

SUDAN ENERGY PLANNING AND MANAGEMENT PROJECT BUDGET BREAKDOWN BY ELEMENTS

PDBAI 987

I. Improved Reliability of the Electric Power System		
1. Commodity and Commodity Support		
-- 16 pm short-term TA	259	
-- associated commodity support	300	559
2. Maintenance Program		
-- 24 pm long-term TA	288	
-- TA support	40	328
3. Load Management		
-- 12 pm long-term TA	144	144
4. End-user Efficiency		
-- 12 pm long-term TA	144	
-- 6 pm short-term TA	97	
-- TA Support	40	281
5. Reorganization and Management		
-- Phase II 36 pm long-term TA	432	
-- Phase II 6 pm short-term TA	97	
-- Phase III pm long-term TA	1584	
-- Basic supervision training	330	
-- Middle management training	170	
-- 60 pm short-term U.S. training	180	
-- TA Support	120	2913
Sub-total		4225
II. Improved Energy Planning		
1. Planning		
-- 72 pm long-term TA	864	
-- 32 pm short-term TA	519	
-- TA support	80	1463
2. Institution Strengthening		
-- 15 pm short-term TA	243	
-- 30 pm U.S. & third country training	82	
-- 24 pm long-term training	40	
-- 7-10 session in-country training	300	665
3. Conservation		
-- 12 pm long-term TA	144	
-- 6 pm short-term training	18	
-- conservation media	30	
-- TA support	35	247
Sub-total		2375
TOTAL		6600

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT DATA SHEET

1. TRANSACTION CODE

A = Add
 C = Change
 D = Delete

Amendment Number

DOCUMENT CODE

3

2. COUNTRY/ENTITY

Sudan

3. PROJECT NUMBER

650-0059

4. BUREAU/OFFICE

AFR

06

5. PROJECT TITLE (maximum 40 characters)

Energy Planning and Management

6. PROJECT ASSISTANCE COMPLETION DATE (PACD)

MM DD YY
 09 30 87

7. ESTIMATED DATE OF OBLIGATION

(Under 'B' below, enter 1, 2, 3, or 4)

A. Initial FY 82

B. Quarter 4

C. Final FY 87

8. COSTS (\$000 OR EQUIVALENT \$1 = 1,000)

A. FUNDING SOURCE	FIRST FY 82			LIFE OF PROJECT		
	B. FX	C. L/C	D. Total	E. FX	F. L/C	G. Total
AID Appropriated Total						
(Grant)	(1,555)	(-)	(1,555)	(6,600)	()	(6,600)
(Loan)	()	()	()	()	()	()
Other U.S.						
1.						
2.						
Host Country		720	720		5,595	5,595
Other Donor(s)						
TOTALS	1,555	720	2,275	6,600	5,595	12,195

9. SCHEDULE OF AID FUNDING (\$000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH. CODE		D. OBLIGATIONS TO DATE		E. AMOUNT APPROVED THIS ACTION		F. LIFE OF PROJECT	
		1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan
(1) SD	740	878		-		1,555		6,600	
(2)									
(3)									
(4)									
TOTALS				-		1,555		6,600	

10. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each)

11. SECONDARY PURPOSE CODES

12. SPECIAL CONCERNS CODES (maximum 7 codes of 4 positions each)

A. Code

TNG

B. Amount

648

13. PROJECT PURPOSE (maximum 480 characters)

- a) Increase the short-term reliability of the Blue Nile electric power grid and improve the managerial and financial capability of the NEC to generate, transmit and distribute power, and
- b) Improve the capability of NEA and GPC to plan and prepare for the most efficient use of Sudan's energy resources.

14. SCHEDULED EVALUATIONS

Interim MM YY MM YY Final MM YY
 0 1 8 5 0 4 8 7

15. SOURCE/ORIGIN OF GOODS AND SERVICES

000 941 Local Other (Specify)

16. AMENDMENTS/NATURE OF CHANGE PROPOSED (This is page 1 of a page PP Amendment)

17. APPROVED BY

Signature

Title

Director, USAID/Sudan

Date Signed

MM DD YY
 0 8 3 1 8 2

18. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION

MM DD YY

INSTRUCTIONS

The approved Project Data Sheet summarizes basic data on the project and must provide reliable data for entry into the Country Program Data Bank (CPDB). As a general rule blocks 1 thru 16 are to be completed by the originating office or bureau. It is the responsibility of the reviewing bureau to assume that whenever the original Project Data Sheet is revised, the Project Data Sheet conforms to the revision.

Block 1 - Enter the appropriate letter code in the box, if a change, indicate the Amendment Number.

Block 2 - Enter the name of the Country, Regional or other Entity.

Block 3 - Enter the Project Number assigned by the field mission or an AID/W bureau.

Block 4 - Enter the sponsoring Bureau/Office Symbol and Code. (See Handbook 3, Appendix 5A, Table 1, page 1 for guidance.)

Block 5 - Enter the Project Title (stay within brackets; limit to 40 characters).

Block 6 - Enter the Estimated Project Assistance Completion Date. (See AIDTO Circular A-24 dated 1/26/78, paragraph C, Page 2.)

Block 7A. - Enter the FY for the first obligation of AID funds for the project.

Block 7B. - Enter the quarter of FY for the first AID funds obligation.

Block 7C. - Enter the FY for the last AID funds obligations.

Block 8 - Enter the amounts from the 'Summary Cost Estimates' and 'Financial Table' of the Project Data Sheet.

NOTE: The L/C column must show the estimated U.S. dollars to be used for the financing of local costs by AID on the lines corresponding to AID.

Block 9 - Enter the amounts and details from the Project Data Sheet section reflecting the estimated rate of use of AID funds.

Block 9A. - Use the Alpha Code. (See Handbook 3, Appendix 5A, Table 2, Page 2 for guidance.)

Blocks 9B., C1. & C2. - See Handbook 3, Appendix 5B for guidance. The total of columns 1 and 2 of F must equal the AID appropriated funds total of 8G.

Blocks 10 and 11 - See Handbook 3, Appendix 5B for guidance.

Block 12 - Enter the codes and amounts attributable to each concern for Life of Project. (See Handbook 3, Appendix 5B, Attachment C for coding.)

Block 13 - Enter the Project Purpose as it appears in the approved PID Facesheet, or as modified during the project development and reflected in the Project Data Sheet.

Block 14 - Enter the evaluation(s) scheduled in this section.

Block 15 - Enter the information related to the procurement taken from the appropriate section of the Project Data Sheet.

Block 16 - This block is to be used with requests for the amendment of a project.

Block 17 - This block is to be signed and dated by the Authorizing Official of the originating office. The Project Data Sheet will not be reviewed if this Data Sheet is not signed and dated. Do not initial.

Block 18 - This date is to be provided by the office or bureau responsible for the processing of the document covered by this Data Sheet.

ENERGY PLANNING AND MANAGEMENT PROJECT

PROJECT PAPER # 650-0059

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Energy Planning and Management

Project Paper # 650-0059

I. Project Summary

A. Recommendations

1. Grant

Authorization of a grant of \$6,600,000 is recommended to assist the Government of the Sudan (GOS) to strengthen the planning and management capacity of the National Electricity Corporation (NEC), the National Energy Administration (NEA), and the General Petroleum Corporation (GPC). The Ministry of Energy and Mining (MEM) will represent the GOS as the grantee for the life of the five year project (FY 82-86). The NEA, NEC and GPC, semi-autonomous bodies which operate within the MEM, will be executing agencies. The GOS contribution to the project will amount to the U.S. dollar equivalent of \$5,595,000 which includes CIP generated local currencies equivalent to \$2,935,000.

2. Grant Conditions and Waivers

The project will include no special conditions precedent, but the GOS as grantee will covenant on (1) counterpart personnel, (2) NEC donor coordination, (3) the role of the private sector, and (4) energy pricing analysis. Details are in Section V.F.

B. Legal Criteria

The project meets all applicable statutory criteria (See Annex I).

With respect to the Host Country contribution requirement, combined NEC, MEM/NEA and GPC inputs to the project equal 45.8% of total project costs.

The GOS request for the project is attached as Annex N. Delegation of Authority to the Director of USAID/Sudan to approve and authorize the project is contained in State 138318, May 20, 1982 (See Annex B), and the revised Delegation of Authority 140.

C. Summary Description of the Project

1. The Problem

Sudan faces an energy crisis of major proportions. Evidence of the seriousness of the crisis is most visible in the disruptions of the transportation because of fuel shortages, frequent electric power outages resulting in major disruptions to industry and irrigated agriculture, and

the removal of nearly all vegetation suitable for fuel in ever-increasing areas around population centers. Macroeconomic data show that 80% of Sudan's total export income is used to meet the imported conventional energy needs of the country. Yet, Sudanese per capita energy consumption is an estimated 35% of the African average and less than 7% of the World average. Inadequate supply and unreliable distribution of energy are significant factors in the overall poor performance of the economy, and particularly as major constraints to growth of the private sector. Irregular availability of fuel disrupts the shipping of raw materials and finished goods. Lack of fuel and electricity has deprived major irrigation agricultural schemes of water at critical times, limited the operation of agricultural field equipment and curtailed movement of agricultural labor and the marketing of the harvest. Frequent power outages have led to growing reliance on stand-by generation for both industrial and residential use, thereby increasing energy costs to consumers and foreign exchange drain for imports of generators and fuel. Organizational and managerial problems in the electric utility and petroleum corporation are serious enough that management at both corporations are seeking immediate managerial and operational assistance.

In the traditional energy areas, it is estimated that over 14 million tons of wood are removed from Sudan's forests annually while reforestation and natural growth replenish one-tenth of this amount each year. As a result, extensive deforestation, desertification and soil erosion are occurring at a rapid pace. Additionally, there is a need to better understand the economic impact of current energy pricing and allocations policies. Developmentally sound energy plans for all sources and users need to be established. This is essentially true for the electric and petroleum energy areas which have caused the Sudanese economy serious problems in the last five years.

2. Project Goal and Purpose

The goal of the Energy Planning and Management Project (EPM) is to ease energy-related constraints to economic recovery while contributing towards the longer term goal of meeting Sudan's requirements for domestic, agricultural and industrial use in ways that are economical, efficient and environmentally sound. In order to achieve this the project will:

a. increase the short-term reliability of the Blue Nile electric power grid and improve the managerial and financial capability of the National Electricity Corporation (NEC) to generate, transmit and distribute power, and

b. improve the capability of the National Energy Administration (NEA) and the General Petroleum Corporation (GPC) to plan and prepare for the most efficient use of Sudan's energy resources.

The EPM will achieve these purposes by concentrating upon strengthening these three institutions within the Ministry of Energy and Mining which have the primary responsibility for public sector energy management and planning functions.

3. Project Activity

Solution of the energy problems of the Sudan requires the joint effort of the government and the private sector. The GOS has the responsibility for planning and policy formulation and shares with the private sector the management and distribution of supplies. Energy conservation and improved efficiency are chiefly the responsibility of private end-users. The project is aimed primarily at the agencies of government which manage energy in the Sudan, that is NEA, NEC and GPC. However, the energy management and energy efficiency programs developed by these agencies will have a direct impact on industrial, commercial/institutional, transportation and agricultural end-users which will contribute to the easing of energy constraints. The ability of GOS to analyze energy problems and plan viable strategies to deal with them will be strengthened through support of the NEA. Assistance to the economic and technical planning sections in NEC and GPC will also contribute to this goal. However most of the assistance to NEC will address the immediate organizational, managerial and tactical planning needs of this operational entity. The project activities, outputs and end status for each of the three organizations is as follows.

National Energy Administration

At the end of the project, the NEA will be capable of assessment and analysis of energy supply and demand data by sector for the purpose of preparing developmentally sound energy plans and programs for Sudan. The NEA will also play a key role in developing energy policy and pricing alternatives. Assignment of staff to the new organizational structure will be completed early in the project, followed by consolidation of energy supply and demand analyses capability. Each year NEA will revise national energy plans and oversee special analyses of prioritized energy problems. It will have all central staff planning responsibilities for the energy sector. Close coordination with the GPC, NEC, the Forestry Department of the Ministry of Agriculture, the Ministry of Finance and Economic Planning and other GOS agencies will be required in order for NEA to be effective in its role. Because there is no agency for fuelwood within the MEM, NEA has and will continue to take the lead in fuelwood management and planning.

For all NEA activities, the project will provide 128 person months of long and short-term technical assistance as well as \$418,000 for professional and management training.

National Electricity Corporation

Short-term technical assistance will be given to NEC early in the project in order to complete a nationally-mandated reorganization and decentralization of services. Additional long-term and short-term technical assistance will be provided to improve operations and maintenance with the goal of rapidly improving reliability. Power outage frequency and duration will be reduced and outage schedules established.

This short-term reliability objective complements the longer-term goal of reorganization and management improvement. In order to achieve better management and planning of the utility, financial controls will be established. In concert with a restructured tariff, NEC cash flow will improve. Load management plans will contribute to increased power factor values. Conservation and efficiency promotion programs by NEC will improve electric use efficiency. In addition to the 132 person months of technical assistance provided to strengthen NEC operations and management, \$230,000 of professional and managerial training will be offered. At project end, NEC will be better organized and managed and thus provide more energy for development, in a more reliable and efficient manner.

General Petroleum Corporation

The GPC is responsible for the importation of all petroleum, the operation of the refinery, and the transportation of products to the oil companies and major users, and for supervising oil exploration and production. Over the past five years, the GPC has been faced with extreme difficulties during periods when foreign exchange has been unavailable to purchase the necessary products. Although this project can do little to overcome the foreign exchange constraint, it will help the GPC develop more flexible allocation procedures to accommodate the inherent instability of their oil supply financing. Further, the project will assist the GPC in planning and developing its new role in petroleum exploration and production matters. In addition, through project assistance the GPC will improve its financial management and its knowledge of world petroleum pricing. Scheduling and planning procedures will be improved through short course professional training. Overall, the project will provide GPC 22 person months of short-term training. In-country short-term training will be provided in conjunction with NEA.

4. Inputs and Financial Summary

In addition to the technical assistance and training listed in Section 3, the project will provide selected commodities to support the long-term advisors, certain training testing equipment as well as microcomputers to handle some accounting and analysis. The \$6,651,000 grant will finance only foreign exchange costs. Local currency support will come from funds generated from the Commodity Import Program (CIP), and from operating budgets of the GOS.

Summary of Energy Planning and Management Budget

LOP (\$000)

<u>Item</u>	<u>US</u> <u>FX</u>	<u>GOS</u>		<u>Total</u>
		<u>CIP</u>	<u>Recurrent</u> <u>Budget</u>	
Technical Assistance	4,916	1,607	2,418	8,941
Training	648	395	-	1,043
Local Currency & Studies	-	420	-	420
Commodities	389	229	-	618
10% Contingency and Project Evaluation	647	284	242	1,173
Total	6,600	2,935	2,660	12,195

D. Project Implementation and Contracting

Given the immediate crises facing the GOS, upon execution of the Project Agreement, funds from the grant will be made available to fund the following contract services:

1. \$100,000 of funding will be provided for the purpose of continuing the energy assessment and analysis at NEA started under the Energy Policy and Planning Project No. 936-5703. USAID judges that continuity in advisory assistance to the relatively young NEA is crucial and therefore will request that these services will be added to the existing contract.

2. \$238,000 will be provided for the initial portion of special advisory services and maintenance and stores operations problems for the NEC for this project. Because of the urgent requirements for these services, it is anticipated that the mission will request that these services be added to the existing contract with Bechtel, presently funded under the ST/EY Conventional Energy Training Assistance Project.

3. The FY 1982 Commodity Import Program (CIP) has allocated \$ 20 million to provide commodities in early FY 82 to improve the reliability and rehabilitate the NEC Blue Nile Grid transmission system. A \$1.168 million incrementally funded contract with Bechtel has been signed for commodity procurement and installation advisory services. Since, only \$800,000 was available from the CIP Grant which has already been provided to initially fund the contract, an additional \$ 368,000 will be required to complete the contract funding. This project will provide that amount for the Bechtel services.

Funding of these three contract additions directly contributes to the project goal, purpose and outputs.

Two four year AID direct contracts will be awarded following normal U.S. Government competitive procedures. One will provide operational and planning assistance to NEC while the other will focus on NEA with some aid going to GPC. All long-term advisors will be hired with the concurrence of the USAID/Sudan and the MEM.

E. Findings

On the basis of the analysis contained in the Project Paper, the Director of USAID/Sudan concludes that the project is technically, economically and socially sound. The financial analysis and budget are complete and the Project Paper supports the conclusion that the project meets all applicable AID criteria. A negative determination was made at the time of the Initial Environmental Examination (Annex H).

F. Issues

The PID Review Cable (Annex P) raised certain issues that have been addressed in this Project Paper. The issues and the relevant sections that take these issues into consideration are noted below.

A. Energy Efficiency: Section IV.D provides the economic analysis of technical assistance and training, with examples cited for the NEA, NEC and GPC.

B. Commodities: The purchase and resale of commodities to be imported for this project will be subject to review at the time in light of possible further changes in the foreign exchange rates.

C. Implementation Plan: Due recognition has been given to the issue of improving the terms of service of MEM professional employees in order to reduce the net immigration of skilled Sudanese. These issues are addressed in Section III. and elaborated in Annex F., Sudanese Immigration and Training.

D. Evaluation: Computer-assisted evaluation methods are to be an integral part of the project for the NEA, NEC and GPC. Commodity purchases, technical assistance and training reflect this effort, as detailed in Section III.D., Inputs.

F. Manpower Assessment and Training: Assessment of manpower and training achievements will be carried out during the course of the project, with short-term and long-term training in the Sudan, the U.S. and third countries being coordinated in a cohesive fashion.

II. Project Background

A. Sudan: The Land and the People

The Sudan is a vast nation of varied terrain, and equally diverse people. Covering 960,000 miles and bordering eight countries, the Sudan is the largest country in Africa. Its areal extent is equal to that of the U.S. east of the Mississippi River.

Some 20 million people live in the Sudan. Approximately 60% of the population is Arabic and lives in the northern two-thirds of the country. About one-tenth of this population - 1.3 million Sudanese - live in the capital, Khartoum and the adjacent cities of Omdurman and Khartoum North.

The southern third of the country is populated by over 100 African tribes, living for the most part in a rural subsistence agriculture. Unlike the Arab north, where large-scale irrigated farming to raise cash crops for the export markets requires substantial energy inputs for water pumping, agriculture and transport the South does not have an industrializing sector and almost all energy needs are met by fuelwood and charcoal.

B. Present Economic Conditions

The Sudan has a recognized but untapped potential as an agricultural leader in the Arab World. Moreover, it is showing prospects of becoming a petroleum producer. Sudan remains a predominantly agricultural economy. Crops contribute 40% to the GDP and are the major source of exports for foreign exchange earnings. Cotton is the most important cash crop, followed by groundnuts, sesame, gum arabic, and sorghum. The yields of most crops in recent years have been disappointing, reflecting agricultural problems due to erratic energy availability.

Manufacturing accounts for about 10% of the GDP of Sudan. The most significant sectors are sugar, textiles and cement. The country's small manufacturing sector now is plagued with problems which permit only sporadic efforts at development. Stagnation has affected the entire economy. General problem areas include rising balance of payments deficits, caused in part by sharply higher costs for petroleum imports, a wearing out and deterioration of the capital stock and a high inflation rate as a result of global events and internal policy decisions. In addition, there have been human capital losses from immigration.

The most pressing and immediate problem is the increased cost of petroleum. Petroleum is intrinsic to the most promising development efforts in Sudan. For example, mechanized agriculture is

conceivable on nearly 200 million acres. Presently, only 15 million acres or 7.5% of this total is actively cultivated. This sector burns nearly 18% of all gasoil used in the country. Increased tillage would raise the oil import bill. In 1981, the total bill for oil in Sudan topped \$400 million. Oil is the largest factor in the yearly financial equation for the country. The importation of petroleum drains foreign exchange accounts and starts a devastating chain reaction. In 1980, petroleum required the equivalent of 63% of all foreign exchange earned from exports. The resulting shortage of foreign exchange prevents the import of sorely needed hardware, spare parts, medical supplies and other larger capital commodities. This in turn strains existing infrastructure. Consequently, capital stocks now are limited or actually degenerating, which further slows development and undermines the economy.

In 1973 the government's Interim Action Program was started. Designed to increase the pace of development, the program caused GDP to grow at about 4.5%. However, the rising price of oil and other external pressures as well as those from within the country have created serious problems. Since 1978, the GDP has been falling in real terms. In 1981, the deficit on the current account was \$700 million.

Human capital losses are also a serious drain in a nation which has a nominal adult literacy rate of barely 20%. The lure of employment in neighboring Arab nations is great for those with technical skills. The percentage of those trained who return to work in Sudan is difficult to determine. A major public corporation in Sudan estimated, in 1980, that up to 50% of its supervisors, 70% of its intermediate level technicians and 50% of its vocational personnel were apt to leave their jobs for better opportunities outside the nation before they completed three years of service. The associated lead time for developing the labor force and managers therefore is extended and development is delayed once again. Moreover, the agencies and corporations do not develop sufficiently experienced senior technical managers. This results in a continued need for junior technical people and the disciplines of economics and finance are de-emphasized. As a result, general economic analysis and planning is weak in many Sudanese organizations.

