0.222	1.424	1.646	0.880
Price Contingency	0.148	1.019	1.167	1.700
Subtotal, Warri Refinery	1.847	11.653	13.500	8.500
B. Kaduna Refinery				
1. Waste Water Treatement	0.230	1.985	2.215	1.322
2. Condensate Recovery	0.065	0.585	0.650	0.795
3. Laboratory Equipment	-	0.375	0.375	-
4. Computer	0.135	1.400	1.535	-
Base Cost	0.430	4.345	4.775	2.117
Physical Contingency	0.065	0.542	0.607	0.308
Price Contingency	0.043	0.475	0.518	0.575
Subtotal, Kaduna Refinery	0.538	5.362	5.900	3.000
C. Eng. Studies, Work-Shop, and Training	-	-	2.300	-
D. Spare Parts for Annual Maintenance, Chemicals and Catalyst	-	-	6.000	-
TOTAL, Warri and Kaduna Refineries	2.385	17.315	27.700	11.500

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NIGERIA

REFINERIES REHABILITATION PROJECT

ESTIMATED LOAN DISBURSEMENT SCHEDULE 1/

Fiscal year	Quarter	Quarterly	Cumulative
		---- US$ Million ----	
FY90	I	7.00 2/	7.00
	II	3.75	10.75
	III	5.25	16.00
	IV	5.25	21.25
FY91	I	1.98	23.20
	II	0.78	24.01
	III	0.81	24.82
	IV	0.75	25.57
FY92	I	0.68	26.25
	II	0.69	26.94
	III	0.76	27.70

1/ Mission estimates based on status of project preparation and experience in similar petroleum projects in Africa.

2/ Disbursement of US$6.0 million to open the NNPC Refineries Account is included in this amount.

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NIGERIA

REFINERIES REHABILITATION PROJECT

PROJECT MONITORING INDICATORS

During negotiations, indicators pertinent to the project implementation and efficient operation of the two refineries at Warri and Kaduna, along the lines outline below, would be discussed and agreed with the representatives of the Government/NNPC as the basis for establishing an agreed project monitoring system.

(i) Maintaining in each refinery up-to-date record of inspection history of all important equipment and machinery and necessary spares and materials required to carry out timely preventive maintenance.

(ii) Maintaining up-to-date record of pollutants measured in each refinery, particularly oil content phenol and biological oxygen demand, at least once in a week in order to monitor the harmful effects of the waste water leaving the refinery and maintain their levels in the waste water at appropriate US Environmental Protection Agency standard or its equivalent.

(iii) Maintaining strict safety standards pertaining to the storage and handling of petroleum.

(iv) Maintain up-to-date record of all technical and financial information required to assess the refinery processing margin periodically (such as consumption of fuel, utilities, catalysts and chemicals; cost of labor, maintenance and administration; quantity and cost of crude processed and products delivered).

(v) Employ suitably qualified personnel and provide training to establish an efficient team of professionals in each refinery for project evaluation, investment planning, planning and conducting preventive maintenance, pollution control and monitoring, and enforcement of safety regulation.

(vi) Preparation of quarterly reports by each refinery for the Bank review of the physical and financial progress of the project, status of procurement and contracting, and disbursement schedules.

(vii) Preparation of quarterly and annual financial statements of each refinery for review by the Bank.

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REFINERIES REHABILITATION PROJECT

ECONOMIC ANALYSIS

A. Warri Refinery

(i) The components that would improve productivity and reduce cost in the case of Warri Refinery are: (a) waste water treatment modifications; (b) condensate recovery modifications; (c) instrument replacement; (d) laboratory equipment; and (e) spare parts. The benefits expected after the implementation of the proposed project are improved capacity utilization, product upgradation, hydrocarbon recovery, and reduced operating cost.

(ii) The investment costs are estimated by the consultants after conducting basic designs, wherever required, and inquiries with prospective vendors. They are exclusive of Nigerian duties and taxes.

(iii) A residual value of 15% of the capital cost is assumed at the end of 15 years.

(iv) The investment cost is disbursed in four years: 10% in the first year, 30% in the second year, 40% in the third year, and 20% in the fourth year.

(v) Operating costs for running the various facilities proposed are already included in the general operating costs of the refinery. Therefore, no operating cost is included separately for these items.

(vi) The consultants estimated that the daily cost of the shut-down of the Warri Refinery amounts to US$300,000 on account of production losses and US$50,000 for fixed costs. Consequential losses in the petrochemical production in the Warri polypropylene plant which receives its feed-stock from the refinery is not included.

(vii) After the modification of the waste water treatment, it is estimated to save about 27,000 tons per year of oil (US$2.94 million).

(viii) For the condensate recovery, the savings estimated are 23,600 tons/year of fuel oil (US$1.89 million) and 830,000 m^3/year of boiler feed-water (US$1.25 million).