International market shifts and coincident government policies have worked against the best chances for agriculture to become a major positive influence in the face of the above problems. During the 1970's when the price of cereal grains rose substantially, the Sudanese retired cotton fields and planted wheat instead. But poor wheat crops ensued, while cotton failed to contribute all that it might have done to generate export earnings and stimulate economic development.

Projections for the Sudanese economy must reflect the serious basic problems and at the same time recognize the potential the nation has as the Arab World primary food producer and a likely oil exporter. Significant petroleum production would provide fuel, foreign exchange through export, fertilizers for agriculture and a host of complementary support industries. The lead times associated with a favorable balance of payment based on an oil and agricultural exports scenario are considerable. More immediate remedial assistance in the management and planning of present resources is the best first step to enable Sudan to realize its full potential as a fuel producer and a leading food source in the region.

C. Energy Sector

1. Energy Supply and Demand

The Sudan consumes nearly 7.0 million tons of oil equivalent in energy every year. Of that total, 85% is generated from wood, charcoal and biomass. Hydropower is responsible for an additional 1%. Refined petroleum provides the remaining 14% of the nation's energy consumption. Unfulfilled energy demands exist throughout the Sudanese economy. Estimates of an unmet demand for oil run as high as one million tons or roughly double the amount now consumed in a calendar year. Potential demand for other energy sources is extremely difficult to estimate. Details on energy use are in Figure II.1.

Each of the constituent energy areas has large problems. To a significant degree the individual troubles of the electricity, petroleum and fuelwood sectors are interrelated. Four common factors include the lack of foreign exchange, the deteriorating capital stock, higher prices for oil imports, and domestic energy price controls that do not fully reflect their true costs.

2. Fuelwood

Fuelwood is the largest energy resource in the country, but it is being depleted at a very rapid pace. Overcutting and undermanagement of the forests threaten their survival. Fuelwood shortages approach critical levels and the transportation cost associated with bringing the wood to the market centers has forced the price of the fuel up. Management of the forests now is in the hands of provincial governments. As part of the general governmental reorganization, provinces are receiving control of those revenue resources which are located within their region. Wood is one such revenue earner. Because the provinces must finance their government operations, they sell wood for revenue. There is no effort to conserve the resources and avoid overcutting as the short-term gains of the sale of wood prove to be an attractive option to local governments.

Figure II. 1

Sudan Energy Consumption. 1981

(Thousand tons of Oil equivalent)

Sector	Hydro-power	Gasoline/ Avgas	LPG	Kerosine Jet Fuel	Gasoil	Diesel	Furnace Oil	Total Petr. Fuels	% Petr. Fuels	Wood	Charcoal	Other Bio- mass	Total all Fuels	% all Fuels
Industry	--	--	1	1	44	6	100	152	15.3	96	--	95	343	4.9
Transport	--	207	--	46	296	--	21	571	57.5	--	--	--	571	8.2
Agriculture	--	--	--	--	95	*	--	95	9.5	--	--	--	95	1.4
Commercial, Government Services	--	--	*	--	9	--	--	9	0.9	84	87	--	180	2.6
Construc- tion, Oil exploration	--	--	--	*	34	--	--	34	3.5	--	--	--	34	0.5
Households	--	--	5	18	32	--	--	54	5.5	3,367	1,763	410	5,597	80.4
PEWC Electricity generation	64	--	--	--	21	14	43	78	7.9	--	--	--	142	2.0
Total	64	207	6	65	531	20	164	993	100.0	3,547	1,850	505	6,959	100.0

Notes:

41.8 x 10⁹ Joules = 1 ton oil equivalent

* indicates less than 500 tons

Totals may not add due to rounding

Households use of Biomass includes 9 00 tons vegetable oil for lighting

Source: NEA Energy Policy & Planning Project data (July, 1982)

Fuelwood constitutes 51% of Sudan's energy consumption. Nearly all is burned in households. Wood charcoal represents 27% of local energy consumption with households again consuming 95% of it. Supplies of fuelwood for charcoal are acutely short in the Khartoum area. Most of the fuelwood is from the provinces and shipped to Khartoum. Since 1970 and the use of mechanized wood harvesting, the forests have receded 150 miles while the cost per mile of shipping wood to Khartoum has doubled. Deforestation has serious widespread environmental and ecological impacts.

3. Petroleum

The petroleum sector has experienced serious supply and distribution problems. Foreign exchange shortages are the root cause but not the only reason for these problems. The General Petroleum Corporation (GPC) pipeline, for example, did not conform to original design specifications, and has been inefficient. Oil distribution equipment is aging. The railroad is narrow gauge and frail and cannot carry large tank cars. Rail tank cars, furthermore, are often out of service. Presently, jet fuel, some kerosene and gasoline is moved by rail. At the Port Sudan refinery, the unloading of tankers is by slow methods. The most pressing problem, however, is the erratic variability of tanker arrivals due to foreign exchange shortages, communications and scheduling difficulties. Tankers can be days late, causing shutdowns of the Port Sudan refinery and exhaustion of the nation's limited oil products inventory.

Within the petroleum sector, controlled petroleum prices and government rationing policies combine to provide a distribution process that works best in Port Sudan and Khartoum where two-thirds of the fuel is used. In western regions of the country, the price of gasoil has been about \$10 per gallon or 10 times the official price. The Sudanese economy consumed roughly 1.0 million tons of crude oil and products in 1981. Approximately 55% of that amount is gasoil. Motor gasoline of 78 octane accounts for about 20% and furnace oil makes up 15% of the petroleum product barrel. LPG and kerosene account for the remainder. The transport sector consumed 57% of all oil inputs in 1980 (571,000 tons) and the industrial sector 15% (152,000 tons). These two sectors warrant consideration as primary targets for energy management initiatives and efforts to improve petroleum end-use efficiency, including a review of official prices and pricing strategy, and the role of private sector enterprise.

The supply of petroleum is frequently interrupted because of limited foreign exchange, pipeline or rail problems, or because of a tanker arriving late in Port Sudan. In the first six months of 1982, over 80% of pipeline downtime was attributable to a lack of product which was the direct result of refinery shutdowns when no crude oil was available. The national petroleum company, which operates the pipeline facilities and the refinery, attempts to

maintain a minimal seven day supply cushion. Interruptions beyond this length cause significant dislocations and shutdowns. Throughout the country there is a storage capacity of barely 500,000 barrels or 17 days worth of supplies. Since stocks are seldom held very long, some of this capacity is unused.

As detailed in Attachment C, there are encouraging prospects for eventual oil production in the Sudan. A very active oil exploration and development program has been underway for most of the past decade, and has already resulted in several commercial finds being reported. Further work in these discoveries is needed, and the construction of pipelines and other facilities will be costly and slow, but already there are good prospects for substantially relieving the impact of oil imports on Sudan's trade deficit within a few years.

4. Electricity

An important constituent of the energy sector is electricity generated from fossil-fuel-fired and hydropowered units. During the period from 1974 to 1980, demand for electricity doubled. The lack of foreign exchange and the brain drain have been particularly harmful to this sector. Power demand continues to increase at rates which outpace new generating capacity. A pivotal year for the electricity sector will be 1983. At that time, some new capacity is expected to be in place and operable shortly thereafter. The new generating units will provide an efficient addition to the existing system, thereby easing the present burden.

The largest users of electricity are households (38%) and heavy industry (35%). These are followed by agriculture, government and services (e.g. street lights, water pumping). The largest generating capacity is within the Blue Nile Grid (BNG) which developed 811.5 Gwh in 1980. Among the industries using electricity, the largest consumer is the textiles group (33%) and sugar manufacture (24%). The oil and soap industries consume 13% and the cement industry is a major user of electricity generation purchased by industry. To create this electricity the NEC burns 79,000 tons or 6% of all petroleum consumed in Sudan annually.

Electric power is used principally in the Khartoum and Blue Nile areas. The BNG is prone to brown-outs, black-outs, and general load management problems which interrupt electric service daily. The NEC (National Electric Corporation) is responsible for electric power. Within this organization, several problems exist. The original plant and equipment is in serious disrepair because of a lack of spare parts.

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Moreover, it is aging and needs substantial overhaul. In addition, the organizational structure at NEC is not strong. One outcome is that the collection of bills is extremely spotty, and the tariffs for residential electricity understate the true cost of this service. Maintenance and repair scheduling is another area where NEC lack of organization is apparent, in part due to the brain drain abroad.

5. Conclusions

The energy sector problems of the Sudan are multiple but in time can be managed. The present energy mix is not sustainable indefinitely. Estimates are that fuelwood will begin to be in increasingly short supply by the end of 1986. Continued increases in oil bills and the frequent breakdown of worn electric generation equipment are two other large handicaps. The situation is quite serious today but there is a great deal which could be done to ease these problems. An improved ability to manage existing energy resources including electricity will go a long way to reduce the energy supply crisis. Moreover, a sustained training effort to instill planning capabilities will provide needed long-term management skills. Planning and management abilities will enable the Sudan to adopt an optimal energy mix strategy to preserve indigenous resources and lower fuel costs, thereby improving the nation's economic health in the short and medium term.

Long range planning must allow for the eventual development of a Sudanese petroleum producing industry. Technical assistance and training under a management and training program will allow the Sudanese GPC and NEA to develop policy toward and working relationships with the private sector. This offers the best opportunity to develop petroleum resources rationally to the mutual benefit of private oil companies and the Sudanese nation.

D. AID Energy Sector Strategy

AID gives a high priority to energy because of its direct and immediate beneficial impact on the economy of the Sudan and the quality of life of the people. AID seeks to complement the roles of other donors including the IBRD and other developed countries. The Commodity Import Program (CIP) gives AID the capacity for quick response to critical short-term needs for equipment, spare parts and other commodities.

USAID is positioned for institution building by its capability for close monitoring and day-to-day dialogue between recipient institutions, technical advisors and donor representatives to adapt the projects to constantly evolving needs.

The principal goals of USAID involvement in the energy sector of the Sudan are to help the Sudan to:

1. Relieve immediate energy constraints by improving efficiency and reliability of the electric power system.

The gap between electric generating capacity and the demand for electricity cannot be completely closed during the next few years, but it can be reduced. Improving reliability of available electricity and reducing demand through improved load management and industrial and commercial sector energy conservation are the only possibilities for significant positive short-term impact on the agro-industrial sector and the general public. In addition to getting the most out of the existing system during this period, the enhanced reliability and demand management program is critical for the efficient delivery and use of additional power supplies when they become available later in this decade.

To improve the efficiency and reliability of the system over the short term, USAID will meld CIP financed spare parts, replacement equipment, and other essential commodities with technical assistance for equipment maintenance, load management, energy efficiency, and other means to improve system efficiency. USAID assistance for analytical studies and policy formulation will support the effort to improve performance of the BNG. Improvements in efficiency of use by larger industrial and commercial concerns will reduce the demand on the now overtaxed system, reduce electricity production costs, and also reduce demand for new generating capacity in the future. In addition to making end-users aware of the specific options by which they can cut their energy requirements, USAID assistance will provide the necessary training of Sudanese technicians, and mechanisms for making available the required equipment and credit. USAID will also provide technical assistance for the current reorganization and management reform of the NEC as an important means toward effective and efficient use of the existing facilities.

2. Plan and prepare for most efficient use of its energy resources.

Achieving this goal will require a coordinated and integrated approach to the development of conventional and renewable energy by both the GOS and the donor community. Central to this effort will be USAID assistance to the NEA to strengthen its capacity for planning and policy formulation. This will follow through on the effort already begun with ST/EY support in increasing an indigenous capability for dealing with longer term national energy policy issues such as energy pricing, regulatory policy, supply and demand analysis, the implications of the Sudan becoming a petroleum exporter, biomass utilization, preservation of the environment, and development of alternative renewable energy resources.

Improved planning will also anticipate the long-term needs of the energy sector so that responses can be made in a timely fashion and long lead time options, such as water power, will not be foreclosed by delay. Improved policy analysis will develop the information and augmentation to promote a longer term, comprehensive energy efficiency program directed at the general public as well as the industrial and

commercial users. Already the Energy Policy and Planning Project has suggested areas where improved energy use efficiency can achieve significant conservation of petroleum as well as electricity. With more than half of national petroleum consumption in the form of motor fuels, this becomes a prime target for price and regulatory incentives to encourage more fuel-efficient practices, particularly in the industrial and commercial sectors.

In the renewable energy sector, USAID will support policy formulation and project implementation to increase the supply of fuelwood as well as to adopt and disseminate appropriate technologies which better use wood and substitute energy resources (e.g. other biomass, solar and wind power). USAID will encourage optimal use of the private sector to develop and disseminate renewable energy technologies.

III. Project Description

A. Goal and Purpose

The Energy Planning and Management Project (EPM) is designed to ease energy-related constraints to economic recovery while contributing towards the long-term goal of meeting Sudanese energy requirements for domestic, agricultural and industrial uses in ways that are economical, efficient and environmentally sound. In order to achieve this goal the Project will:

a. increase the short-term reliability of the Blue Nile electric power grid and improve the managerial and financial capability of the National Electricity Corporation (NEC) to generate, transmit and distribute power, and b) improve the capability of the National Energy administration (NEA) to plan programs and implement strategies for the most efficient use of Sudan's energy resources.

To achieve these two purposes, the EPM project will concentrate upon strengthening three institutions within the Ministry of Energy and Mining which are charged with the primary responsibilities for energy management and planning in the public sector: The NEA and the NEC mentioned above and the General Petroleum Corporation (GPC). The NEC segment of the EPM project will concentrate upon the operational problems of this public corporation. The NEA segment will address the planning and policy issues of energy management in the NEA, and the planning and policy implications of GPC activities.

Selected use of short-term and long-term technical assistance will be coupled with a mixture of in-country and overseas training programs, and an appropriate range of commodity and local currency supports in order to conduct the EPM. The financial plan for the EPM calls for the USAID inputs of \$ 6,000,000 excluding 10% contingency and project evaluation over five years, with approximately 48.4% of U.S. dollar budgets for NEC, 45.2% for MEM/NEA and 6.4% for GPC. GOS inputs will total \$ 5,068,000 over five years, with approximately 40.7% of funds budgeted for NEC, 45.1% for MEM/NEA, 14.2% for GPC. The GOS contribution includes both financing from its recurrent budget and from CIP local currency generation.

In terms of functional support, technical assistance will account for 82.8% of the overall U.S. dollar spending effort excluding 10% contingency and project evaluation. Training will account for 10.8% and commodities 6.4% of the foreign exchange budget.

B. End of Project Status

At the conclusion of this five-year project (i.e. during 1987), the energy planning and management capabilities of the GOS will have been improved such that:

1. NEC will provide more reliable electricity service, through the regionalized system of electricity boards and by the combined effects of:

- a. improved organization and management structure within NEC.
- b. orderly maintenance and repair schedules.
- c. effective use of spare parts provided by the CIP.
- d. improved cash flow by accelerating the collection of accounts payable.

2. NEA will be capable of planning and advising on the implementation of energy supply and demand policies that are of optimal benefit to the Sudan.

3. GPC will have reviewed the planning techniques and appropriate policies to import, process and distribute petroleum products in an orderly fashion. At the

same time, GPC will be capable of responding to changing circumstances in the exploration, production, refining and marketing of domestic crude oil resources. This latter capability will be extremely important as the GOS builds a second oil refinery and moves towards becoming a potentially significant oil producer and exporter.

4. Public corporations, government institutions and larger private companies which are substantial energy users will be using their energy supplies more efficiently in the production of goods and services.

5. Commercial and financial arrangements for distribution, servicing and financing of cost-effective and energy-efficient equipment will have been strengthened.

C. Outputs

1. National Energy Administration

The EPM project will assist the NEA to become established as a respected central sources of useful energy data and policy alternatives. At the conclusion of the project, the NEA will have completed a series of analyses and plans that will benefit overall national energy management and planning in the Sudan. Trained NEA professionals will be available to work with NEC, GPC and other GOS departments to coordinate and monitor interdisciplinary energy projects that will add to the efficient use, appropriate pricing and effective management of Sudanese energy supplies. Detailed outputs of anticipated NEC activities are summarized below.

1. Adoption of an orderly transition to new organization structure.

NEA professionals have been operating as a task force in conjunction with the Energy Policy and Planning Project but have not yet been assigned permanent, structured jobs. Assignment of NEA staff professionals into working departments will be completed during the first year of the project. Written job descriptions will be prepared and issued. Individual job performance and overall organizational effectiveness will be reviewed annually.

2. National energy supply and demand planning and evaluation functions consolidated at NEA.

MEM will centralize national energy planning activities at NEA and assign multi-fuel supply policy studies to NEA. In addition, NEA will be formally charged with the responsibility to evaluate the overall energy consumption of the Sudanese economy by fuel type.

3. Energy analyses and policy option papers prepared.

NEA will prepare and disseminate energy studies on key topics of national concern, gather reactions from interested GOS and private-sector entities and frame national policy options for decision and implementation by MEM. Ten such studies will be completed during the project life. Among the topics to be considered as candidate subjects are:

- a. efficiency of petroleum consumption in the transportation sector.
- b. cost-benefit analysis of reforestation and substitution of oil for fuelwood in the Roseires Dam watershed.
- c. economics of regional controls on fuelwood - cutting and

deforestation.

d. consumption patterns of electricity and oil in export-oriented industries, with policy recommendations to improve energy use efficiency.

e. timing and impact on regional energy supplies of Power III, Power IV and Power V electricity - generating projects under alternative scenarios.

4. Detailed energy plans completed and reviewed annually.

NEA will compile an annual plan of national priorities and actions to address the orderly use of available renewable and conventional fuel resources, including anticipated electricity output and anticipated oil availability as well as projected fuelwood and charcoal use. This plan will include specific recommendations on MEM and GOS actions to promote the use of available fuels in end uses that contribute most to the well being of the nation.

5. Recommended policies and plans implemented.

In response to directives from the MEM, the NEA will work independently and in cooperation with GPC, NEC and other GOS entities to carry out the policy actions determined from NEA recommendations.

6. Capacity for computer-assisted data processing and analysis expanded.

Five members of the NEA staff will be trained during the first two years of the project life in the use of microcomputers to speed project analysis and to store key data for prompt retrieval. The desk-top computer already in place at NEA will be supplemented by state-of-the-art equipment to permit customizing of software packages and semigraphics printing.

7. Plan for regional energy allocation developed.

NEA will prepare a region-by-region plan for the distribution of petroleum and the generation of electricity in accordance with regional economic requirements. Data will be gathered by NEA through field trips and consultation with regional governments, GPC and NEC. One outcome of this plan will be an assessment of likely regional fuelwood and charcoal requirements. The plan will reflect several alternative scenarios of fuel availability and economic activity.

8. Energy pricing and regulations in accordance with national development priorities implemented.

A detailed economic analysis of energy pricing for oil products, electricity, fuelwood and charcoal will be completed in the first two years of the project. Then, NEA will conduct biannual reviews of national energy pricing and regulatory practices in order to advise MEM on the relative effect that these factors are having upon national development. The assessment will cover such issues as electricity tariffs, gasoline and diesel price levels and controls, significance of black markets on oil products, and their impact upon individual regions of the Sudan.

9. Fuelwood and traditional energy subsector policy established and initial action taken.

NEA will consult with the Ministry of Agriculture and other relevant GOS agencies in order to prepare a national plan for the orderly monitoring of fuelwood harvesting and charcoal production. Implementation of this plan will provide NEA with the necessary data to propose a national policy on the use and replenishment of fuelwood and other renewable energy resources, reflecting regional government capabilities and requirements. The NEA will take appropriate actions to track the outcome of these policy directives.

10. Expanded use of energy-efficient equipment promoted.

The performance and cost effectiveness of various energy-using equipment will be analysed to determine their appropriateness for the Sudan. Equipment surveys will be performed at Sudanese large energy-users to determine equipment needs to improve energy utilization and energy efficiency. Strategies for improved distribution, financing and serving of energy-saving equipment will be developed and steps taken to implement these strategies.

11. Energy information needs prioritized and strategies implemented.

An energy information network will be established. The NEA will gather general energy publications, local energy data and analyses for its energy library. Surveys of existing mechanisms for transferring information in the Sudan will be performed. Priority information needs of government, industry, professional societies, large energy-users, schools and training institutions will be identified. Then, an energy information reference system will be made available to the appropriate entities in the energy sector.

12. Case studies of successful energy-efficiency operating experiences prepared and findings documented.

Where appropriate, case studies will be prepared primarily for presentation to professional societies and corporation in the trade publications. Abstracts will also be prepared for use by the media.

2. National Electricity Corporation

Project support to the NEC will center on the goal of increasing the short-term reliability of the Blue Nile electric power grid, and improving the managerial capability of the NEC to deal with the commercial issues raised by the decentralization. Specifically, the EPM project will provide a team of long-term technical advisors and training to assist this public corporation in improving its financial controls, budgeting, planning, load management efficiency and administration of inventories and stores. As detailed in the following outputs, the EPM project will contribute towards establishing the newly-created NEC as an effectively-run business.

1. New NEC organizational structure and management procedures developed and implemented.

Until recently one government agency (PEWC) was responsible for both electric power and water. Now the NEC is a separate organization for electricity. The Irish Electricity Supply Board (ESB) will develop a new organizational structure and related management procedures for NEC. Implementation of this new organizational structure and related management procedures will be carried out under this project. In addition to the general implementation of new management systems and controls, additional assistance will be provided in certain financial, planning and technical areas.

2. Maintenance procedures reviewed and, where necessary, new procedures developed and implemented.

Proper maintenance of equipment has been a continuing problem for NEC. While many problems are due to shortages of parts, it is possible that maintenance can be improved through the development and implementation of new maintenance procedures. Doing so could enable NEC to make better use of its existing facilities and enhance the benefits to be gained from additional generating facilities now being built or planned.

3. Purchasing and stores procedures reviewed and, where necessary, new procedures developed and implemented.

For a maintenance program to operate effectively, the purchasing and stores systems must also function effectively. Purchasing and stores systems help support utility operations. Therefore current purchasing and stores operations will be reviewed and, where necessary, modified. Also included in this effort will be a review of technical specifications to assure they are up to date.

4. Planning and budgeting procedures and techniques reviewed and, where necessary, new procedures and techniques developed and implemented.

The electric utility industry is capital intensive and long lead times are associated with many capital items. Therefore good planning is required for successful operation of an electric utility. For planning to be successful, it must have management's support. Budgeting, on the other hand, is the link between planning and financial controls. Budgets are detailed financial descriptions of plans against which actual performance can be measured.

Planning and budgeting procedures and techniques will be reviewed, and, where necessary enhanced. A good working relationship will be established between NEC planning and the NEC management. NEC planning links will also be established between NEC and NEA, on such matters as support to regional governments regarding electricity generation and distribution.

5. Financial control system and billing procedures reviewed and, where necessary, new procedures developed and implemented.

Financial controls are required to assure that expenditures do not exceed budget levels and that collections of revenues meet projected goals. Billing procedures must be capable of providing the NEC with a smooth flow of revenues in a timely manner. The current financial control systems and billing procedures will be reviewed and, where necessary, modified, in order that the NEC can be run on good business principles.

6. Energy efficiency and load management programs reviewed and, where necessary, new programs developed and implemented.

One important way for NEC to balance electricity supply and demand is to improve the efficiency of electricity use. Working in conjunction with the private sector, programs will be developed to provide more output per unit input of electricity. Included in this effort will be power factor corrections. It is also necessary to plan for those times when supplies are not adequate to meet demands, even after the installation of new equipment and the introduction of improved planning and management techniques. Therefore, load management and load shedding plans will be reviewed and, where necessary, new plans developed and implemented.

7. Electricity tariffs of NEC and regional electric systems reviewed for economic and social impact.

The rates charged by NEC and the electricity systems operated by the regional governments are supposed to reflect true costs. This charges also will have social impacts. As part of this project, the economic and social consequences of electricity tariffs will be assessed. This output will be made available to the NEA for national energy planning purposes.

3. General Petroleum Corporation

The GPC has considerable autonomy as a public corporation, with specific responsibilities for the procurement and importation of crude oil and petroleum products,

refining and shipping of fuels from Port Sudan to Khartoum, commercial relations with the four oil marketing companies, and monitoring of the exploration and development drilling activities of private oil companies. Sharply high oil prices in recent years have raised the value of energy inputs handed by GPC, to more than \$ 400 million per year, and have made it very important that GPC management and planning functions be executed in an orderly and cost-effective manner. These needs are addressed by the EPM project and specifications of this project are discussed in the following outputs.

1. Flexible oil products allocation system designed.

In order to be better able to make tactical decisions on the allocation of refined petroleum products, GPC will design and create a systematic model of the Sudanese oil terminal and distribution system. This tool will have the capability of providing timely information on the consequences to the oil distribution system at large of allocation decisions. The model will be able to deal with individual products and individual regions of the country. It will include lead and lag times for the movement of oil products by various transportation means.

2. Improved distribution scheduling system designed.

GPC will review procedures for procurement and importation of crude oil and refined products, and eventual distribution of refined oil products. The purpose of the review will be to identify opportunities to increase overall system reliability in scheduling products shipments. Based upon this review, actions will be taken, as warranted, to achieve the more orderly distribution of available oil products, and to advise end-users in advance of unavoidable shortfalls in deliveries. In particular, the review will examine how the skills of the private sector oil distribution companies may be used more fully to achieve smoother allocation mechanisms.

3. Reduction in crude oil and refined products purchase costs.

During the course of the EPM project, GPC will increase its awareness of international crude oil and refined products market conditions and be capable of using this improved market intelligence to achieve lower procurement costs for oil imports. GPC ability to do this must rest on a timely availability of foreign exchange. Assuming funds are available, GPC should be able to affect the equivalent of a 20 cent per bbl reduction in supply costs through a combination of lower oil prices, reduced demurrage and freight costs and extended credit terms.

4. Improved financial and management systems.

As a consequence of the EPM project, GPC management will have more time for strategic corporate planning and decisions will be based upon more rigorous analytical procedures. These improvements will be reflected in the overall financial performance of the GPC. Amongst these improvements may be a faster response time from the Bank of Sudan in financing decisions affecting the purchase of imported crude oil and refined products.

D. Project Inputs

1. Summary of Inputs

Inputs for the EPM project including a 10% contingency and funds for project evaluation, will total \$ 12,244,800 and will be provided by AID and the GOS. Government contributions come from both its recurrent budget and the CIP generated local currency fund. Inputs are summarized by source in the following charts where currency has been converted to U.S. dollar equivalents at the official exchange rate

of LS 0.90 equals \$ 1.00. The following analytical tables exclude the 10% contingency and the cost of the EPM project evaluation.

	\$000			
	GOS contribution			
	Foreign Exchange	CIP Funds	Regular Budget	Total
Technical Assistance	\$ 4,916.3	1,606.3	2,418	8,940.6
Training	647.6	394.8	-	1,042.4
Local Consulting and Studies	-	420	-	420
Commodities	388.8	229.2	-	618
Total	5,952.7	2,650.3	2,418	11,021

These sums amount to the following percentages of the total project:

	%			
	GOS contribution			
	Foreign Exchange	CIP Funds	Regular Budget	Total
Technical Assistance	44.9	14.5	21.9	81.3
Training	5.8	3.5	-	9.3
Local Consulting and Studies	-	3.8	-	3.8
Commodities	3.5	2.1	-	5.6
Total	54.2	23.9	21.9	100.0

Grouped according to institution within the MEM, the overall budgets are:

	\$000			
	GOS contribution			
	Foreign Exchange	CIP Funds	Regular Budget	Total
NEC	2,910.8	1,284.9	781	4,976.7
NEA/MEM	2,660	1,170.3	1,116	4,946.3
GPC	381.9	195.1	521	1,098
Total	5,952.7	2,650.3	2,418	11,021

By agency, the proportionate spending is budgetted to be:

	%			Total
	Foreign Exchange	GOS contribution CIF Funds	Regular Budget	
NEC	26.3	11.6	7.1	45.0
NEA/MEM	24.5	10.6	10.1	45.2
GPC	3.4	1.7	4.7	9.8
Total	54.2	23.9	21.9	100.0

By type of activity, the budget is as follows:

	NEC	NEA/MEM	GPC	Total
Technical Assistance				
\$000	4,061.7	3,904.	974.6	8,940.6
%	45.2	44.0	10.8	100.0
Training				
\$000	358	684.4	-	1,042.4
%	34.5	65.5	-	100.0
Local Consulting and Studies				
\$000	250	100	70	420
%	59.5	23.8	16.7	100.0
Commodities				
\$000	307	257.6	53.4	618
%	49.6	41.7	8.6	100.0
Total				
\$000	4,976.7	4,946.	1,098	11,021
%	45.0	45.1	9.9	100.0

Details on these inputs are presented in the following subsections.

2. Technical Assistance

The NEA/MEM technical assistance team will be led by a Chief of Party who will divide his time between the MEM, where he will be a senior policy advisor, and the NEA, where he will provide energy policy and planning aid. The NEC Chief of Party will be resident at the NEC and will concentrate his efforts on operational matters. Job descriptions, scope of work and minimum qualifications of all long-term technical advisors are detailed in Appendix B (Job Descriptions). Selected short-term technical

assistance will also be provided to the NEA, NEC and GPC in areas of specific needs.

a. National Electricity Corporation

Long-term technical assistance will be provided by a team of four specialists, whose terms of residency and areas of operational concentration will be:

	<u>Person-months</u>	<u>%</u>
NEC Chief of Party	48	47
Maintenance, purchasing and stores	18	18
Financial controls, budgets, planning	24	24
Energy efficiency, load management	12	12
<u>Total</u>	<u>102</u> =====	<u>100</u> =====

Short-term technical assistance to the NEC will involve these special areas of emphasis:

	<u>Person-months</u>	<u>%</u>
Interim Advisor to NEC Director	10	25
Manpower and staffing levels	6	15
Systems analyst, operations research	10	25
Computer applications and programming	8	20
Financial analysis, cash flow management	6	15
<u>Total</u>	<u>40</u> =====	<u>100</u> =====

The NEC also will receive short-term technical assistance from Bechtel in the procurement and installation of CIP-funded purchases to rehabilitate the BNG.

b. National Energy Administration/MEM

Long-term technical assistance will take the form of a three-member team of advisors, with these terms of residency and areas of specialization:

	<u>Person-months</u>	<u>%</u>
NEA/MEM Chief of Party	48	50
Energy planning and economics	30	31
Supply logistics, pricing and allocations	18	19
<u>Total</u>	<u>96</u> =====	<u>100</u> =====

Short-term technical assistance to the NEA and MEM will concentrate upon these aspects of energy planning and management.

	<u>Person-months</u>	<u>%</u>
Manpower and staffing levels	4	13
Energy efficiency end-use	6	19
Supply and demand analysis	4	13
Computer applications and programming	4	13
National energy policy and administration	3	9
Forestry and renewable energy sources	8	25
Distribution and marketing of fuels	3	9
<hr/>	<hr/>	<hr/>
Total	32	100
	=====	=====

The NEA/MEM will also receive short-term technical assistance through an extension of the ISTI/EDI Energy Policy and Planning Project contract.

c. General Petroleum Corporation

No long-term technical assistance on operational issues is budgeted for the GPC. Selected planning and policy evaluation issues, such as supply planning and allocations policy, will be addressed in consultation with the GPC by the NEA/MEM long-term technical advisors.

Short-term technical assistance to the GPC will include:

	<u>Person-months</u>	<u>%</u>
Manpower and staffing levels	2	9
Exploration and production economics	6	27
Agreements and licensing for exploration and production	6	27
Storage, distribution, logistics	8	36
<hr/>	<hr/>	<hr/>
Total	22	100
	=====	=====

3. Training

The training component of the EPM project will use Sudanese training facilities and instructors, whenever appropriate. Certain training courses and inspection visits will take place in the U.S. or third countries. For the most part, the training will be non-degree short courses although some long-term graduate degree training is planned for the U.S. Please refer to Annex F for a discussion of local training alternatives that could assist in lowering the net immigration of skilled Sudanese workers.

The training component of the EPM project anticipates that NEC training will be directed at operations and tactical problem-solving. The NEA and GPC training, on the other hand, will address longer-term strategic aspects of energy planning and management. A close coordination between NEA and GPC will be necessary in the selection of appropriate issues and course attendees.

The training budgets may be summarized as follows:

	\$000		
	<u>Foreign Exchange</u>	<u>CIP Funds</u>	<u>Total</u>
NEC	229.5	128.5	358.0
NEA/GPC	418.1	266.3	684.4
<u>Total</u>	<u>647.6</u>	<u>394.8</u>	<u>1,042.4</u>

The absence of a GOS contribution from regular budget funds reflects the fact that the GOS personnel time has been assigned to the technical assistance component of the budget analysis. This decision recognizes the much more substantial role that technical assistance will play in the EPM project.

The training activities, as classified by location and duration, are as follows. Short-term courses will typically be for one or two weeks in the Sudan, involving a team of U.S. and Sudanese instructors. The short-term third-country and U.S. training will include a series of inspection tours. Long-term training is defined as being of 12 months or longer.

<u>Location</u>	<u>Type</u>	\$000		
		<u>FX</u>	<u>CIP</u>	<u>Total</u>
Sudan	short-term	396.1	373.8	769.9
U.S.	short-term	126.8	14.0	140.8
U.S.	long-term	51.4	2.0	53.4
<u>Subtotal, U.S</u>		<u>178.3</u>	<u>16.0</u>	<u>194.2</u>
Third-country	short-term	73.3	3.0	76.0
<u>Total</u>	short-term	<u>596.2</u>	<u>394.8</u>	<u>986.7</u>
<u>Total</u>	long-term	<u>51.4</u>	<u>2.0</u>	<u>53.4</u>
<u>Total, All Trainin</u>		<u>647.6</u>	<u>394.8</u>	<u>1,042.4</u>

4. Commodities

Commodities are not a major portion of the EPM project, totalling \$ 618,000 in foreign exchange and CIP funds. Of this, 50% is for NEC, 42% for NEA and 9% for GPC. The principal purchases will be seven vehicles for long-term technical advisors (4 NEC, 3 NEA), with adequate provision for maintenance and fuels, audio-visual equipment and related training materials, and microcomputers with associated peripheral equipment and software packages. An analysis of the commodities budget follows, incorporating shipping and contingency allowances.

	\$000		
	<u>FX</u>	<u>CIP</u>	<u>Total</u>
<u>NEC</u>			
Four vehicles @ \$15,000+shipping	90	-	90
Spare parts, POL	20	130.6	150.6
Audio-visual; training	26.4	-	26.4
Microcomputers; records retention	40	-	40
<u>Total NEC</u>	<u>176.4</u>	<u>130.6</u>	<u>307</u>
<u>NEA/MEM</u>			
Three vehicles @ \$ 15,000+shipping	68	-	68
Spare parts, POL	15	98	113
Audio-visual; training	25	-	25
Microcomputers	50	-	50
<u>Total NEA/MEM</u>	<u>159</u>	<u>98.6</u>	<u>257.6</u>
<u>GPC</u>			
Audio-visual; training	25	-	25
Microcomputers	28	-	28
<u>Total GPC</u>	<u>53.4</u>	<u>-</u>	<u>53.4</u>
<u>Total, Commodities</u>	<u>388.8</u>	<u>229.2</u>	<u>618</u>

E. Key Assumptions to Project Success

In design of the EPM, several assumptions have been made regarding the institutions to be assisted by this project, and the economic and commercial environment of the period during which the project will be implemented.

The assumptions are believed to be pragmatic and reflective of established trends in the economy of the Sudan, the approach of GOS, USAID and AID/W to the issues addressed by this project, and the number of capital projects already underway in the Sudan.

It is assumed that GOS will continue to support the NEA as an institution for energy policy and planning activities, and that this agency along with the GPC and NEC will have the necessary authority and funding to implement their plans and programs in a timely fashion.

Extraordinary changes in the international price of crude oil and refined products (e.g. more than twice the world's average inflation rate) are not expected to occur during the years of the EPM project. Furthermore, it is anticipated that the remedial repairs to the BNG and execution of Power III projects will proceed close to schedule, e.g. within 20% of planned time tables.

Furthermore, it is assumed that the overall balance of payments situation in the Sudan will not worsen, and sufficient foreign exchange will be available for the purchase of sufficient if not optimal quantities of petroleum. Insofar as NEC revenues

are concerned, it is assumed that the GOS will allow NEC to generate and retain sufficient funds to sustain operations.

The continuity of AID funding throughout the life of the EPM project is assumed, and lastly it is assumed that the professional staff of NEA, NEC and GPC who receive training and other EPM benefits will remain at their posts and not emigrate at a greater rate than in the past.

F. Relation of Project to AID and Other Donor Activities

In addition to the EPM project, USAID is providing \$100 million in CIP which will consist, in part, of \$20 million for the rehabilitation of the BNG and increased reliability of NEC operations. These CIP funds will directly address the NEC's need to improve the BNG and are complementary to the efforts of this project to improve NEC planning and management. The \$ 20 million is being committed in 1982 with the expectation that major components purchased by these funds will arrive during 1983 and be fully operational before the end of 1983.

A second USAID project, the Energy Policy and Planning Project, has provided NEA with initial data collection and analytical capabilities. This work will be extended under the EPM project.

USAID is also funding a renewable energy project, Rural Renewable Energy (650-0041), which will interface with the EPM project in the areas of energy planning for renewable energy sources such as fuelwood and hydropower. The Rural Renewable Energy Project focuses on new and improved renewable energy technologies but also will study the potential for solar and wind energy. As a national policy body, the NEA will obtain new skills in renewable energy data collection, management and planning under the EPM project. These will be useful in developing new renewable energy policies in response to AID Rural Renewable Energy Project (No. 650-0041).

Other donor efforts include those of the World Bank, notably the electric power generating projects, Power III and Power IV. The estimated cost of Power III is \$290 million and that of Power IV \$485 million. In addition, the British ODA is financing a new facility at the Burri power plant which will provide 40 MW of new electric power. The Third and Fourth Projects (Power III and Power IV), financed by the World Bank, will result in new generating capacity and new transmission circuits between the Sennar junction and Kilo 10 substations. Details of these donor activities are in Annex G.

Related to the Power III project is assistance from the Irish Electricity Supply Board (ESB) in selected areas of applied training for electrical technicians at these new power stations. The ESB has also provided management advice to NEA that is being coordinated with the management and planning components of this project.

Finally, there are private sector activities that are providing some energy planning and management skills. In particular, U.S. and European oil companies have been conducting an active petroleum exploration and development program that is detailed in Annex C. As these efforts unfold, GPC exploration and production staff will receive private sector U.S. and third country technical training of both a long-term and short-term nature. The relative level of support by the EPM project to the GPC reflects this private sector effort.

IV. Project Analysis

A. Financial Analysis and Budget

The Sudan Energy Planning and Management Project will provide technical assistance (\$8,941,000), training (\$1,042,000), local consulting and studies (\$420,000) and commodities (\$619,000) to assist the operations and management of MEM/NEA (\$4,994,000) NEA (\$4,926,000), and GPC (\$1,098,000). Funds are also provided for project evaluation (\$64,000) and a 10 percent contingency (\$1,195,000). The total project budget including the contingency is \$12,195,000 of which AID is contributing \$6,600,000 (54%).

In the budget design, U.S. dollar funds were inflated at 10% a year and Sudanese pounds at 20% a year. Detailed project budgets appear in Annex O, while the summary budget follows.

Sudan Energy Planning and Management Project
Summary
LOP Budget (\$000)

	USAID (FX)	CIP (LC)	GOS		Grand Total
			Regular Budget (LC)	Total	
<u>Technical Assistance</u>					
Long-term					
NEC (102 pm)	1,574.8	384.4	781.0	1,165.4	2,740.2
MEM/NEA (96 pm)	1,529.4	436.0	1,116.0	1,552.0	3,081.4
Subtotal	3,104.2	820.4	1,897.0	2,717.4	5,821.6
Short-term					
NEC (30 pm)	930.1	391.4	-	391.4	1,321.5
MEM/NEA (32 pm)	553.5	269.4	-	269.4	822.9
GPC (22 pm)	328.5	125.1	521.0	646.1	974.6
Subtotal	1,812.1	785.9	521.0	1,306.9	3,119.0
Total T.A.	4,916.3	1,606.3	2,418.0	4,024.3	8,940.6
<u>Training</u>					
Long-term					
MEM/NEA	51.4	2.0	-	2.0	53.4
Short-term					
NEC	229.5	128.5	-	128.5	358.0
MEM/NEA	366.7	264.3	-	264.3	631.0
Subtotal	596.2	392.8	-	392.8	989.0
Total Training	647.6	394.8	-	394.8	1,042.4
<u>Local Consulting & Studies</u>					
NEC	-	250.0	-	250.0	250.0
MEM/NEA	-	100.0	-	100.0	100.0
GPC	-	70.0	-	70.0	70.0
Total	-	420.0	-	420.0	420.0
<u>Commodities</u>					
NEC	176.4	130.6	-	130.6	307.0
MEM/NEA	159.0	98.6	-	98.6	257.6
GPC	53.4	-	-	-	53.4
Total Commodities	388.8	229.2	-	229.2	618.0
<u>Project Evaluation</u>					
Total before contingency	45.7	17.9	-	17.9	63.6
Contingency 10%	5,998.4	2,668.2	2,418.0	5,086.2	11,084.6
Total EPM Project	600.0	266.8	242.0	508.8	1,108.8
Rounded Project Total	6,598.4	2,935.0	2,660.0	5,595.0	12,193.4
	6,600.0			5,559.0	12,195.0

Short-term Technical Assistance includes funds for the contract services described in para ID of the Project Summary, p.5.
Person-month totals do not reflect these contracts.

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IV. B. Technical Analysis

1. National Electricity Corporation

a. Description and Institutional Analysis

The National Electricity Corporation officially came into existence in June 1982, arising from a reorganization of the Public Electricity and Water Corporation (PEWC) that divided the electric utility from the water operation. The NEC continues to be a publicly owned electric utility, but its responsibilities are limited to the interconnected Blue Nile Grid (BNG) and Eastern Grid. The distribution of electricity to several regions within the grid, and the generation, transmission and distribution within six independent power areas not connected to the grid will be controlled and operated by regional authorities.

NEC is still running all operations but now is beginning to plan the transfer. However, there are a number of serious questions and problems related to the devolution. For example, the relationship between NEC and the new regional operations is not clear. The services NEC must provide to the regions are not fully defined. The process of coordinated utility planning is also uncertain. For the regions connected to the central grid, the bulk power prices and policy are under study. The procedures for operations of the regional utilities also have to be planned, including selection of institutions to be the local operating authority. And, new tariffs have to be established with the ultimate goal of utility financial self-sufficiency.