(ix) About 50,000 tons per year product upgradation and 1 day of production loss for spare parts (US$1.35 million) and 5 days of production loss for instrument replacement (US$1.75 million) are estimated. For the replacement of laboratory equipment, about 100,000 tons of product upgradation is estimated (US$2.0 million).

(x) The estimated costs and benefits in average 1988 product prices are summarized as follows:

		Investment Costs	Benefits per year
		US$ Million	
(i)	Waste water treatment	4.438	2.94
(ii)	Condensate recovery	2.986	3.14
(iii)	Instrument replacement	1.479	1.75
(iv)	Laboratory equipment	0.428	2.00
(v)	Spare parts	3.639	1.35
	Subtotal	12.970	11.18
	Physical Contingency	1.946	
	Total	14.916	

(xi) The benefits from the project are limited to 60 percent in the first year of operation, 70 percent in the second year and 100 percent thereafter.

(xii) A sensitivity analysis also is carried out to reflect 10 percent increase in the investment cost and simultaneously 10 percent decrease in benefits.

(xiii) The economic rates of return (IRR, %) and NPV at 10 percent discounting (US$ million) for the two cases are estimated as follows:

Year	Cash Flows	
	Base Case	Sensitivity Analysis
	US$ Million	
0	-1.492	-1.641
1	-4.475	-4.922
2	-5.966	-6.563
3	-2.983	-3.281
4	6.708	6.037
5	7.826	7.043
6	11.180	10.062
7	11.180	10.062
8	11.180	10.062
9	11.180	10.062
10	11.180	10.062
11	11.180	10.062
12	11.180	10.062
13	11.180	10.062
14	11.180	10.062
15 1/	13.417	12.523

1/ 15 percent residual value of investment cost (US$2.237 and 2.461 million) is included.

	Base Case	Sensitivity Analysis
IRR, % =	38.21	33.26
NPV at 10% discounting US$ Million =	36.273	30.429

B. Kaduna Refinery

(i) The components that would improve productivity and reduce cost in the case of Kaduna Refinery are: (a) waste water treatment; (b) condensate recovery; (c) laboratory equipment; and (d) computer. The benefits expected after the implementation of the proposed project are improved hydrocarbon recovery, product upgradation and reduced operating cost.

(ii) The investment costs are estimated by the consultants after conducting basic designs, wherever required, and inquiries with prospective vendors. They are exclusive of Nigerian duties and taxes.

(iii) A residual value of 15 percent of the capital cost is assumed at the end of 15 years.

(iv) The investment cost is disbursed in four years: 10 percent in the first year, 30 percent in the second year, 40 percent in the third year, and 20 percent in the fourth year.

(v) Operating cost for running the various facilities proposed are already included in the general operating cost of the refinery. Therefore, no operating cost is included separately for these items.

(vi) After the modification of the waste water treatment, it is estimated to save about 17,000 tons per year of oil (US$2.0 million).

(vii) For the condensate recovery, the savings estimated are about 130,000 cubic meters per year of boiler feed water (US$0.20 million) and about US $0.25 million per year by postponing an investment of about US$2.5 million for the expansion of the demineralization plant.

(viii) For the replacement of laboratory equipment about 50,000 tons of product upgradation is estimated (US$1.0 million).

(ix) By the installation of the data logging and shipment computer, about 50,000 tons per year of additional upgradation of products is estimated (US$1.0 million).

(x) The estimated costs and benefits are summarized as follows:

		Investment Cost	Benefits per year
		US$ Million	
(a)	Waste water treatment	3.537	2.00
(b)	Condensate recovery	1.445	0.45
(c)	Laboratory equipment	0.375	1.00
(d)	Computer	1.535	1.00
	Subtotal	6.892	4.45
	Physical Contingency	1.034	
	Total	7.926	

(xi) The benefits form the project are limited to 60 percent in the first year of operation, 70 percent in the second year, and 100 percent thereafter.

(xii) A sensitivity analysis also is carried cout to reflect 10 percent increase in the investment cost and simultaneously 10 percent decrease in the benefits.

(xiii) The economic rate of return (IRR %) and NPV at 10 percent discounting (US$ million) for the two cases are estimated as follows:

Year	Cash Flows	
	Base Case	Sensitivity Analysis
	--------US$ Million---------	
0	-0.793	-0.872
1	-2.378	-2.616
2	-3.170	-3.487
3	-1.585	-1.744
4	2.670	2.403
5	3.115	2.803
6	4.450	4.005
7	4.450	4.005
8	4.450	4.005
9	4.450	4.005
10	4.450	4.005
11	4.450	4.005
12	4.450	4.005
13	4.450	4.005
14	4.450	4.005
15 1/	5.639	5.313

1/ 15 percent residual value of investment cost (US$1.189 and 1.308 million) is included.