These concerns are only a few of a series of problems that the NEC and regional authorities must address in the next few years. Not only NEC and the regional authorities, but also the GOS place a high priority on the decentralization.

A second important institutional aspect of the recent reorganization of the PEWC is the present requirement for new operational and management procedures at the NEC. The Irish Electricity Supply Board (ESB) is presently preparing a new organizational structure upon which NEC will build. NEC expects to revise nearly all of its operation procedures including finance and collection of accounts receivable. New manuals of orders and job responsibilities will be required. Substantial changes will occur in NEC operations in the next two years.

Blue Nile Grid Operations

About 80% of total national electricity demand is in the BNG. Electricity use in the BNG area has doubled during the seven

year prior to 1981. The present distribution of energy consumption (kilowatt hours) is estimated to be as follows:

Residential	40.5%
Industrial	39.5%
Agricultural	10.5%
Other	9.5%
	<u>100.0%</u>

In recent years, more balanced demands on the BNG have allowed consumption (Gwh) to grow faster than capacity (MW). There was a 10.4% annual growth in consumption and a 9.8% growth in capacity between 1974 and 1981. The annual system load factor (actual consumption divided by the amount of electricity the system could produce if it operated at maximum capacity at all times; a situation that is neither possible nor desirable) is currently about 62%. Peak demands (MW) occur in summer afternoons during periods of high air conditioning demand.

The rated capacity of the power plants on the BNG total 230 MW, but maximum present output is only 189 MW as shown below:

NEC System: BNG

Existing Generating Plants

<u>Plant No.</u>	<u>Type</u>	<u>Year Installed</u>	<u>Rated Capacity (MW)</u>	<u>Present Maximum Output (MW)</u>
Burri	Diesel	1964	15	10
Burri	Diesel	1981	15	15
Burri	Steam	1956	30	10
Kilo X	GT	1969	15	13.5
Roseires	Hydro	1971-80	130	120
Sennar	Hydro	1962	15	15
Wad Medani	Diesel	1950-67	8	4
Other			2	1.5
			<u>230</u>	<u>189</u>

The Roseires hydro facility, which currently accounts for 63% of BNG maximum output (MW) is 500 km from Khartoum, and connected by a 220 kv single circuit transmission line. Therefore, any fault on this line precipitates a cascading outage condition for the system. In 1981, there were 20 power failures in the BNG system, of which 13 failures were due to outages on the 220 kv line.

Revenue from the sale of electricity in 1980/81 fiscal year was LS 38.8 million. Approximately 80% of the revenues were from the sales of the BNG. Expenses were LS 36.4 million, leaving a cash income before provisions for depreciation of only LS 2.4 million, as detailed below:

	<u>Million LS</u>	<u>%</u>
Production Expenses	16.3	42.0
Distribution Expenses	7.0	18.0
Administration Costs	6.4	16.5
Financial Costs	6.7	17.3
Total Cash Costs	<u>36.4</u>	<u>93.8</u>
Cash Income Before Tax	<u>2.4</u>	<u>6.3</u>
	<u><u>38.8</u></u>	<u><u>100.0</u></u>

In 1980/81 book value of the PEWC assets specifically allocated to electricity was LS 77.5 million. Cumulative depreciation in past years was LS 50 million, indicating an initial book value of LS 127.5 million for electricity sector assets. This valuation would need to be adjusted upwards to account for inflation in order to arrive at the true replacement cost of NEC assets. Furthermore, the asset base does not include all capital plant obtained by donor grants, an important understatement of the gross asset base. Even before making such corrections, it is clear that the LS 2.4 million cash flow is woefully inadequate to cover depreciation and other non-cash charges necessary to replace capital equipment. The NEC is in serious financial straits.

Financial constraints have lead to woefully inadequate expenditure on replacement parts and maintenance. Regular maintenance and repair procedures have been set aside and crisis is the norm. Serious inventory control and maintenance problems now exist for the BNG and local distribution systems. The reliability of the BNG has dropped substantially in the last three years. Improvement of maintenance and inventory control will be part of the major reorganization of operations at the NEC.

Given the above proposed and planned expansions, NEC will generate adequate power for the development needs of the BNG area by 1984-5. Substantial donor assistance is being provided for generation and transmission including the AID \$20 million Commodity Import Program (CIP). The managerial and operational capability of the NEC, an aspect equally important as generation, has recieved much less support from international donors. As NEC generating capacity expands, its managerial skills must keep pace. Training and advisory services in NEC operations are a high priority.

Power System Expansion: Work on Power II is currently being completed and Power III projects are underway. Financing is being sought for Power IV.

Power II is a short-term expansion program confined to the BNG service area. It was designed to alleviate chronic capacity shortage problems.

The Power III project will cost \$290 million and has five main components (1979-1986). Funding is through the IBRD, with contributions also originating from the ODA, the Federal Republic of Germany, the GOS and the NEC.

The five components are:

1. Addition of the fifth and sixth turbines (40 MW each) at Roseires, along with embedded parts for the seventh unit.
2. Construction of a 60 MW (2x30 MW) oil-fired turbine plant in Khartoum North.
3. Installation of 40 MW (4x10 MW) of additional diesel generating capacity at Burri.
4. Stringing a second 220 kv transmission line between Sennar and Kilo X.
5. Reinforcement and extension of existing transmission lines and substation facilities in Khartoum North.

The proposed Power IV project (1985-1990) consists of:

1. Installation of 60 MW (2x30 MW) of thermal generation at Kostî or Khartoum North. A station at Kostî would burn residual fuel oil produced at the proposed new refinery.
2. Completion of Roseires Unit #7 (40 MW).
3. Additional 20 MW (2x10 MW) at Burri.
4. A fourth project, which is dependent upon making the Roseires Dam higher, is the installation of 30 MW of additional hydro power at Sennar. NEC plans to propose this project as part of Power V, for completion in 1989/90.

b. USAID Assistance

Reorganization of NEC to meet its new responsibilities is one of the first orders of business for the corporation. The Irish Electrical Supply Board (ESB), which was already providing training services to NEC, has been asked by GOS for a new organization scheme. A draft of the ESB proposed new organization chart is shown in Annex Q. The proposed new organization structure will be reviewed by NEC and Sudanese management experts.

USAID will then assist NEC in implementing the agreed-upon management structure and related management systems. This will be the primary responsibility of the principal long-term technical advisor to NEC. The Resident Advisor will also help NEC senior management in the technical and managerial questions related to decentralization.

The areas of purchasing and stores will also receive immediate attention. While many of the problems in this area are related to the chronic foreign exchange shortage, NEC and USAID agree enhanced planning and management in this area will improve NEC's operations.

A key part of the reorganization will be to assess the business performance of NEC. To meet requirements placed upon it by the GOS and various donors, NEC must be financially sound. To assist NEC in the commercial aspects of operating an electric utility, long-term technical assistance will be provided in the areas of planning, budgeting and financial controls. One important aspect of this area is improved billing and bill collection.

Even with the implementation of Power III and Power IV, the NEC will need to conserve electricity. It is therefore important that its customers make effective use of electricity. Load management can also help bridge gaps between supply and demand. Technical assistance will be provided to assist its larger customers in making more effective use of electricity, including improving power factors, and in improving load management procedures.

c. Technical Issues

With respect to the NEC, there is a risk of oversaturating the management with technical help and training but not an unacceptably high risk. NEC is going through two major changes simultaneously: the management structure is being reorganized through the auspices of the Jish ESB and the national electricity distribution and marketing system is being regionalized by the transfer of authority to the local governments. Extracts from the enabling legislation that created the NEC in 1982 are attached as Annex M.

NEC reorganization and management planning requirements are diverse and substantial. NEC senior managers have shown high interest in the CIP procurement to improve the reliability of the BNG and related reorganization steps. A continued high level of involvement by NEC will be necessary in the form of a clear commitment from counterparts for the EPM to achieve optimal results.

2. National Energy Administration

a. Description and Institutional Analysis

The NEA was established within the MEM in 1980 to act as a central data collection and dissemination body, with national energy policy and planning responsibilities. NEA has as its principal function the development of sound energy management policy recommendations for the renewable and conventional fuels upon which the MEM can base suitable Sudanese national energy strategies. A secondary function is to assist in implementing policies and program as determined by the MEM. Another important role of the NEA is to consult with and advise the GPC, NEC and the private sector when research suggests policy or operational changes that may be in the national interest.

The NEA role in collecting and evaluating data on fuelwood, oil and electricity supply and demand is critical. This role is particularly important in the area of forestry and fuelwood. The decentralized nature of the fuelwood industry fosters a lack of coordination and management. Since decentralization of forest management in the late 1970's, fuelwood management has been turned over to regional governments. Overall coordination of fuelwood policy is absent. Because fuelwood accounts for four-fifths of all energy used, it is important that management issues be addressed nationally.

The institution is young, being only two years old, but already the NEA has gathered a nucleus of qualified professional talent. Its staff numbers 49, plus two long-term U.S. advisors assisting in its initial task of completing a national energy assessment. The present composition of the staff is:

<u>Field</u>	<u>Number of Staff</u>
Chemical/Petroleum Engineering	13
Mechanical/Electrical Engineering	5
Subtotal Engineering	18
Economics/Statistics	8
Chemical/General Science/Economics	6
Physics/Math	4
Zoology/Botany	2
Subtotal Sciences	20
Agriculture	3
Forestry	4
Geology/Geography	2
Subtotal Renewable Resources	9
Law/Public Affairs	2
Total all NEA Staff	49

The overwhelming factor in an institutional analysis of NEA is its lack of organizational structure. To date, the staff has functioned as a task force working on the energy assessment. It is imperative that the NEA establish a firm organizational structure in order to build an institutional capacity. An organizational plan has been accepted and one important early output of the EPM project will be the assignment of personnel to these positions. Administrative procedures, organization and job responsibilities will follow.

Not only is the organization of NEA very recent but also most of its staff are young professionals in entry-level jobs. In relation to the NEA need to establish its authority as a component of the GOS energy structure, the relatively young staff is a drawback. Yet, the success of a staff operation to a large extent will hinge on the quality of its work and the working relations maintained with line operations. To date, NEA has worked well with the GPC and PEWC while its relations with the Forestry Department are exceptionally strong. Part of its success is because NEA professionals are in the same disciplines as those in NEC, GPC and Forestry. They relate well and understand the issues and problems. A second reason for the success of NEA is that this office has filled a void in GOS national energy planning at a critical time. The NEA's energy assessment is giving Sudan policy makers much new information to assist in national energy and development planning. And, other special studies are leading to proposed projects to help the energy sector. Lastly, NEA has benefited from donor assistance which is providing short-term and long-term training and advisors. These actions not only build the capability of the staff but also give NEA some status by virtue of having attracted the interest of an international donor.

Although much has been accomplished at NEA, substantial institutional development is required for NEA to grow into the GOS central body for energy planning and policy analysis. NEA progress and performance in the first two years show that it has made a good start to consolidating its position as a central energy planning staff. NEA has gathered a useful range of regional and national energy data; individual staff analysis capabilities and understanding of the energy sector are expanding.

b. USAID Assistance

The importance of USAID assistance to NEA over the past two years in training, data collection and task management is recognized by NEA and MEM as a key factor in its progress. The possibility of continued steady achievement by NEA without continued advisory and training assistance for a 3-5 year period is difficult to predict. Absent donor support, NEA is less likely to become a recognized central energy planning body and NEA staff capabilities would expand at a slower pace.

In regard to energy management, analysis and planning, donor assistance for NEA institutional advancement is a sound developmental investment. It greatly increases the chances of NEA contributing to the GOS needs for an energy advisory and analytical unit. There has been a void in the Sudan in this area and the need for this function is not questioned by the MEM.

The EPM project will provide funding for short-term technical assistance services to NEA to June 1983, when the long-term contractors are expected to arrive. It is anticipated that these services will be provided by amendment of an existing contract for similar services being provided by ISTI/EDI in Sudan under the Energy Policy and Planning Project (936-5703). This interim assistance provides continuity and assures that the progress made is not lost. The nature and level of assistance provided under a new contract or contract amendment will be similar in quantity of effort to the Energy Policy and Planning project. Two long-term advisors will be working at NEA; the Chief of Party will divide his time between NEA and MEM. Short term consultants will assist in special issues and problems as the needs arise, and long-term and short-term training will be available to upgrade the staff skills.

c. Technical Issues

Achievement of project outputs requires no special technology. The techniques planned for data collection, analyses and information systems have been tested and used widely in other economically developing countries. By and large, the real question is the institutional capacity of NEA to do the job. EPM project assistance directly addresses this concern, not only by providing advisors and training to NEA but also to NEC and GPC. To a considerable extent, NEA must rely on these institutions and the private sector to gather data and provide technical advice. By providing assistance to these other MEM energy institutions as part of a comprehensive energy management and planning project, the objective of coordinated energy planning is fostered.

A final management concern is the extent to which NEA can absorb the assistance provided by the EPM project. Since the level and type of assistance is not substantially different from the Energy Policy and Planning project, NEA is expected to benefit fully from the training and advisory services provided. Furthermore, NEA managers have shown a keen interest in the project and a high level of commitment and involvement is expected during implementation.

3. General Petroleum Corporation

a. Description and Institutional Analysis

The General Petroleum Corporation (GPC) is a public corporation engaged in most aspects of the petroleum industry in the Sudan. Prior to 1980, GPC was known as the Petroleum General Administration (PGA). Functions range from the supervision of exploration and development efforts by private sector oil companies, to domestic crude oil refining, international procurement of crude oil and refined products, pipeline transmission of products from Port Sudan to Khartoum, transfer of products to private oil marketing companies and the orderly allocation of products around the country according to state policy. Annex R is the organization chart.

The GPC is responsible for supervision of all oil and gas exploration licenses. Presently, there are seven major international oil companies searching for oil in Sudan. Chevron has expended \$300-400 million in oil exploration in the last six years. Discoveries to date have been announced as capable of producing about 20,000 bbl per day. For more details see Annex C. The GPC also evaluates and analyzes geological and geophysical data produced by the companies engaged in exploration. The GPC will be the state entity to represent the GOS when oil production and possible exports begins late in the 1980s.

The GPC also acts as the crude oil and refined products purchasing agent for the GOS, arranging supplies from the international market. Moreover, GPC is a joint 50/50 partner with Shell in the Port Sudan refinery. The private marketing companies in the Sudan (Mobil, Shell, Agip and Nitoc) must purchase all their petroleum fuels from GPC, unless special permission for direct imports is granted by the GPC. No limitations exist on importation of oils and lubricants.

The Port Sudan refinery is small (25,000 bbls/day capacity) and aging (no new capacity has been added since the 1960s), but well-run. However, owing to crude oil supply shortages, the Port Sudan refinery operated at about three-fourths of its capacity in 1981.

The Petroleum Products Pipeline Public Corporation (PPPPC), formerly an independent state-owned company, became a semi-autonomous body within the GPC during 1981. Its 8" diameter pipeline runs 1,200 km from Port Sudan to Khartoum. Gasoil and some gasoline is pumped on a toll basis for the major private marketing companies. Some products (namely jet fuel and gasoline) are moved by rail, but substantial volumes move from Port Sudan by road tank wagons. The GPC is excluded from this transportation area. The tank trucks normally are privately owned and either independently operated or contracted by one of the major marketers to haul fuel.

GPC is also responsible for the review of government controlled oil prices, recommending adjustments at intervals. All key oil products are subject to GOS price controls. Sudanese official prices for gasoline and gasoil are somewhat low by world standards (e.g. 90 cents per U.S. gallon for gasoil). Physical shortages and supply problems outside the Khartoum area are widespread and are causing greivous damage to the local economy, particularly in the north and west. Black market prices of up to ten times the official price are frequently cited by informed sources.

Supply conditions in the south are also erratic and difficult; this region is supplied to a small degree by rivershipments from Kostu but receives oil primarily by road from Kenya. Petroleum consumption in the south is miniscule, being under 1,000 bbls per day for a region with approximately seven million people.

GPC responsibilities involve very large sums of money. The oil import bill alone is \$400 million per year. Relatively speaking, the value of petroleum as an energy input to the Sudan is about ten times the electricity input (NEC sales are approximately \$40 million in local currency).

The GPC acts as the procurer of fuel oils for the NEC, and also acts as the exporting agent for that portion of residual fuel oil which is refined at Port Sudan but in surplus in national requirements. These sales generate some foreign exchange for the GPC but on balance the GPC is a major disburser of foreign exchange on behalf of GOS and is thereby deeply influenced by Bank of Sudan actions.

b. USAID Assistance

GPC has received USAID technical advisors and training support during 1980-1982 in the course of ^{the} Energy Policy and Planning project. Because GPC is a public corporation with operational responsibilities that have been seriously impacted by foreign exchange limitations beyond their control, most of the emphasis of GPC in the past two years has been on coping with immediate crises. GPC management has had insufficient time to schedule, plan and analyze long term actions that would ease the burdens now shouldered by the organization.

USAID will continue to provide selective support to GPC in those areas where short-term technical assistance can be of the most value. These areas include the design of improved crude oil and refined products supply schedules, allocation mechanisms and distribution plan to permit a more orderly and predictable delivery of petroleum supplies into the Sudanese economy. These steps cannot add to the foreign exchange that may be made available to buy oil, but they will help to improve the overall management of the supply and distribution chain in a concrete fashion.

Assistance to the GPC will also include the availability of NEA long-term technical advisors to address planning, fuels pricing and supply scheduling questions of concern to GPC management. These advisors will deal with the broad planning aspects that can permit GPC to discharge its functions more effectively. In addition, GPC will have available a CIP-generated fund that can be used to commission studies and secure the expertise of private sector Sudanese advisors and other public-sector Sudanese institutions.

The EPM project has been designed with full awareness of the rapid changes taking place in the Sudanese oil industry. Highly significant oil discoveries and the prospects for a second oil refinery (See Annex D) will result in the role of the GPC altering in the next few years. Portions of the short-term technical training have been structured with these possible changes of circumstances in mind.

It is expected that the GPC and NEA will work together in a cooperative fashion to review energy pricing and allocation policies, and make suitable recommendations to the MEM after the economic and social consequences of any adjustments have been thoroughly assessed. Because of the national energy policy implications of such studies, the technical assistance and training budgets for these tasks have been assigned to the NEA portion of the EPM project.

c. Technical Issues

GPC management are more seasoned than the NEA, for example, and are fully capable of absorbing all of the benefits that may arise from the successful executions of the programs in this project. GPC training facilities are not adequate, and the commodities budget provides for the purchase of suitable audio-visual equipment and other supporting materials in order to properly outfit a training room that will be provided by the GOS.

Also, GPC will set aside appropriate facilities to house a microcomputer, peripheral equipment (e.g. printer) and software packages that will be highly beneficial in speeding GPC computations and project analyses. The microcomputer will be notably useful in the design and implementation of improved crude oil and refined products scheduling and delivery logistics plans and procedures.

IV.C. Social Soundness Analysis

The Sudan Energy Planning and Management Project (EPM) benefits key public and private institutions in the energy sector and related fields of the national economy. A large percentage of the national population will also profit from the project's activities. Those Sudanese who will experience significant gains live within the area served by the Blue Nile power distribution grid (BNG), which service 30% of the national population. Since the nation's largest urban concentration (Khartoum/North Khartoum/Omdurman) is served by the BNG, any increase in energy supplies will be of considerable socio-economic value. Aside from the urban beneficiaries, improved reliability in the electric power supply and better allocation of petroleum products will assist the farming sector. Lack of fuel and electricity has deprived irrigated agricultural schemes of water at critical times, limited the operation of field equipment and curtailed movement of agricultural inputs, including labor, and has complicated the marketing of harvested crops. Improved management of oil and electricity will ease the fuel-wood supply difficulties in the rural areas.

1. Urban Beneficiaries

Improved reliability and increased supply of energy will have a major positive impact on the industrial sector of the national economy, much of which is located in the area of BNG. Currently, the rapid rate of rural to-urban migration, especially in the great Khartoum metropolitan area, creates a surplus labor pool which the local economy is unable to absorb. Tens of thousands of new arrivals and their families eke out a hand-to-mouth existence while making little or no positive contribution to the economy. In large part this situation is a direct result of the industrial sector's generally poor performance and its inability to create new jobs. One of the principle reasons for this slow expansion rate is inadequate energy supply, especially electrical power and refined petroleum products.

No hard statistics exist on the disincentives to industry that stem from energy deficiencies. An indication of the magnitude of the problem is exemplified in the following: during the period May-September 1980, no electrical power was supplied to the major industrial area of North Khartoum for a period of over 90 days. The PEWC disconnected many factories from the city's power grid. Those factories having private generators were permitted to operate, but fuel allocations by the GPC typically were adequate for only one-quarter to one-third of normal operations. Those factories without generators simply closed down. Permanent laborers continued to draw their wages throughout the enforced furlow. Tens of thousands of daily laborers, however, received no compensation. A similar situation occurred in 1981 and 1982. The resultant loss of production was somewhat lower in 1982 since most factories had imported generators. Nevertheless the lack of fuel again reduced normal hours of operation and a concurrent reduction in the number of available jobs. The costs to the Sudan economy were high.

The socio-economic cost in terms of human misery also was inordinately high. Hundreds of thousands of families suffered directly or indirectly from loss of income. The lack of adequate energy supplies, therefore, has a distinctly injurious human cost component. Increased energy availability will have a direct positive effect on the human condition in urban areas. Economic growth and new job opportunities will raise personal income and consumption levels.

2. Rural Beneficiaries

Along the BNG there are dozens of agricultural schemes which rely on electric or petroleum-powered pumps for irrigation. The Rahad Scheme, for example, is one of the largest but its operations are indicative of other commercial schemes.

Approximately 100,000 agricultural laborers and tenants work the Rahad Scheme's one million acres. These producers are dependent upon the Scheme's irrigation canals to deliver the water required to support their crops. The canals, in turn, are dependent on pumps to move water from the Blue Nile into the Rahad River which feeds the canals when the river's flow is inadequate to meet demand. The pumps are electrical and depend upon the BNG for power. At critical times during the crop cycle, the power supply from the BNG has been insufficient to meet the Scheme's needs. Therefore, Rahad suffers delays in planting and production losses both due to the inability to deliver water on time. A reliable year-round supply of power will enable production increases on the Scheme and at similar enterprises along the BNG. A concomitant rise of income for hundreds of thousands of agricultural laborers and small-scale commercial producers will be an obvious social benefit.

Aside from provision of electrical power, mechanized agriculture will benefit from a comprehensive, long range petroleum distribution policy. Thousands of tons of agricultural production remains unrealized under the prevailing allocation process. During the peak harvest season of the 1981/82 crop year, for example, the dura farmers in the Gedaref region (the "breadbasket" of Sudan) were unable to obtain sufficient fuel to power their mechanical harvesters. The fuel was available in Port Sudan, but the allocating agency failed to recognize the seasonal requirements of the mechanized schemes. Consequently, thousands of acres of dura were not harvested while other fields were cut before the crop had already begun to deteriorate. Since dura is both a domestic staple and a major export crop, the economic losses sustained because of this petroleum distribution problem were considerable.

Nearly all rural Sudanese cook with wood products. A growing shortage of fuelwood is a major problem in many parts of the country and has resulted in sharply increased prices and acute deforestation. The efforts under the project to develop rational fuelwood policies and management programs will help stabilize the fuelwood supply and prices. Proper forest management and planned fuelwood production will help correct the ecological damage due to present practices. Farmers and villagers now are concerned over the daily deterioration of their environment which results from overcutting and inattention to the ecological balance.

3. Features of the Social Environment in Relation to the Project

There are no sociocultural institutions or processes which are at variance with the Project's objectives. The prevailing pattern of out-migration of technicians and other skilled individuals to the neighboring Arab states, however, raises a significant socio-economic issue for the project. The social benefits from training and working with expatriate counterparts are too easily lost if trainees leave the Sudan. The delicate issue of individual freedom and social responsibility of trainees to use new skills in the Sudan is not easily resolved.

While it is impossible to guarantee that participants and others receiving technical assistance will remain in Sudan, there are ways of increasing the probability that they will. One method is to select mid-career individuals with families for overseas training. Records show that the typical sojourner is a single male fresh from college or with only a few years of on-the-job service. Naturally, mature mid-career people do leave Sudan but they tend to leave less often than their younger colleagues and remain abroad for shorter periods.

It is now MEM policy to require returning participants to pledge themselves to government services for a specified period. The length of time depends on the length of their training. But there is no real penalty for breaking this agreement. One rational method of preventing unilateral abrogation of these service contracts is to consider some type of bond system. Under such agreements certain wages are set aside and are forfeited by the employee failing to fulfill his service commitment. Another approach which may be used alone or in conjunction with some kind of bond is an incentives scheme. This may be in the form of salary bonuses as the employee gains seniority. This system encourages long-term employees, the organization's most valuable assets, to remain with the organization.

All three of these approaches to the brain drain will be considered and tested, in the project implementation. The EPM also will use on-the-job, in-country training as much as possible both to cut costs and curb the temptations of taking jobs outside of Sudan.

Decentralization

The continued devolution of central government functions to the newly established regional governments raises the issue of the extent to which the functions presently performed by the NEC and other relevant central agencies can be decentralized. NEC is under directive of a recently passed law for PEWC reorganization to decentralize and devolve to regional governments. This will create additional staffing needs, short-run discontinuities in policy and program formulation, and possibly even slow the momentum towards attaining an integrated national approach to energy planning and policy making.

Although there have been suggestions that decentralization might be instituted on a limited basis, it is too early to assess the extent or scope of the decentralization. The project implementor should be aware of any movements to decentralize and take appropriate steps to insure that advisory and policy studies are coordinated with any structural or functional modifications in key organizations.

Decentralization and migration are salient features of the social environment which potentially could have significant impact on implementation and ultimate project success. Since both are well beyond the control of the project, they will be monitored closely and adjustments in training, technical consultations and other inputs will be made as the situation warrants.

4. Summary and Conclusions

The Sudanese citizen, the ultimate beneficiary of this project, is a passive participant: his/her living conditions can only improve as the project's outputs and purposes materialize. More energy will result in more jobs and higher production, hence in rising incomes and a better standard of living. No prevailing social attitudes or customs need be changed for the Sudanese to benefit from the project's ultimate outputs. Urbanization is already a growing trend in Sudan, and while the success of the project might be said to stimulate it marginally (by leading to an expansion of the industrial sector), this would be more than offset by the creation of new employment opportunities and the insulation of the existing job markets from the effects of an unreliable flow of energy. Also more reliable energy supplies in rural areas will lead to a growing rural economy and act to slow down migration to the towns and cities. Overall/project is socially sound.

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IV.D. Economic Analysis

1. GDP losses due to energy problems

The Sudanese national economy generates a GDP of \$ 5 billion annually or approximately \$ 300 of real GDP per capita. Output per capita, adjusted for inflation, has fallen during the last three years. The agricultural, manufacturing and government sectors of the Sudanese economy continue to decline. The construction and service industries, however, were estimated to have experienced some modest but real growth, apparently the result of a combination of private capital transfers by individual Sudanese working out of the country, and government expenditures in these sectors. One of the critical elements preventing a stronger GDP performance is the troubled energy sector, especially electricity supply.

Between 1974 and 1980 demand for electricity doubled but generating capacity grew by only 20%. Consequently, demand outstripped supply and placed excessive stress on the BNG in particular. Power outages which now are a daily occurrence affect all the major domestic sectors. In manufacturing, where 35% of all NEC - generated electricity (292 Gwh) is consumed, the effects are especially damaging. Textiles, cement, sugar and oil and soap production all depend on electricity, and losses incurred by these key industries due to power failures are unmeasured for the economy as a whole.

Textiles consume 33% of NEC generated electricity (80 Gwh). However, textile manufacturers in the Khartoum area have said an average of 110 days per year of lost production was due to power outages. This has meant output of textiles has fallen at the same time that the number of textile factories has risen. Textile spinning operations have been at only 33% of capacity. As a result, Sudan is not yet self-sufficient in textile production despite having the capacity to manufacture sufficient quantities of cloth to meet domestic demand.

The cement industry consumes 1.6% of all NEC sales of industrial electricity. This particular industry operates at about 58% of capacity. It is less frequently subject to the frustration of power outages because of the relatively small amount of electricity in its fuel mix. The industry generates ten times the amount of electricity it buys from its own internal generators. It uses a substantial amount of oil: nearly 100,000 tons of gasoil, 3,000 tons of diesel oil, and nearly 20,000 tons of furnace oil annually. The cement industry's need for what is becoming an increasingly undependable electric supply cannot be compensated by shifting the dependence to oil, which is itself also subject to disruption.

Energy use in the sugar industry shows a similar pattern to cement. Sugar refineries buy 24% of NEC electricity supplied to industry, or 58.8 Gwh of electricity per year. About three-quarters of the sugar industry's electricity needs are generated internally, amounting to 232 Gwh annually. To do so, the industry uses 11,000 tons of gasoil, 38,000 tons of furnace oil and 430,000 tons of crop residues each year. Despite the level of internal generation that should favor reliable operations, the Sudanese sugar industry operated at an indicated 17% of designed capacity utilization in 1980. A major reason for this poor performance is the disruptive impact of unannounced cuts to electrical service.

The manufacture of edible oils and soap takes 13% (31 Gwh) of all electricity sold to industry. This is augmented by internal electricity generation of about 13 Gwh. These industries' fuel mix includes 5,000 tons of gasoil and diesel fuel, 19,000 tons of furnace oil, almost 30,000 tons of wood and 42,000 tons of crop residues. Here again, the electricity component is critical to production. Power outages serve to frustrate smooth, continuous operation. Moreover, energy is used unproductively after outages to reheat cooled boilers and refinery line equipment.

The agricultural sector uses 11% of all NEC-sourced electricity (79 Gwh) and generates 40% of the GDP. The electricity used is devoted to irrigation in the Khartoum area and in the central, northern and eastern regions of the country. Decreased crop yields due to less than optimal watering at critical growth stages result in a lower GDP. The agricultural industry used approximately 91,000 tons of gasoil in 1980. Of this, irrigation used 32%, agricultural operations (tillage, cultivation) used nearly 64%, and the remainder was used for canal maintenance. The electricity used for irrigation pumping is the equivalent of 26,000 tons of gasoil. Roughly half of all agricultural irrigation depends upon electricity. Plans call for expanded electric pumping in the BNG area where 92% of all electric pumping now is done. Doubtless such expansion will place greater stress on the BNG system. This makes load management, outage scheduling, energy efficiency efforts among large users, increased power factor values and improved production per unit energy vital immediately and for the long-term.

Petroleum supply problems also cause production declines. Oil distribution breakdowns affect industry differently than do electricity outages. First, this is because oil is used in more industries for fueling basic processes than is electricity. Second, oil disruptions can cause simultaneous problems across an industry. For example, farms use electricity only for irrigation. Petroleum, however, is used for irrigation, cultivation and tillage and harvesting.

Many manufacturers have installed oil-fired generators to provide their own independent source of electricity. If NEC electricity supplies were able to meet current industrial demand on the BNG and in Port Sudan, it is estimated gasoil consumption would drop by 21,000 tons. This is equivalent to 4% of total national gasoil consumption. Firms and individuals use oil because they believe it is more reliably available but as more manufacturers and farmers choose to use petroleum fuels, the result is a greater drain of foreign exchange to buy oil and further petroleum supply problems. Regardless of the fuel choice, electricity or oil, every sector of the Sudanese economy has production capacity lying idle because of fuel unavailability. Furthermore, the available fuel often is consumed without applying prudent fuel management techniques at a national or individual level.

2. Export losses from electricity outages and petroleum shortages

Sudanese exports consist primarily of agricultural products. Cotton is the principal export commodity followed by groundnuts, sesame and sorghum. In 1981, exports fell 3.3% by value from the previous year. The performance of the irrigated cotton sector has been especially disappointing. Production has dropped by 287,000 bales between 1979 and 1981. The reasons for the decline in cotton production are many but electrical outages contributed to lower production because of inadequate irrigation.

Petroleum shortfalls are doubly injurious. First, they have the direct effect of curtailing all operations using this particular fuel. Second, shortfalls of oil reduce the ability of the electric company to provide peak load service consistently. Export losses due to fuel supply problems annually range into the tens of millions of dollars. Potential exports of commodities which remain unproduced, because of the limited quantities of petroleum, are worth hundreds of millions of dollars each year.

The energy predicament aggravates special problems related to fuelwood. The acacia trees which produce gum arabic, for example, represent a significant export commodity of the nation. On average, a gum arabic tree lives 25 to 35 years with economic quantities of gum being produced after the sixth season. In the Sudan, a significant drop in gum arabic production is estimated to be partially caused by early cutting of acacia trees for fuelwood. If sufficient quantities of conventional fuels existed, either for electric generation or direct substitution for fuelwood, the compound problems of decreased gum export and deforestation would be partially ameliorated.

3. Multiplier Effects of Energy Shortages

Reliable supplies of energy are central to the smooth functioning of any economy. The Sudan is no exception. When oil or electricity supplies fail unexpectedly, the cascade effect of these interruptions causes losses to occur throughout the economy.

One example of note can be cited from the recent experiences of the agricultural sector. In 1981, export earnings from dura were above expectations and as a consequence, many private farmers decided to expand their plantings of this cash crop in 1982. This action was taken on the assumption that dura prices on Saudi Arabian markets would remain strong.

The expanded plantings of dura led to greater demands for diesel to power tractors for tilling the soil and planting the crop. Once planted, more gasoil was needed for pumps to provide irrigation water. Electricity for water pumps was also in demand. Harvesting again called for sufficient distillate fuel to power the farm machinery, and the transport to Port Sudan required additional fuel for trucks. All of these energy demands were made on top of an already overtaxed energy supply system and sufficient petroleum and electricity supplies were not forthcoming. Some farms lost crops, either from inadequate water in the early stages or crops rotting at harvest time. Other agriculturalists sought and received special allocations from the GPC in order to move the dura to markets. These special allocations came from the fixed supplies available and caused more severe shortages elsewhere in the economy. It was a policy judgement that dura harvesting should be given priority.

Unfortunately, the Saudi dura markets weakened in 1982. Export sales opportunities were fewer. The crops remain in surplus and unsold. Meanwhile, those sectors of the economy whose petroleum and electricity allocations were cut were unable to make up for the losses. The outcome produced a double-edged loss.

This multiplier effect could have been reduced very significantly if the national policy decision to give dura exports special energy assistance had been more thoroughly understood (an NEA function), if allocations procedures had been followed more systematically (a GPC function) and if electricity and petroleum supplies had been available in a more predictable and orderly fashion (NEC and GPC functions).

Similar examples could be cited for other crops such as sugar cane and cotton, where domestic self-sufficiency in the production of sugar and textiles has not been achieved despite the construction of sufficient but underutilized productive capacity. Imported sugar raises food costs; imported textiles drain foreign exchange reserves. Both events have negative effects upon the national economy.

4. Savings on Petroleum Purchases

Petroleum imports are overwhelmingly the single largest item in the national budget of the Sudan. Foreign exchange costs for crude oil and refined products imports in 1982 will be \$ 400 million, or about 80% of the value of all Sudanese exports.

Although these sums are quite large in the Sudanese context, the Sudan is a very small oil consumer even in comparison to other African LDCs on a per capita basis. Petroleum imports are around 30,000 bbls per day, when foreign exchange is available. Such small volumes give the GPC little buying power on world markets. In addition, the use of smaller tankers to deliver crude oil and refined products incurs higher shipping costs per bbl relative to other buyers.

GPC can be expected to continue to rely on Saudi Arabia and other Arabian Gulf oil suppliers. The official price for Saudi light crude has been \$ 34 per bbl f.o.b. Saudi Arabia with some discounts to certain buyers. A 6% discount or \$ 2.00 per bbl might be the present limit of Saudi price reductions. Realistically, the Sudan might be able to achieve one-tenth of this amount or about 20 cents per bbl in lowered costs by virtue of more effective purchasing. The same magnitude of potential cost reductions exists for gasoil imports. These reductions would come about from several factors: greater awareness of international market conditions, fewer delays in executing purchase decisions and documentation, longer lead times in scheduling deliveries.

If 20 cents per bbl was saved through a combination of GPC technical assistance and training, this would amount to over \$ 1.7 million per year in foreign exchange savings. Even five cents per bbl would mean \$ 425,000 per year.

5. More electricity available through improved NEC Management

NEC electricity generating capacity in the BNG has a rated capacity of 230 MW with a true capacity of approximately 180 MW. Various capital investment programs are underway that will effectively double NEC generating capacity by the end of the 1980s. The cost of Power III will be \$ 290 million according to IBRD estimates, in order to add 180 MW of new generating capacity, string a new 220 kv transmission line and reinforce existing lines and substations.

If \$ 290 million is needed at today's costs in order to add the equivalent 180 MW that the BNG is now providing, it is clear that the EPM Project could provide substantial benefits to the economy of the Sudan by its expenditures of less than \$ 5 million in foreign exchange on NEC and electricity-related NEA technical assistance and training. On a replacement cost accounting basis, the EPM outlays would need to result in an effective gain of 4 MW or approximately 2% of the 180 MW current generating capacity (and less than 1% when Power III is completed after 1986) in order to recoup the costs. This gain may be achieved by reducing the frequency of outages through better maintenance scheduling which includes preventive maintenance, from overall efficiencies achieved through energy management (e.g. use of load shedding schedules, correction of power factors for industrial and commercial customers), and from better financial accounting practices that strengthen NEC cash flows.

With respect to the cash receipts, NEC accounts receivable are currently averaging over five months. Billings are approximately LS 5 million per month, which represents over LS 25 million in working capital tied up unproductively. Improved billing and collection practices should half this time within two years, which would result in LS 10 - 15 million in NEC capital available for other purposes. It would also reduce the interest charges to carry these outstanding accounts. Assuming a nominal 10% per annum cost of capital, the interest savings every year on LS 15 million would be LS 1.5 million in ongoing cash flow benefits.

6. Economic Benefits of NEA Planning and Analysis

The NEA is less than two years old. Its value to the GOS has not yet been fully demonstrated but there is clear evidence from its performance in 1981 and 1982 that NEA can be an effective arm of the GOS and warrants cost-effective technical assistance and training.

NEA, as a staff group, has the responsibility of conducting energy management planning studies that cross interdisciplinary lines within the MEM. An example of this type of study can be identified from research done under the Energy Policy and Planning Project in the area of the Roseires Dam watershed. NEA learned from this work that local residents had been unable to obtain Kerosene for cooking and illumination (owing to petroleum supply and distribution problems). Substitution of fuelwood for this purpose led to over-cutting of trees in the watershed and a consequent runoff of silt that had a two-fold impact. Top-soil was lost, and the Roseires Dam experienced a reduction in electricity generating capacity because siltation occurred more rapidly than in previous years.

One remedy suggested as part of the proposed Power V is to raise the Roseires Dam, which is the heart of the BNG generating system. This approach would be technically feasible but highly expensive. An alternative approach may be to replant trees and reduce silt runoff. To do this effectively, residents in the Roseires watershed might need to be supplied at least temporarily with alternative petroleum fuels to ensure an end to excessive tree-cutting.

An NEA study of the technical and economic options of these alternative would involve NEC, GPC and forestry personnel in the Ministry of Agriculture, as well as other governmental agencies outside the Ministry of Energy and Mining.

A second example of an inter-Ministry exercise in energy efficiency can be noted. Transportation in the Sudan is the major end use market for diesel fuels. Sudan Railway, long-distance trucks, busses and smaller vehicles are diesel-powered. An efficiency study of freight and passenger travel patterns could lead to improved fuel use arrangements and contribute to savings on foreign exchange, savings in scheduling times and a better prioritization of transport fuel allocations.

To illustrate the magnitude of these potential savings, it should be noted that the transport sector consumed 51% of total petroleum imports in 1980, amounting to 571,000 tons of oil (4.1 million bbls). Implementation of an integrated transportation strategy for the Sudan which led to a 5% reduction in fuel use would generate a gross savings of foreign exchange, at current world oil costs, of \$ 7 million per year. Against this would be set any one-time investment costs to achieve these ongoing benefits.

As a further example of the potential economic benefits of energy efficiency programs that can be formulated with NEA assistance, the industrial sector consumed 15% of total petroleum imports in 1980, or 152,000 tons (1.1 million bbls). A 10% reduction in fuel use by this sector would result in gross foreign exchange benefits of \$ 3.7 million annually arising from lower oil imports.

7. Economic Analysis of Energy Pricing Policy

One of the significant problems found within the energy sector is the distortion in fuel allocations arising from artificially low government-established prices for some petroleum products and certain electricity customers.

The NEC is responsible for the design of electricity tariffs and the GPC has a similar function for petroleum product prices, notably the two key transport fuels: gasoline and diesel. Energy pricing decisions are made by the GOS at the highest level, because these prices can have serious political and social consequences for the Sudanese people.

Presently, the pricing structure for oil products and also for electricity does not reflect the full replacement cost of the primary energy. This means that the GOS is subsidizing energy prices by an indirect transfer from other sectors of the economy. The conscious decision to subsidize energy costs is a legitimate role of government but the cost of this decision needs to be fully understood, and the end-user beneficiaries identified carefully. At this time, the GOS does not have such information.

One manifestation of these pricing and allocation dislocations in the Sudanese economy is the active black market for gasoline and diesel in the more remote parts of the country. An Imperial gallon of gasoil changes hands for LS 10 (\$ 9 per U.S. gallon) in the northern, southern and western provinces, or at a level ten times that of the official price set in Khartoum. Uncertainty of supply and high costs for the limited available supply are key restraints on agricultural developments in these regions.

It is difficult to estimate the impact on rural prices if the official price were to rise. There is insufficient data about the unauthorized reselling of fuel in areas far from Khartoum Province. For example, part of the arms length market prices may reflect the true transportation costs to distant regions of the country. A price for fuels which more nearly approximates replacement costs would have a real impact throughout the Sudanese economy.

For example, in the agricultural sector, higher energy prices would be very likely to lead to a change in crop choice, cropping systems and farm size. With the shortage of seasonal labor in certain agricultural areas of Sudan, the GOS may prefer to subsidize diesel prices to promote further farm mechanization. Similarly, subsidized electricity costs for irrigation pumping may be desirable to promote cash export crops and foreign exchange earnings.