	Base Case	Sensitivity Analysis
IRR, % =	31.20	26.79
NPV at 10% discounting US$ Million =	12.959	10.485

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REFINERIES REHABILITATION PROJECT

DOCUMENTS AVAILABLE IN PROJECT FILE

(i) Decree No. 33 of 1 April 1977 establishing the NNPC and the Petroleum Inspectorate.

(ii) Audited financial statements for the years ended 31 December 1985 and 1986.

(iii) Financial reports for the Kaduna refinery:
(a) year ended 31 December 1986 (Final draft)
(b) year ended 31 December 1987 (draft)

(iv) Annual Reports for the Warri Refinery for the years 1984, 1985 and 1986.

(v) Financial report for the Warri Refinery for the year ended 31 December 1987.

(vi) Extract of financial summary from the 1988-92 corporate plan of NNPC (draft).

(vii) Annual Report of the Central Bank of Nigeria for the year ended 31 December 1987 containing analysis of 1987 Nigerian Economy.

(viii) BEICIP's Report on the Rehabilitation of Warri and Kaduna Refineries.

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REFINERIES R N PROJECT

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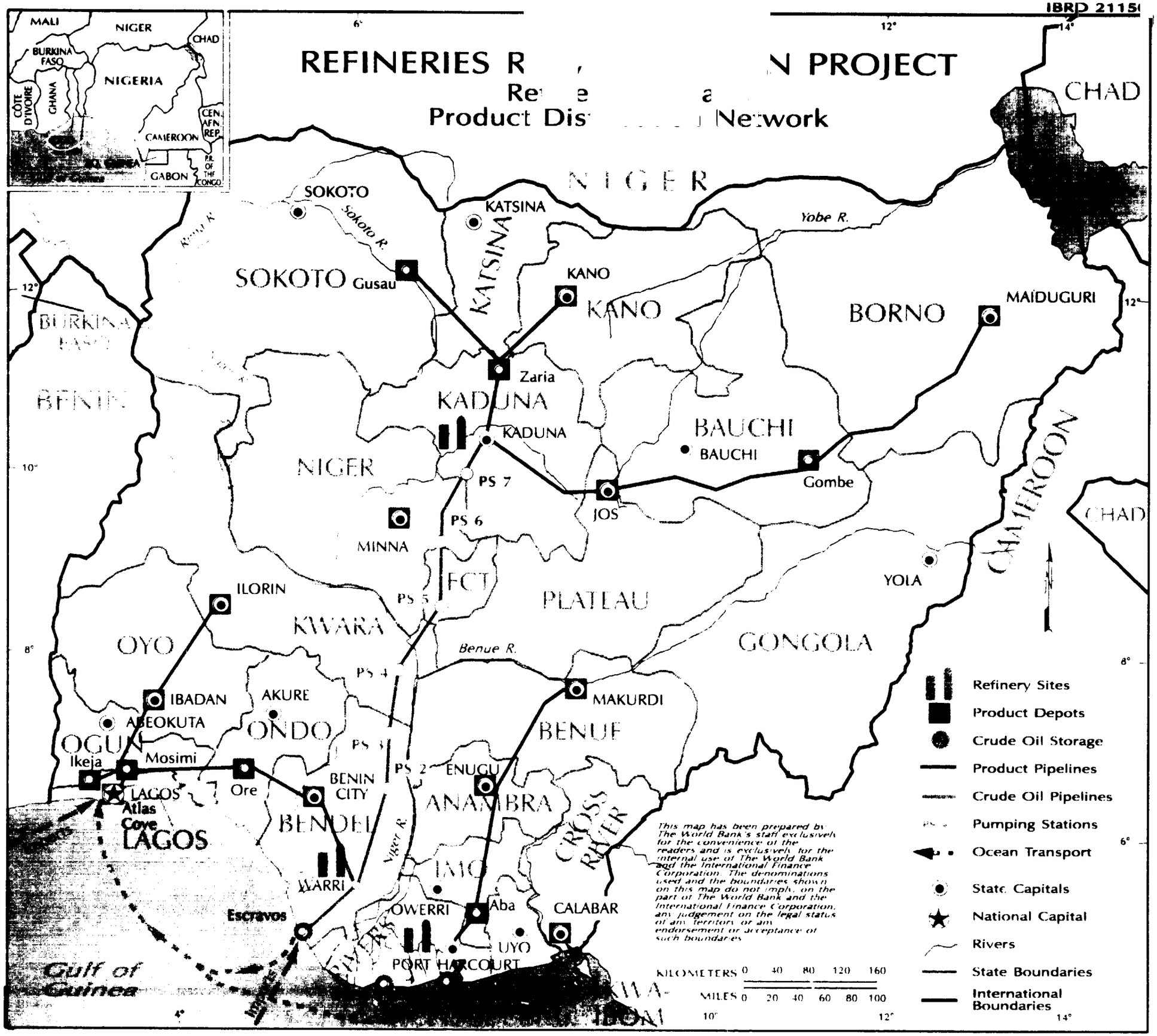

OCTOBER 1988