Any energy pricing policy decisions for the Sudan must respond to a wide range of special problems in the functioning of the domestic economy (e.g. poor transportation infrastructure, foreign exchange shortages, slow communications) and government concerns for the public welfare. All policy decisions about national energy prices involve deepset social and political concerns. Given these factors and the present limited information, it is not yet possible to conduct an economic analysis of pricing policy. Thus, one output of this project will be a series of studies on energy pricing to determine how the pricing systems affects the Sudanese people and then to determine what impact any changes in prices might have. The present Energy Policy and Planning Project has provided certain pioneering analyses of Sudanese energy supply and demand patterns upon which further studies can build. Key project outputs are included for both NEA and NEC in the area of energy pricing, and NEA staff will work closely with the GPC on oil product pricing and allocation issues.

8. Recurring Costs

The project will create no significant recurring costs for the GOS. Indeed, the improved management and planning skills acquired by the MEM, GPC, NEA and NEC should lead to lower costs sustained over time in a number of key areas. Examples of areas for cost reduction and revenue enhancement are developed in the Project Outputs.

It is not expected that the MEM will be required to make material increases in the staffing of the GPC, NEA or NEC to achieve the ends of this project. Training with an emphasis on in-country courses using a mixture of Sudanese instructors and short-term technical advisors may help to reduce the employee turnover rate and attrition due to net immigration.

V. Project Implementation

A. Administrative Arrangements

The Implementing Agency for the GOS will be the Ministry of Energy and Mining (MEM) with the Minister assuming responsibility for overall project performance. More specific responsibilities for the project components will rest with the organizational heads of NEA, NEC, and GPC. These Directors will be responsible for specific project activities within their respective organizations. They will assign counterparts to all advisors and concur in decisions about overseas and local training. The Directors or their designees will be responsible for CIP-generated local currencies which have been set aside for project activities. USAID concurrence in expenditure above a level to be determined for project implementation will be required.

On behalf of AID, the USAID Mission Director will have ultimate responsibility for the project. Day to day project management and monitoring will be done by the USAID Energy Officer. Likewise, contractor management and monitoring will be this person's responsibility. The project contractors will submit all progress and other reports and documents to the USAID Energy Officer. He will be the liaison between the three implementing agencies and USAID. The USAID Evaluation Officer and the USAID Energy Officer will be responsible for the conduct of the interim and final evaluations. From the financial standpoint, the USAID Controller will review disbursements and reimbursement requests from the grant to ensure conformity with AID regulations. Additionally, the USAID Controller will check that adequate financial procedures and controls exist within the project.

Two four-year institutional agreements for technical assistance and training will be awarded as direct USAID contracts. These are discussed in detail in the Contracting Agreements section below. The contractors will provide Chief of Party and the necessary administrative and logistic support to manage their respective responsibilities within the EPM project. The contractors will provide advisory services and training to their respective client groups in the MEM. All contract personnel will report to their respective Chief of Party. The two Chiefs of Party will report administratively to their respective contractors and will report to the USAID Mission Director through the USAID Energy Officer. Quarterly progress reports, audits, project studies and all other project reports will be submitted by each contractor to the USAID Energy Officer and the MEM.

Although each contractor will operate independently, the Chiefs of Party will be responsible for coordination of their activities and will provide copies of their reports to each other. To the maximum extent possible, complementary assistance should be planned.

B. Contracting Arrangements

1. Special Immediate Short-term Assistance

The EPM project will provide technical assistance to the MEM within two months of approval and authorization, through the provision of funds to existing AID contracts.

A PIO/T for \$100,000 will give ISTI/Energy Development International funds to continue its activities originally financed by the Energy Policy and Planning Project (936-5703). An additional LS 105,000 in CIP funds will be provided, and ST/EY will fund \$ 200,000 of the ISTI/EDI extension. The purpose of this addition is to continue the energy assessment and analysis started at NEA. Continuity in advisory assistance to the relatively young NEA is important to achieving its acceptance and long-term success and therefore it is anticipated that USAID will request that these services be added to the existing contract.

A sum of \$238,000 will be provided for special advisory services, maintenance, immediate purchasing and stores system and operation problems in the NEC. Because of the urgent requirements of these services it is anticipated that the mission will request that these services be added to the existing contract with Bechtel, presently funded under the ST/EY Conventional Energy Training Assistance Project.

In addition to these two existing contract additions, a contract for \$1,168,000 has been signed with Bechtel for procurement advisory services. Since only \$ 800,000 was available from the CIP Grant, which has already been provided to initially fund the contract, an additional \$ 368,000 will be required to complete the contract funding. This project will provide that amount for the Bechtel Services.

2. Long-term Contracts

Two four-year institutional contracts will be awarded to provide long-term assistance starting at approximately the same time as the immediate short-term assistance is completed. One contract will be let for technical assistance, training and certain commodities needed to achieve project objectives at the NEC. The other contract will focus on assistance to the NEA but also will include GPC training and short-term advisory services. As described previously, the assistance to the GPC is primarily for planning on crude oil and refined products procurement, development of improved refined products allocation systems and an assessment of Sudanese petroleum pricing. These activities relate closely to the NEA energy planning and policy functions and to the planning and management of GPC. No operational assistance will be provided to the GPC. Thus, the decision was made to combine NEA and GPC technical assistance and training into a single contract.

Because the project is designed to provide stronger energy institutions to assist in planning energy use in Sudan, it is essential that the contractors have proven capability to deal with the public sector organizations in developing countries. It is also necessary that they be capable of providing in-country resident advisors with strong LDC and energy planning and management experience. The contractor selection process will involve participation of the GOS with AID. Prospective contractors will identify the Chief of Party, and all other long-term technical advisors in their proposal. For a description of these individual responsibilities, see Annex B, Job Descriptions.

The contractors will be responsible for their respective short term technical assistance recruitment except for the project evaluation which will be contracted independently and directly by USAID. In addition, the contractor will be responsible for implementing all project-funded short-term and long-term participant training in the Sudan, third countries and the U.S. Procurement of commodities except vehicles will be the responsibilities of the contractor. Vehicle procurement will be arranged by USAID.

C. Implementation Plan and Schedule

In order to provide the immediate short-term assistance and negotiate the two long-term contracts at the earliest date, a number of project implementation orders will be issued immediately after authorization. The project schedule is extremely tight in the first nine months after authorization and close monitoring of contracting and ordering is necessary by the USAID Energy Officer. Once the two contractors are selected, the Chiefs of Party will prepare within the first three months of assignment a general work plan and schedule for the life of the project, and a detailed schedule and plan for the next six months of the project. After the first six months, the COP will prepare and update quarterly a detailed 12-month plan. These plans will set time-frames for the accomplishment of the project outputs. USAID and MEM responsibilities and required actions will be included in the plan. The detailed project schedule for the first year and some major project milestones thereafter are listed below:

<u>1. General Activities</u>	<u>Due Date</u>	<u>Responsibilities</u>
1. Execute Project Agreement	Aug. 31, 1982	USAID, GOS
2. Issue PIO/T for EPM Project	Sept. 24, 1982	USAID drafts, GOS and USAID sign.
3. Issues PIO/Ts for a) Supplementary support for Bechtel Procurement/engineering advisory services for BNG	Sept. 30, 1982 to Dec. 31, '83	GOS and USAID sign

<u>General Activities</u>	<u>Due Dates</u>	<u>Responsibilities</u>
b) Contract services for continuation of energy assessment and analysis services for NEA.	Sept.30, 1982 to June 30, '83	
c) Supplementary Support for immediate assistance to NEC on systems and operations problems. (PSC Interim Advisor)	Oct.1, 1982 to July 31. '83	
4. PIO/C issued for project vehicles	Sept. 30, 1982	AID drafts, GOS signs
5. CBD notice issued for long-term institutional contracts.	Oct.5, 1982	AID/W and AID/RCO action
6. RFP completed for long term institutional contract, available for pickup at AID/W.	Oct.15, 1982	AID/W CO.
7. Technical and Cost Proposals due in Nairobi, REDSO/EA.	Dec.31, 1982	Proposers
8. Panel formed and initial rankings made	Feb.15, 1983	RCO, USAID and GOS
9. Final selection of contractors made	Mar.15, 1983	KEU, USAID and GOS
10. Contracts executed	Apr.15, 1983	RCO and Contractors
11. MEM/NEA Chief of Party arrives	May 31, 1983	Contractor
12. NEC Chief of Party arrives	May 31, 1983	Contractor
13. Vehicles arrive	May 31, 1983	USAID and Contractors
14. Baseline evaluation study.	Aug.31, 1983	USAID, GOS and Contractors.
15. Long-term technical advisors arrive	July 1- Oct. 31, 1983	Contractors
16. Detailed work plan and schedule prepared for next 12 month period (to be updated every six months).	Sept.30, '83	Contractors
17. General work plan for entire project completed	Sept.30, 1983	Contractors

<u>General Activities</u>	<u>Due Date</u>	<u>Responsibilities</u>
18. First of quarterly progress reports	Dec.31, 1983	Contractors
19. Interim Evaluation	Jan.15, 1985	Evaluator, GOS and Contractors
20. Final evaluation	Apr.15, 1987	Evaluator, GOS and Contractors.
21. MEM/NEA Chief of Party departs	May 31, 1987	Contractor
22. NEC Chief of Party departs	May 31, 1987	Contractor
<u>(2) NEC Activities</u>	<u>Due Dates</u>	<u>Responsibilities</u>
1. Supplementary Bechtel contract	Sept 30, '82 to Dec.31, '83	GOS and USAID to sign
2. PSC Interim Advisor arrives	Oct.1, 1982 to July 31, 1983	PSC Advisor, USAID
3. Maintenance, Purchasing and Stores Advisor arrives	Oct.1, 1982	Bechtel
4. New tariffs developed	Jan.1, 1983	NEC, Bechtel
5. New organizational structure in place	Mar.31, 1983	NEC
6. Purchasing and stores procedures improved	Mar.31, 1983	NEC, Bechtel.
7. NEC Chief of Party arrives	May 31, 1983	Contractor
8. New maintenance procedures established	June 30, 1983	NEC, Bechtel
9. First short-term training program	Oct.31, 1983	NEC, Contractor
10. NEC Finance, Planning and Budgeting Advisor arrives	July 1 - Oct. 31, 1983	Contractor
11. NEC Energy Efficiency Advisor arrives	July 1 - Oct. 31, 1983	Contractor
12. Maintenance, Purchasing and Stores Advisor departs	Mar.31, 1984	Bechtel

<u>NEC Activities</u>	<u>Due Dates</u>	<u>Responsibilities</u>
13. New financial controls and billings procedures completed	Oct.31, 1984	Contractor
14. Improved load management study completed	May 31, 1984	Contractor
15. NEC Energy Efficiency Advisor departs	July 1 - Oct 31, 1984	Contractor
16. NEC Finance, Planning and Budgeting Advisor departs	July 1 - Oct 31, 1985	Contractor
17. NEC Chief of Party departs	May 31, 1987	Contractor
<u>(3) MEM/NEA/GPC Activities</u>	<u>Due Date</u>	<u>Responsibilities</u>
1. Supplementary EDI/ISTI Contract	Sept 30, '82 to June 30, '83	GOS and USAID sign
2. MEM/NEA Chief of Party arrives	May 31, 1983	Contractor
3. Assignment of all NEA personnel to new organization structure	June 30, 1983	NEA
4. NEA Energy Pricing and Allocations Analyst arrives	July 1 - Oct. 31, 1983	Contractor
5. First of policy option papers prepared	Aug.31, 1983	NEA, Contractor
6. First short-term training course in Sudan	Sept.30, 1983	NEA, GPC, Contractor
7. Study of energy efficiency equipment completed and appropriate programs identified	Jan.31, 1984	NEA, Contractor
8. NEA Planning Analyst arrives	May 31, 1984	Contractor
9. Improved GPC scheduling and distribution system for crude oil and refined products	June 30, 1984	NEA, GPC, Contractor
10. Refined products allocations procedures improved	June 30, 1984	NEA, GPC, Contractor

<u>MEM/NEA/GPC Activities</u>	<u>Due Dates</u>	<u>Responsibilities</u>
11. Detailed national energy plan	June 30, 1984	NEA, Contractor
12. Long-term U.S. training begins	Aug. 31, 1984	NEA, Contractor
13. NEA Energy Pricing and Allocations Analyst departs	Jan. 1 - Apr. 30, 1985	Contractor
14. NEA Planning Analyst departs	Nov. 30, 1986	Contractor
15. MEM/NEA Chief of Party departs	May 31, 1987	Contractor

D. Procurement Plan

Procurement of commodities within the project will be relatively small, amounting to a total of \$ 388,800. In accordance with AID regulations, the source and origin for grant purchased commodities will be Code 941 and the host country. USAID will purchase vehicles directly for the project contractors. Because of the long delivery time, the vehicles will be ordered before the contractors are selected, in order to have their arrival coincide with that of the contract advisors. All other commodity purchases will be made by the contractor directly but the firms will receive USAID assistance.

E. Evaluation Plan

The evaluation plan will consist of two major evaluations, a detailed baseline study conducted by the two contractors and the quarterly progress reports submitted by each contractor. The USAID Energy Officer will be responsible for arranging the two major evaluations. Since the contractors will not be in place for 9-12 months after project approval and a number of immediate short-term interventions will have taken place, each contractor will do an evaluation of their assigned MEM institutions as a baseline report. This information will be used to create their short and long-term working plans and schedules.

1. Interim Evaluation

The Interim Evaluation will be a joint effort of the MEM and USAID at a time early enough to allow adjustment in the project plan to correct any project design errors or compensate for changing circumstances. It will be conducted around January 1985 after 15-18 months of

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long-term contractor assistance. An energy planner and an electric utility specialist will be hired for one month by AID to assist in the evaluation. The team may also include the REDSO Energy Officer if additional assistance is required. Some of the important factors to be considered are as follows:

1. the impact of the immediate short-term assistance.
2. the provision of advisory services and training by the contractors.
3. the extent of coordination of activities by the two contractors.
4. NEA acceptance by the MEM and other GOS Ministries as a centralized energy planning staff.
5. the appropriateness of the relative project contributions to the NEC, NEA and GPC. Special attention will be directed to the GPC in light of the rapidly changing oil sector in the Sudan.

Additionally, each project output will be evaluated to determine the extent to which it has been achieved. The evaluation team will determine if the outputs are still reasonable objectives for the EPM project and, if necessary, will suggest project adjustments.

2. Final Evaluation

About four to six months before EPM project completion, a detailed final evaluation will be completed. The major focus of the effort will be the measure of the project achievement of its purpose, outputs and end of project status. One outside consultant with general energy planning and management experience will be hired for one month to assist USAID and the MEM to complete the evaluation. It is expected that the final evaluation will take place in early 1987.

F. Conditions and Covenants

The EPM project will include no special conditions precedent, but the GOS as grantee will covenant as follows:

(1) Counterpart Personnel: In view of the importance of institutional development to the objectives of this project, the GOS covenants that, except as USAID may otherwise agree in writing, appropriate Sudanese officials will be assigned to work periodically with long-term resident advisors funded under this project.

(2) NEC Donor Coordination: In recognition of the importance of consistency and compatibility of all external donor-funded activities at the NEC, the GOS covenants (a) to keep USAID apprised of such activities, both ongoing and contemplated and (b) to arrange for periodic meetings approximately annually of major donors for the general purpose of coordinating ongoing and planned donor assistance. Following the meeting in May of 1982 another should take place before the end of 1983.

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(3) Private Sector: Because of the important role the private sector can play in improving energy efficiency in Sudan, the GOS covenants that to the maximum extent practical, GPC, NEA and other GOS entities will encourage private sector participation in energy planning, distribution and conservation.

(4) Energy Pricing: The parties agree to a detailed socio-economic analysis of GOS energy pricing policies. This analysis will determine the long-term, full replacement cost of electricity and petroleum fuels, compare these to current real costs and prices, and suggest appropriate pricing adjustments to more fully reflect current and likely future costs of energy, including foreign exchange costs, in a manner that is consistent with GOS economic objectives.

VI. A. PROJECT DESIGN SUMMARY

LOGICAL FRAMEWORK

Project Title and Number: Sudan Energy Planning and Management (650-0059)

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
<p>Program or Sector Goal:</p> <p>To ease energy related constraints to economic recovery while contributing towards a longer term goal of meeting Sudan's energy requirements for domestic, agricultural and industrial uses.</p>	<p>Measures of Goal Achievements:</p> <ol style="list-style-type: none"> 1. Improved GNP in energy sensitive sectors. 2. GNP per unit of energy consumed increases. 3. Energy allocations correspond with national and regional development priorities. 4. Type of energy consumed recognizes environmental and economic constraints in Sudan. 	<ol style="list-style-type: none"> 1. Energy supply and demand analysis 2. Economic and energy statistics 3. GOS energy management plans and programs. 	<p>Assumptions for achieving goal targets:</p> <ol style="list-style-type: none"> 1. The real price of oil remains stable for the next five years. 2. Sufficient foreign exchange is available for the purchase of oil. 3. Hydro and thermal electric power plant construction remains close to schedule. 4. MEM has the authority to implement its plans and policy.

Project Title and Number: Sudan Energy Planning and Management (650-0059)

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
<u>Project Purpose:</u>			
<p>a. Increase the short-term reliability of the Blue Nile electric power grid and improve the managerial and financial capability of the NEC to generate, transmit and distribute power in bulk.</p> <p>b. Improve the capability of NEA and GPC to plan and prepare for the most efficient use of Sudan's energy resources.</p>	<p align="center">End-of-Project Status</p> <ol style="list-style-type: none"> 1. NEA will provide more reliable electricity service through regional electricity boards and by (a) improved NEC organization and management structure, (b) orderly maintenance and repair schedules, (c) effective use of spare parts provided by CIP and (d) improved cash flow by accelerating collection of accounts payable. 2. NEA will be capable of planning and advising on implementation of energy supply and demand policies that are of optimal benefit to the Sudan. 3. GPC will have reviewed planning techniques and appropriate policies to import, process and distribute petroleum products in an orderly fashion. 4. Public corporations, government institutions and larger private companies will use energy supplies more efficiently. 5. Commercial and financial arrangements for distribution, service of and financing of cost-effective and energy-efficient equipment will have been strengthened. 	<ol style="list-style-type: none"> 1. NEC and GPC operating and financial records 2. NEA data studies and recommendations 3. Project Evaluations 4. Energy consumer records of production and energy use 5. Contracts and agreements between oil companies and GOS. 	<ol style="list-style-type: none"> 1. NEC has ability to generate and retain operating revenues to the satisfaction of the GOS 2. The policy analysis and planning functions of NEA are accepted by GPC, NEC and other section of MEM. 3. GOS implementation of regional government programs is conducted in a clear and timely manner to permit project to respond accordingly. 4. Trained individuals return/their positions in MEM.^{to}

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Project Title and Number: Sudan Energy Planning and Management (650-0059)

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Project Outputs	Magnitude of Outputs:	<u>NEA</u>	Assumptions for achieving outputs:
<u>NEA:</u>			
1. Adoption of and orderly transition to new organization structure	1. x	1. NEA records and accounts.	1. Commercial users desire to improve energy efficiency.
2. National energy supply and demand planning and evaluation functions consolidated at NEA.	2. x	2. Project records and evaluations 3. Review of NEA studies. 4. MEM and AID records	2. Cooperation of GPC NEC and private sector in providing suitable information to NEA.
3. Energy analyses and policy option papers prepared	3. 10	5. Project evaluations	3. Cooperation of public in NEA analyses.
4. Detailed energy plans completed and reviewed annually.	4. Once per year	6. Contractor records 7. Observations	4. Demand for electricity generation from BNG remains constant or grows proportionate to capacity of BNG.
5. Recommended policies and plans implemented	5. x		
6. Capacity for computer assisted data processing and analysis expanded.	6. 5 people		5. NEC management will endorse reorganization and adjust functional duties among the several departments.
7. Plan for regional energy allocation developed.	7. One plan		6. Private sector marketing companies assist GPC in data areas and work with GPC for mutual benefit.
8. Energy pricing and regulations in accordance with national development priorities implemented.	8. Two reviews of pricing and regulations.		
9. Fuelwood and traditional energy sub-sector policy established and initial action taken.	9. One policy		7. Public and private professional skills are effectively tapped.

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Project Title and Number: Sudan Energy Planning and Management (650-0059)

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
10. Expanded use of appropriate energy-efficient equipment promoted.	10. One Study		
11. Energy information needs prioritized and strategies implemented.	11. One policy study; 100 publications acquired/developed distributed in quantity.		
12. Case studies of successful energy-efficiency operating experience prepared and findings disseminated.	12. 20 reports.		

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Project Title and Number: Sudan Energy Planning and Management (650-0059)

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Project Outputs:	Magnitude of Outputs:		
<u>NEC</u>			
1. New NEC organizational structure and management procedures developed and implemented.	1. x	1. NEC management structure diagram and corporate policies handbook	
2. Maintenance procedures reviewed	2. x	2. Maintenance schedules	
3. Purchasing and stores procedures reviewed.	3. x	3. Purchasing and stores documents	
4. Planning and budgeting procedures and techniques reviewed	4. x	4. Planning documents and budgeting systems.	
5. Financial controls system and billing procedures reviewed.	5. Collection improved 25% by year 3 and 60% by year 4	5. Financial control systems and accounts receivable reports	
6. Energy efficiency and load management programs reviewed	6. x	6. Energy efficiency and load management programs.	
7. Tariffs reviewed for NEC and regional governments.	7. x	7. Revised tariff schedules	

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Project Title and Number: Sudan Energy Planning and Management (650-0059)

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumption:
Project Outputs"	Magnitude of Outputs	GPC	
<u>GPC:</u>			
1. Flexible oil products allocation system designed.	1. One System	1. Operational and financial records	
2. Improved distribution scheduling systems designed.	2. One system	2. Review of reports	
3. Reductions in oil and refined products purchase costs	3. Average saving or 20 cents/barrel	3. Contractor records and project evaluation	
4. Improved financial management systems	4. x		
<u>Project Inputs:</u>			
Technical Assistance	Please see budget for details	1. Technical Assistance contract documents 2. Training schedules and plans 3. AID internal reports 4. Interim reports from contractor 5. GOS budget documents	1. Necessary GOS support provided to the proje 2. AID funding is available on a timely basis through term of the project
Training			
Commodities			
Local Currency			
Please see Budget for details			

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VI.B. Job Descriptions

1. MEM/NEA Chief of Party

The MEM/NEA Chief of Party shall be an employee of a U.S. contractor who will assist the GOS in implementing the Energy Planning and Management Project. This specialist reports functionally to the Minister of Energy and Mining, and administratively to the USAID Project Manager. He also reports through normal corporate channels of the contractor to ensure that all contractual obligations are met.

a. Scope of Work

Management

This specialist will:

1. Manage and supervise MEM, NEA and GPC project activities and project personnel.
2. Assist the NEA in developing objectives, priorities, directives and strategies; coordinating preparation of long-range, intermediate, and annual work plans; and implementing strategies as deemed appropriate by NEA.
3. Assure the achievement of NEA project outputs.
4. Develop administrative, financial, organizational and implementation plans and procedures to carry out these work plans.
5. Supervise financial management of project funds, budget and disbursement of project funds for procurement of commodities and training.
6. Act as the NEA Resident Advisor, reporting to the head of the NEA in the conduct of his programs at the NEA, to ensure the coordination of these programs with NEC, GPC and other GOS departments and agencies.
7. Advise on the selection of short-term project consultants, and coordinate their inputs.
8. Select and procure contract commodities for project use.
9. Establish and maintain relationships and close cooperation with other donors, private sector companies, other governmental bodies, Sudan Renewable Energy Center personnel, and private voluntary organizations in support of NEA objectives.
10. Assure that Sudanese capabilities in energy planning and management are upgraded to the point where NEA is capable of carrying on when the project is completed.
11. Monitor recurring costs to ensure that the limited GOS budget can continue to support full-capacity operations of the NEA upon completion of USAID assistance.
12. Perform all other functions normally related to the Chief of Party position for effective management of the EPM project at the MEM, NEA and GPC.

Training

1. Assist the NEA and GPC in assessing NEA and GPC manpower training needs.

2. Advise on the selection of long-term and short-term training programs in the U.S. and in third countries.
3. Recommend and coordinate U.S. and third country participant training using contract funds.

Reporting

1. Assist in organizing USAID monthly meetings. An agenda will be prepared before each meeting highlighting actions requested and taken for each issue on the agenda. The agenda will continue to carry pending issues until resolved.
2. As requested by USAID, prepare special reports on project activities.

MEM Policy Advisor Responsibilities

He shall be available to the MEM as a Policy Advisor. Approximately one-half of the project time will be required in this function. The other half of his time will be spent in support of NEA.

b. Minimum Qualifications

1. B.S. in a natural resources technology or natural resources management discipline, plus either an M.S. in engineering or an M.A./M.B.A. in energy economics, business administration or public policy management.
2. Fifteen years of practical experience in management of interdisciplinary technical and non-technical functions in the energy field which includes experience at a senior administrative level. At least two years experience related to the organization of governmental institutions responsible directly for energy planning and management.
3. Two years of work experience in an LDC, at least one year of which must include administration of development projects under hardship conditions.
4. Superior written and verbal communication skills.
5. Willingness to study and learn spoken Arabic if not already fluent.

Other Factors Given Consideration

- A. Spoken Arabic at FSI level 2 or above.
- B. Past experience in Sudan or Africa.
- C. Functional experience in electric industry or petroleum industry.
- D. Experience in working with the private sector, public organizations and institutions, and private voluntary organizations in LDCs.

2. NEA Planning Analyst

The NEA Planning Analyst shall be an employee of a U.S. contractor who will report functionally to an appropriate NEA counterpart and administratively to the MEM/NEA Chief of Party.

a. Scope of Work

Management

1. Help to organize and define NEA data collection and analysis functions.
2. Supervise the collection and analysis of energy supply and demand data.
3. Develop prioritized policy and program alternatives arising from the study of these data.
4. Assist in development and implementation of management plans and program strategies deemed appropriate by NEA and GPC.
5. Establish working relationships with individuals doing related work, both within the Sudan and elsewhere, such as the Sudan Renewable Energy Center.
6. Identify and recommend U.S. short-term technical assistance in support of NEA and GPC.
7. Assure achievement of all NEA and GPC project outputs.

Training

1. Assist in assessing NEA manpower needs.
2. Identify and prioritize NEA training needs and, where deemed appropriate by NEA, coordinate and administer local in-country training programs and production of training materials in the Sudan.
3. Assure the acquisition and development of written and individual training materials and their effective use.
4. Assure continued development of the NEA library and its effective use.

Reporting

1. Prepare brief monthly reports on project activities for USAID and the GOS. The reports will highlight the achievements, issues, problems and recommendations associated with the project. The format will be agreed with the GOS and USAID.
2. Prepare an annual report on project activities and progress. The format will be agreed upon by the GOS and USAID.
3. Assist the NEA in presenting project findings to GPC, NEC or other relevant GOS agencies.

b. Minimum Qualifications

1. B.A. or B.S. in economics, statistics or scientific discipline.
2. M.B.A. in business administration or M.A./M.S. in economics, or public policy.

3. A minimum of seven years experience in related fields (e.g. market research, corporate planning), of which two years should be related to energy planning and management for developing countries.

4. A minimum of one year experience in an LDC living under hardship conditions.

5. Experience collecting and analyzing data, preparing reports and carrying out policy analyses in energy economics.

6. Practical experience in the administration and implementation of development projects and the ability to work in an interdisciplinary team.

7. Superior written and verbal communication skills.

8. Willingness to study and learn Arabic if not already fluent.

c. Other Factors Given Consideration

1. Spoken Arabic at FSI level 2 or above.

2. Past experience in the Sudan or Africa.

3. Formal training in a relevant energy discipline.

3. NEA Energy Pricing and Allocations Analyst

The NEA Energy Pricing and Allocations Analyst shall be an employee of a U.S. contractor who will report functionally to an appropriate NEA counterpart and administratively to the MEM/NEA Chief of Party.

a. Scope of Work

This specialist will:

1. analyze GPC crude oil and refined products supply and procurement practices, supply schedules and distribution arrangements and recommend changes where appropriate.
2. advise GPC on options for implementing agreed changes to supply and distribution arrangements, and assist GPC in making these changes where appropriate.
3. analyze logistics and scheduling activities between Port Sudan refinery, PPPPC (pipeline company), GPC and private-sector marketing companies.
4. analyze existing GPC allocations practices and alternative plans and programs for the allocation of refined petroleum products by region and by end-use sector of the economy.
5. design and conduct technical and economic analyses of the relative impact upon the Sudanese economy of various pricing policies for electricity rates and refined petroleum products.
6. establish and maintain working contacts with appropriate professional staff in other GOS entities and the private sector in order to have access to any available expertise from these sources.
7. assist the work of other long-term and short term advisors in related fields, particularly those engaged in energy pricing and allocations issues at NEC and GPC.

b. Minimum Qualifications

1. B.A. or B.S. in relevant field of study, e.g. distributive trades, operations research, commerce, energy economics.
2. Ten years experience in energy industry with primary emphasis on the operation of terminals, pipelines and road tank wagons, and the scheduling of oil shipments in bulk.
3. At least two years experience in international crude oil and petroleum products trading would be helpful.
4. One year of work experience in energy projects related to LDCs, preferably including six months of hardship post in Africa.
5. Language ability in Arabic or a willingness to learn Arabic would be helpful.

4. NEC Interim Resident Advisor

This person will be a Personal Services Contractor and will provide one year of senior advisory services, as soon as possible, (October 1, 1982) to the Director General of the NEC.

a. Scope of Work

1. Act as the personal advisor to the Director General on all matters concerning organization, finance, accounting and tariffs, engineering, construction and operations, billings and customer and employee relations.

2. Be at the disposal of the Director General to work on any special projects that might be assigned.

3. Attend any international donor meetings as might be required.

B. Minimum Qualifications

1. B.S. in Electrical or Mechanical Engineering.

2. Twenty-five years of progressive professional experience in electric utility organization(s) and/or consulting firms. At least five of these years must have been in the capacity of a senior manager.

3. Proven administrative experience and superior written and verbal communications skills.

4. Experience in a smaller U.S. electric utility would be particularly desirable.

5. One year of work experience in energy projects related to LDCs, preferably with six months residency at hardship posts in Africa.

6. Language ability in Arabic or a willingness to learn Arabic would be helpful.

5. NEC Chief of Party

The NEC Chief of Party shall be an employee of a U.S. contractor who will assist the GOS in implementing the Energy Planning and Management Project. This specialist reports functionally to the Minister of Energy and Mining, and administratively to the USAID Project Manager. He also reports through normal corporate channels of the contractor to ensure that all contractual obligations are met.

a. Scope of Work

Management

This specialist will:

1. Manage and supervise NEC project activities and project personnel.
2. Assist the NEC in developing objectives, priorities, directives and strategies; coordinating preparation of long-range, intermediate, and annual work plans; and implementing strategies as deemed appropriate by NEC.
3. Assure the achievement of NEC project outputs.
4. Develop administrative, financial, organizational and implementation plans and procedures to carry out these work plans.
5. Supervise financial management of project funds, budget and disbursement of project funds for procurement of commodities and training.
6. Act as the NEC Resident Advisor, reporting to the head of the NEC in the conduct of his programs at the NEC, to ensure the coordination of these programs with NEA, GPC and other GOS departments and agencies.
7. Advise on the selection of short-term project consultants, and coordinate their inputs.
8. Select and procure contract commodities for project use.
9. Establish and maintain relationships and close cooperation with other donors, private sector companies, and other governmental bodies, in support of NEC objectives.
10. Perform all other functions normally related to the Chief of Party position for effective management of the EPM project at NEC.

Training

1. Assist the NEC in assessing NEC manpower training needs.
2. Advise on the selection of long-term and short-term training programs in the U.S. and in third countries.
3. Recommend and coordinate U.S. and third country participant training using contract funds.

Reporting

1. Assist in organizing USAID monthly meetings. An agenda will be prepared before each meeting noting actions requested and taken for each issue on the agenda. The agenda will continue to carry pending issues until resolved.
2. As requested by USAID, prepare special reports relating to project activities.

b. Minimum Qualifications

1. An undergraduate degree in a related technical area and preferably an MBA or formal training in the areas of management and planning.
2. Fifteen years experience as a senior manager in U.S. electric utilities. Experience should be concentrated in the areas of operations and maintenance, including construction. Additional experience should include commercial planning aspects of an electric utility.
3. Two years of work experience in an LDC, at least one year of which must include administration of development projects under hardship conditions.
4. Proven administrative experience and superior written and verbal communications skills.
5. Willingness to study and learn spoken Arabic if not already fluent.

Other Factors Given Consideration

1. Spoken Arabic at FSI level 2 or above.
2. Past experience in Sudan or Africa.
3. Experience in working with the private sector and public organizations and institutions in LDCs.

6. NEC Maintenance Purchasing and Stores Advisor

This person will be an employee of Bechtel who will be responsible for assistance pertaining to NEC maintenance, and purchasing and stores. He will report functionally to an appropriate NEC counterpart and administratively to Bechtel.

a. Scope of Work

This specialist will:

1. Review NEC maintenance procedures and operations, and recommend possible improvements.
2. Review NEC purchasing and stores procedures and operations, and recommend possible improvements.
3. Assist in implementing any of these above recommendations as agreed upon by the management of NEC.
4. Train Sudan^es counterparts in the area of maintenance, and purchasing and stores.
5. Supervise any related short-term assistance and training.

b. Minimum Qualifications

1. An undergraduate degree in engineering or a related area.
2. Ten years related experience in materials equipment and supplies with U.S. electric utilities, preferably in a small or medium-sized rural utility.
3. Proven administrative experience and ability to work in an interdisciplinary team.
4. Superior written and verbal communications skills.
5. One year experience in projects involving LDCs.
6. Willingness to learn spoken Arabic would be an advantage.

Other Factors Given Consideration

1. Spoken Arabic at FSI 2 level or above.
2. Past experience in Arabic-speaking countries living under hardship conditions.
3. Experience in working with public organizations and institutions in LDCs.

7. NEC Financial Controls and Planning Advisor

This advisor shall be an employee of a U.S. contractor who will be responsible for assistance pertaining to NEC financial control and planning activities. He will report to the NEC Chief of Party.

a. Scope of Work

1. Review NEC financial procedures, and planning procedures and techniques, and recommend possible improvements.
2. Review NEC billing and debt collection procedures and operations, and budgeting procedures and recommend possible improvements.
3. Review NEC and regional government tariffs, and recommend possible improvements.
4. Assist in implementing any of the above recommendations as agreed upon by the management of NEC.
5. Train Sudanese counterparts in the areas of finance and financial controls, and budget planning.
6. Supervise any related short-term assistance.

b. Minimum Qualifications

1. B.A. or B.S. in finance, accounting or business administration, and an M.A./M.B.A. in economics or business administration.
2. Ten years related financial controls and planning experience with U.S. electric utilities.
3. Proven administrative experience and ability to work in an interdisciplinary team.
4. Superior written and verbal communication skills.
5. One year experience in projects involving LDCs.

Other Factors Given Consideration

1. Spoken Arabic at FSI level 2 or above.
2. Past experience in Arabic-speaking countries living under hardship conditions.
3. Prior experience with financial controls and planning related to small utility systems.
4. Experience in working with the private sector and public organizations and institutions in LDCs.

8. NEC Energy Efficiency and Load Management Advisor

This advisor shall be an employee of a U.S. contractor who will be responsible for assistance pertaining to energy efficiency and load management. He will report to the NEC Chief of Party.

a. Scope of Work

1. Review NEC and its large commercial/institutional/governmental and industrial customers efforts to use electricity efficiently and recommend strategies for improvement in cooperation with similar NEA survey work of major petroleum end-users.

2. Prioritize NEC and national training needs for professionals and lower-level technicians in electrical energy efficiency, and implement training strategies and programs as deemed appropriate by NEC.

3. Train Sudanese counterparts in the areas of improving energy efficiency and load management.

4. Evaluate the performance, cost-effectiveness and applicability of various types of industrial and commercial electrical equipment to determine their appropriateness for use in the Sudan. Work in cooperation with NEA evaluation of petroleum-using equipment.

5. Using NEC personnel, conduct electrical equipment surveys of a select number of large energy-users to determine equipment needs to improve energy-efficient utilization of electrical power. Work in cooperation with NEA sponsored survey work of petroleum using equipment to develop prioritized lists of end-users equipment needs for possible consideration under future USAID Commodity Import Program allocations.

6. Review NEC load equipment programs and recommend possible strategies for improvement.

7. Assist in implementing any of the above recommendations as agreed upon by the management of NEC.

8. Provide instruction in load management and energy-efficiency to university and polytechnic faculty and students, engineers through the Sudan Engineering Society, and short-term management instruction through the Management Development Center or other appropriate associations.

9. Assist in organizing large-user working groups on energy-efficiency and load management for industrial users and large commercial/institutional/governmental end-users.

b. Minimum Qualifications

1. B.S. in electrical or mechanical engineering, preferably with a minor in economics or business administration.

2. Seven years related experience in load management, selection of energy-efficient equipment, and design of energy-efficient systems for industrial and commercial/institutional applications.

3. Proven administrative experience and an ability to work in an interdisciplinary team.

4. Superior written and verbal communication skills.

5. One year experience in projects involving LDCs.

6. Willingness to learn spoken Arabic would be an advantage.

Other Factors Given Consideration

1. Spoken Arabic at FSI level 2 or above.
2. Past experience in Arabic-speaking countries living under hardship conditions.
3. Prior experience with load management and energy-efficiency related to small utility systems.
4. Experience in working with the private sector and public organizations and institutions in LDCs.

VI.C Sudanese Oil and Gas Exploration

Oil exploration in the Sudan has been accelerating following the announcement in the past two years of discoveries by Chevron Overseas Petroleum, Inc., a subsidiary of Standard Oil of California. Chevron is still the leading exploration firm, and the only one which has reported success to date. As of 1982, Chevron had invested over \$300 million in oil exploration in the Sudan. Several other firms are also engaged in exploration. These firms include: Texas Eastern, Union Texas (an Allied Chemical subsidiary), CFP Total (France), Phillips Petroleum, Sunmark (a division of Sun Oil), and Transpacific Oil and Minerals (Canada). Letters of interest have been received by the Ministry of Energy and Mining from Mobil, Ensearch and Atlantic Richfield.

Oil Exploration dates to 1959, when the Italian firm Agip explored the Red Sea coast and drilled six wells. Only one of these, the Derwara 2, tested hydrocarbons, but was deemed uncommercial.

Through the 1960s and early 1970s, a number of firms explored this same Red Sea area. These include Shell, Texaco, American Pacific Company, Ball and Collins Group, Ocean Oil, and most importantly Chevron. Chevron was the only one of these companies to drill any wells in the area. Two wells tested noncommercial hydrocarbon flows and the other was dry. In 1977, Chevron relinquished their Red Sea concession to concentrate on a 516,000 sq. km block in southcentral Sudan. It was here that oil was first discovered in 1978 at the Abu Jabra field. Subsequent discoveries were made in the Unity and Tallih fields located near Bentiu, and the Tabaldi and Shariff fields located near Muglad.

Chevron is now developing these finds, of which the Unity field has the highest potential. Here, oil is found in 15 ft. sandstone reservoirs at a depth of from 11,000 to 14,000 ft. Probable reserves in place are estimated at 300 million barrels of light crude, of which only 80 million barrels may be recoverable. Chevron has stated that the existing wells of the Unity field are likely to yield 8,000 - 10,000 bbls per day for at least ten years.

Production from all Chevron discoveries to date may be 15,000 bbls per day. However, production is not yet established because there is no refinery in the region. Plans for a 5,000 bbls per day topping plant or mini-refinery were put forward, but then cancelled and the new refinery to be built in Kost, is not expected until after 1986.

Chevron continues to explore and drill on their existing concession. Chevron also has a 78,000 sq. km tract in the Melut block south of Malakal. Regional exploration is scheduled to begin here in 1983.

Second on the scene in the Sudan was the French state firm, CFP. In 1979, they were awarded a concession covering 7,500 sq. km onshore near the Red Sea. They have drilled one unsuccessful well. Other CFP concessions include 150,000 sq. km and 45,000 sq. km blocks awarded in 1980. Both are located in south central Sudan. No drilling is expected in these tracts before 1983.

In 1979, Texas Eastern signed an exploration agreement for 27,000 sq. km offshore in the northern Red Sea and in 1980, Union Texas signed an agreement to work a 4,250 sq. km strip along the Red Sea, south of Port Sudan. They have recently begun drilling the Digna 1 at this location.

In 1981, interest in Sudanese exploration concessions continued to grow. In this year, Phillips Petroleum signed an agreement to explore a 120,000 sq. km concession in northcentral Sudan. Two other agreements, a 70,000 sq. km concession with Transpacific Oil and Minerals of Canada in south central Sudan, and a 172,000 sq. km tract for Sun in central Sudan, were about to be signed in June 1982. If these agreements proceed, over 30% of the country will be under exploration license. Mobil, En-search and Atlantic Richfield have expressed interest in concessions, and Shell and Elf Aquitaine are reportedly being considered as partners in the Phillips blocks. The acceleration in exploration and development activity is evident from drilling footage data. After Agip completed their sixth well in the early 1970s, a cumulative total of 50,000 ft. had been drilled. By 1978, footage reached 80,000 ft. for nine wells, and by 1982, a total of 31 wells had been drilled for a total depth of 310,000 ft.

At the beginning of 1982, of these 31 wells, six were drilled by Agip, one by CFP and 24 by Chevron. Expenditures to date by Chevron have been about \$300 million. Of Chevron's 24 holes drilled, 12 were dry, three have been capped for later evaluation and nine showed oil. Of these nine, five wells were judged to be commercial. These are Abu Jabra, Unity, Tabaldi, Sharaf and Tallih. The Unity field has had several stepout wells drilled. The timing of these discoveries and the reported flow rates are summarized below.

<u>Field</u>	<u>Date Tested</u>	<u>Test Flow, bbls/day</u>
Abu Jabra	July 1979	575
Tabaldi	Aug. 1979	135
Sharaf	July 1980	3,600
Unity 2	Mar. 1980	2,900
Unity 3	May 1980	2,900
Unity 5	Sep. 1980	3,600
Unity 7	Jan. 1981	2,900
Tallih	Feb, 1981	3,600

Oil exploration is expected to continue at a rapid pace in the Sudan. The prospects of new discoveries are high, and the uncertainties associated with possible major changes in domestic oil production potential will be a key factor in Sudanese energy management planning.

VI.D Kosti Petroleum Refinery

Recent crude oil discoveries in the Sudan, combined with the country's unfilled demand for petroleum products, have led to plans for construction of a new oil refinery at the Nile River port of Kosti, located 275 km south of Khartoum. Engineering and financial plans have been reviewed by the World Bank and by Chevron. The Ministry of Energy and Mining indicates a choice of refinery design and financing is imminent. Once this occurs, tender offers for construction can be evaluated and construction started. A refinery may be completed at Kosti by 1986. However, the high cost of a pipeline, and the rapidly changing situation in oil exploration have raised considerable uncertainties about the refinery size, configuration and cost.

In August 1981, an agreement was signed between the Sudanese government, the International Finance Corporation (IFC) -- a World Bank affiliate -- and Chevron Overseas Petroleum, Inc. (Chevron). This agreement created the White Nile Petroleum Company whose purpose is the financing, planning, construction and operation of the Kosti refinery. Under the terms of this agreement, the Sudanese government and Chevron were each to own 40% of the company's equity, while the IFC was to hold 20%. The equity split has since been restructured to cut the Chevron stake to 20% and raise the Sudanese government to 80%.

White Nile Petroleum Company has issued invitations for initial engineering and financing planning. Chevron and Bechtel Company are hired consultants on the design and management of the project, and discussions concerning the refinery configuration and financing are well advanced. These firms have offered five alternative design proposals, each providing for a slightly different slate of refined products.

Indications to date suggest that a 15,000 bbls per day capacity refinery may be constructed. Crude oil will be shipped via a 550 km pipeline from the Unity field. The refinery's planned capacity may be increased to 25,000 bbls per day if sufficient reserves are discovered in proximity to the pipeline. The total cost of the pipeline, refinery and offsite facilities is estimated by the World Bank to be about \$800 million.

Project financing will be arranged by the White Nile Petroleum Company and it is likely that the equity holders will underwrite the plant, each contributing a share approximately equal to its equity share in the company. However, other means of financing are being weighed, and the equity percentages may change. The key is long-term financing from the World Bank.

Although the Kosti location was chosen by President Nimeiri, a Bentiu location had received some attention. Southern Region politicians had desired that the plant be built in the south. They expected that this would bring badly needed infrastructure development, employment and tax revenues for their region.

On the basis of distribution economics, the Kosti location is a better one. Kosti is located on the White Nile River at the point where the railway to the west and south crosses. It is the northern terminal for river traffic. This would enable relatively convenient product distribution to the south and west, an objective of the refinery.

The completion of the Kosti refinery will materially alter Sudan's petroleum product distribution network. The small existing refinery at Port Sudan would continue to import crude and provide petroleum products to the north, east and Khartoum. The Kosti refinery would pipeline Sudanese crude from the Unity field area and distribute products mostly to the south, west and Khartoum. The impact of these changes on the logistics of crude oil and products movements in Sudan will be extensive. The scale of these distribution changes will be in large part controlled by the eventual decisions on the size and type of oil product outputs planned for the Kosti refinery.

IV, E, Fuelwood

Bioenergy is the dominant source of energy for the Sudan and accounts for about 85% of national energy supplies. The main form this energy takes is fuelwood 51% and charcoal 27%. Other biomass sources account for the remainder. It is estimated that over 14 million tons of wood are removed from Sudan's forests annually. Consumption is growing at 2.2 percent per year, but this rate of consumption cannot be sustained, with shortages likely to begin in the late 1980's. Already extensive deforestation, desertification, and soil erosion are occurring. Almost all fuelwood energy is used for purposes in urban and rural areas. Approximately seven percent of the fuelwood is used in bakeries, brick-making, industrial boilers, restaurants, pottery firing and tobacco curing.

A delineation by type of ground cover was recently made of all forested areas in Sudan using Landsat satellite imagery. This exercise determined that changes in forestry cover have been so rapid and significant in the Kassala, and Blue Nile and White Nile Provinces, the ground reconnaissance is needed to verify these satellite-based ground-cover estimates.

One of the main trees in northern Sudan used for charcoal is Acacia senegal, the source of gum arabic, one of Sudan's major agricultural cash crop exports. Whereas these trees have a productive life of 20-30 years, trees of nine years or less are being cut for firewood and charcoal production. Also, although cutting of trees on communal land is prohibited by law (except for clearing land of cultivation), this regulation has largely been ignored because the demand for fuelwood cannot be met through other nearby sources.

Wood cutting and charcoal production have become increasingly attractive sources of rural income, creating an unfortunate tendency toward over-dependence on these sources of income. Deforestation causes soil erosion followed by declining soil productivity and lower rainfall. These effects are damaging to farmers and nomads alike. As a result, people are forced to migrate and settle where one of the options for earning a living is charcoal production or selling firewood.

Charcoal producers fit into four categories: those who make charcoal from trees in their own fields; those who buy the right from others to cut their trees and produce charcoal for sale; those who cut trees or use fallen trees on communal land; and those supplied and organized by a wholesaler. Because of the use of inefficient production methods, six to seven tons of wood are required to make a ton of charcoal.

Because acquisition of wood is less arduous than production of charcoal, woodsellers are often women and children. In the Bora area, Kababish people who lost their animals during a prolonged drought, settled in tents on the outskirts of the town and took up wood cutting and selling as their main livelihood. These people, although aware of regulations, resort to cutting trees on communal land or land belonging to someone else, and cut immature trees because of the necessity to make a living. Pressures on wood

supplies are made worse by the fact that fuelwood sales and taxes are a source of revenue for local governments.

The imbalance between fuelwood supply and demand can only be corrected through the interlinked and lengthy tasks of providing for adequate reforestation, improving the efficiency of charcoal production, and increasing the efficiency of wood and charcoal use. The Government of Sudan, with the assistance of several foreign donors, has embarked on an ambitious program to improve the supply of fuelwood. Efforts are also underway to implement projects to refine and disseminate technologies that will improve fuel use efficiencies and find other renewable energy substitutes for wood and charcoal. One such project is the USAID-funded Rural Renewable Energy Project (650-0041). Some of the technologies being considered under this project include improved charcoal kiln, more efficient wood stoves, briquetting and charcoal production from biomass wastes, and solar cookers.

VI. F. Sudanese Immigration and Training Methodology

One feature of the Sudanese economy is the willingness of the male Sudanese to work abroad in the Arabian Gulf and Saudi Arabia. Remitted earnings are an important source of income for numerous families. The tendency is for these workers to remain abroad for a few years but not indefinitely, and eventually to return to the Sudan. All walks of life are affected, ranging from low-level service industry jobs (e.g. hotel workers) to skilled tradesmen (e.g. welders) to clerical and professional ranks (e.g. engineers).

The main attraction is a vastly different salary structure outside of the Sudan. Comparable skills draw five times the Sudanese salary in Saudi Arabia; even higher multiples are quoted. This is not surprising in light of the fact that unskilled labor earns about LS 60 per month in the Sudan (the problem is exacerbated by the relatively lower wages paid to government employees). NEC computer center machine operators, for example, are reportedly paid LS 80 per month.

Although many Sudanese are motivated to seek jobs abroad without ever having lived or worked temporarily in other lands, it is clear that a major stimulus to emigration is prolonged exposure to alternative job markets. Long-term training, under AID auspices or otherwise, is one common source of this experience. When a Sudanese is trained abroad and does not return to his former career for very long, the loss is doubled: training funds are not used to benefit Sudan, and a replacement must be trained instead.

A way to reduce these risks while maintaining a strong training effort is to favor training within the Sudan whenever possible. Although certain skills cannot be learned locally in a timely fashion (e.g. oil-well logging), many energy-related skills can be taught in Sudan. Frequently, local instructors from the University of Khartoum or the Management Development Center can be employed, using local currency. These instructors offer an additional advantage of being better able to cite Sudanese-specific examples that are relevant to the trainees.

The Management Development Center (MDC) provides a good case in point of Sudanese training resources. The MDC originated in 1965 as an institution devoted to training managers from the supervisory level to the corporate executive level for responsible positions in the Sudanese private sector.

Since approximately 1974 the Management Development Center has been receiving funding, mainly in kind, from the United Nations Special Fund. It has been during these past four years that the MDC has been able to genuinely establish itself as a unique institution.

The MDC offers short courses in Marketing, Business Administration, Production Management, Accounting and Quality Control, and other areas. Courses vary in length from two to 26 weeks. The MDC also conducts a course known as the Young Executive Program (YEP) whereby Sudanese mid-level managers are trained in the latest business techniques and practices. This course has been developed with particular emphasis on problems exclusive to the Sudanese business community. One of the strengths of the MDC is its knowledge of the private and public sectors in the Sudan and its ability to mold modern theoretical business practices to Sudan's particular problems.

Most of the participants in YEP are drawn from the private sector and must have at least 8 years of work experience before they can be accepted into this program. This course leads to a Diploma in Management. As far as other programs are concerned, any institution can send employees to the MDC for training, according to course availability throughout the year. The group which sends participants to these courses pays the fees.

The MDC is concerned mainly with enterprises in the Khartoum area, although 14 of the current 20 participants in the YEP are from cities outside of this region. The MDC does periodically conduct research on Sudanese enterprises and completed a World Bank requested study on the management of PEWC. Other studies include a look at small scale industry in the Sudan, a survey of training needs in the Sudan and a short study on the administration of rural development in the Sudan. Its staff consists of 25 professionals, eight of whom are undergoing graduate training abroad. The center has 16 professional vacancies at the moment, mainly due to a lack of funds.

MDC has expressed an interest and willingness to assist in AID-funded training programs, and also is amenable to AID consulting teaching or training at MDC facilities.

VI. G.

Other Donor Activities Affecting Energy in the Sudan

Programs are arranged according to sectors as follows:

- I. Conventional Power Generation
- II. Economic Policy Planning
- III. Labor, Management and Employment
- IV. Industry
- V. Education
- VI. Agriculture, Forestry and Water Supply
- VII. Transport and Communication

Each program or project has been coded as to type as follows:

A. Technical Assistance

- 1) Technical advisors, consultants
- 2) Technicians, research personnel
- 3) Equipment and commodities for research
- 4) Facilities for research

B. Development Assistance

- 1) Teachers/trainers/volunteers
- 2) Extension workers
- 3) Scholarships for training/education
- 4) Training facilities
- 5) Equipment and commodities for use in development
- 6) Communications/roads

C. Capital Assistance

- 1) Equipment
- 2) Construction
- 3) Repair and maintenance

(1) Project Title (Proj. No.)	(2) Source of external assistance (type of assistance code)	(3) Planned duration/ total assistance committed (US\$'000)	(4) Expenditure during calendar 1979(1980) (US\$'000)	(5) Nature of Assistance Location Objectives Inputs/Activities
Power II Credit 564-SU	IDA (C 1,2,3)	1975-1981 US\$23 m.		15 MW of diesel generating capacity at Burri. Fourth unit (42 MW) at Roseires. Complementary extensions of 220 KV and 110 KV transmission line. 5 MW diesel capacity and distribution line at Juba. Long-term planning studies for preparation of 15-year electricity development by early 1976. Reorganization of PEWC and improvement of its technical operations and management.
Power III Credit 1006	IDA (C 1,2,3)	1980-1985 US\$65 m.		Expansion of power supply and distribution in Blue Nile grid via hydro, thermal and diesel generation (FRG and ODA cofinance).
	(C 1,2,3)			DANIDA is proceeding with a Sudanese request for a fourth Danish state loan for part financing in 1980 of the establishment of four power stations in the cities of Shendi, Dongola, El Fasher and Wau, and a fifth state loan for part financing in 1981 of power stations in five other cities. The total costs to be covered by the two loans are estimated at 150 mill.D.kr.=US\$28,302 m.
National Energy Assessment in Sudan	USAID (A 1)	1981-1982 US\$650,000		1) Formulate national energy policy 2) Assess energy conservation and alternate sources 3) Provide training and support for Sudanese energy personnel.
Sennar Dredger	U.K. (C 3)	1976/6- 1980/81 455,000	166,000	Sennar - Provision of dredger of dam.
Sennar dam	U.K. (C 3)	1970/1- 1979/80 360,000	6,000	Sennar Provision of new sluice gates.

SECTOR - 11 General and Economic Policy Planning

(1)	(2)	(3)	(4)	(5)
Planning assistance and training (SUD/80/016)	UNDP/IBRD (A 1,2,3 B 3)	1980-1983 3,116	647	<p>a) Khartoum</p> <p>b) Development and strengthening the Government's capability and annual planning and monitoring, regional and local planning, project preparation and analysis, macro-economic and fiscal analysis, sectoral analysis and statistics.</p> <p>c) Eight advisers assigned to the Ministry of National Planning in the fields of Economic, Fiscal, Agricultural, <u>Industrial Education and Manpower Planning</u>, Project preparation and training. In addition a number of consultants and training facilities are being made available.</p>
Development Administration Training Course (SUD/75/014)	USDP/UNDTCD (B 3)	1975-1981 300	4/(239)	<p>Khartoum</p> <p>Various fellowships related to administration and planning.</p>
Population and Human Resources Planning in the Southern Region	UNFPA (A 1,2,3)	1979-1983	417	<p>Juba University</p> <p>Assist in building an institutional capacity for developing a comprehensive population and manpower strategy for the Southern Region.</p> <p>International personnel, administrative support, grants to institution training, equipment and other miscellaneous expenses.</p>

(1)	(2)	(3)	(4)	(5)
Consultancies and Feasibility Studies (various)	FRG (A 1,2)	1978/79 1,328 1979 1,017 <u>1980</u> 2,260	N/A	Various studies and experts (e.g. assistance to Department of Statistics, <u>Department of Public Works</u> Juba)
Assistance to the Executive Organ for Development Projects in the Jonglei Area. (SUD/77/003) EFE A 123 B 3	UNDP/OPE (A 1,2,3 B 3)	1978-1982 268	64	Khartoum, Bor. To develop a capacity for long-term planning and identification for formulating and administration of development projects in Jonglei Area. 2 Experts, <u>fellowships</u> , equipment and supplies.
Strengthening the Organization making Economic Policy and Planning for the Southern Region. (SUD/78/012)	UNDP/UNDTCD (A 1,2,3 B 3)	1978-1982 1,654	105(305)	a) Juba - Southern Region b) Establishment of an efficient economic planning, monitoring and evaluation organization in the Regional Ministry of Finance and Economic Planning and building up a Regional Statistical Organization. c) One Chief Technical Adviser, four junior experts in Regional Planning. In addition some consultants and fellowships.
Forestry Education (SUD/72/023)	UNDP/FAO (A 1-5)	1975-1981 477	44	Khartoum To assist the Government in establishing a Department of Forestry within the Faculty of Agriculture, University of Khartoum so as to initiate <u>training</u> of Forestry Officers. A forestry expert, visiting forestry lectures, study tours, fellowships and equipment.
Institute for Ag. Technicians, Southern Region (SUD/72/035)	UNDP/FAO (A 1,2,3 B 3)	1973-1981 2,689	273	Yambio To assist the Government in preparing the existing Yambio Institute to cater for training needs in Ag. research, Ag. and home economics extension, <u>land development</u> , plant protection, etc., in the Southern Region. Three experts, two UN Volunteers, fellowships abroad and equipment.

(1)	(2)	(3)	(4)	
Management Development PH. II (SUD/70/544)	UNDP (A 1 B 3,5)	1970-1982 2,978	361	Khartoum Strengthening of training, consultancy, and research capacity of MDCenter. Six ILO Experts, equipment and fellowships.
Manpower Survey PH. II (SUD/74/028)	UNDP (A 1 B 3,5)	1975-1982 374	64/(344)	Juba (University) One ILO Expert and two volunteers, fellowships and equipment for the University of Juba Manpower Survey Unit.
Youth Training Center PH. II (SUD/73/004)	UNDP/UNICEF (A 1-4 B 3)	1974-1980 1,830	460	Khartoum Five ILO Experts; equipment and fellowships for establishing national programs (24) of Centres for pre-vocational training of primary education level men and women. Supplies, equipment, funds from UNICEF.
Management Development Center (MDC) (SUD/70/544)	U.K. (A 1 B 1,4)	1971-1982 2,994	1980 (2,170)	Provision of consultants from Industrial Society to assist MDC in survey of supervisory training.
Vocational Training Center	FRG (A 4 B 1,B 4)	1979-1986 6.610	N/A	Port Sudan Building construction work has been started in 1979.
Vocational Training Center	FRG (A 3 B 3)	1963-1983 5,593	N/A	Khartoum Advisory assistance by 5 experts; the VTC Khartoum trains approximately 600 students in a three year course in automobile mechanics, carpentry, electrical metallurgical techniques, refrigeration and television.
Youth Training Center (Phase One to Three) (SUD/79/005)	UNICEF (A1-3)	1972-1981	3,377 (2,177)	(a) Khartoum and 24 small towns. (b) To establish a network of pre-vocational training centers for large numbers of primary-school graduate men and women, for the Council of Youth.

(1)	(2)	(3)	(4)	(5)
Manpower and population section, Ministry of National Planning (UD/79/005)	UNFPA (A1-3)	1979-1983	638 (-)	Khartoum - Ministry of National Planning. To assist the manpower and population section in carrying out data collection and analysis and policy oriented studies. It also aims at enabling the section to coordinate activities in the field of manpower and population. International experts, training equipment and administrative support.
Management development center (Phase Three) (UD/70/544)	UNDP/IPF (A 1,2,3, 4)	1971-1982	2,994 (2,170)	(a) Khartoum (b) To develop a centre for in-service senior and middle management courses; for the Ministry of Public Service and Administrative Reform.
National vocational training center (Phase Two) (UD/72/020)	UNDP/IPF (A1-4)	1968-1982	1,100 (1,000)	(a) Wad Medani (b) To develop a centre for 3-year apprenticeship courses in industrial skills, concluding with agricultural mechanics, for the Department of Labour.
Multi-Service Training Centre (Phase 1) (UD/78/014)	UNDP/IPF (A1-4)	1976-1982	3,198 (1,948)	(a) Juba (b) To establish a pre-service and in-service vocational training center for men and women. Training in trades skills and commercial skills. Dormitory accommodation for 64 men.

(1)	(2)	(3)	(4)	(5)
Integrated Rural Education Centres (IRECS)	Funds-in-Trust: UNESCO (A1, 2)	1978-(80) 635	N/A	IREC's establishment in Southern Region.
Technical Training	Belgium (B 4)	Ongoing		Khartoum Assistance to Higher Technical School.
North East Studies Institute/Khartoum Polytechnic Link Scheme	U.K. (B 1,3,4)	1978/9 1981/2 450,000	180,000	Khartoum Program of two way staff visits, training provision of equipment books etc.
Link Scheme related activities	U.K. (B1,3,4)	55,000	40,000	Lecturers, administrative input and support services.
Scholarships	FRG (B. 3)	1981-1983	N/A	252 Scholarships planned in the fields of animal husbandry, forestry, crop production, plant protection, <u>workshop training</u> , road maintenance, water drilling, television techniques, tourism and hotel management. Besides this several German organizations (e.g. Foundations for International Development, Carl Duisberg Society) annually arrange a number of <u>seminars, training courses, and conferences of various subjects</u> , in which Sudanese participants regularly take part on a scholarship basis.

(1)	(2)	(3)	(4)	(5)
Improvement of Efficiency of Public Sector Industries (Ph.I) (SUD/79/010)	UNDP (A 1, 3 B 3)	1976-1983 2,096	330 (987)	Khartoum Creating an Efficiency Monitoring Unit in Khartoum. Five Experts, four consultants, fellowships and equipment.
Mobile Workshops for cooperatives	UNDP (C 3)	1981-1985 1,462		To set up maintenance of cooperatively owned machinery (e.g. in Gezira)
Industrial Survey	UNIDO (A 1)	1980-1981 150	(5)	Assist Ministry of Industry to supplement sectoral survey with an overall survey of industrial capacity and potential.
Central Instrument Repair Workshop (SUD/73/045)	UNDP (A 1, 3 B 3)	1976-1982 271	21 (171)	Khartoum Assisting the Industrial Research and Consultancy Institute to establish a workshop for repairing electronic and other instruments. Equipment provided; expert and fellowships due 1980.
PL - 480 Title I/III	USAID (C1 3)		\$100 m.	PL 480 Title I/III wheat is being provided to Sudan over a 5-year period totalling approximately to \$100 million Counterpart generations from the sale of this commodity will be used as local currency support of development program which would otherwise have been curtailed due to Sudan's present financial crisis. Beneficiaries will include the <u>Sudan Railway Corporation</u> , the <u>agriculture and health sectors</u> , the <u>River Transport Corporation</u> , the <u>University of Gezira</u> , the <u>Desert Encroachment Control and Rehabilitation Program</u> , and the <u>Rural Development Planning Project</u> , and possibly the <u>Western Sudan Agricultural Research Project</u> .
CIP	USAID (C1, 3)			The <u>Commodity Import Program (CIP)</u> provides short-term balance of payments relief by financing essential supplies of wheat (seed and consumables), raw materials, <u>spare parts</u> and capital goods necessary for stimulating exports and continuing ongoing development activities in the <u>agriculture, transport and industrial sectors</u>

SECTOR VI - Agriculture, Forestry, Water Supply and Renewables

(1)	(2)	(3)	(4)	(5)
Renewable Energy	FRG (A 4) (A1 -4 B 4)	1979-1980 7,250	N/A	Utilization of renewable sources of energy (Solar, gasification, mini-hydro); support for IER; one advisor for Min. of Energy.
Rural Renewable Energy	USAID (A1-4 B 4)			See USAID renewable energy PP for project
Water Hyacinths Control Project	FRG (A1-4)	1964 March 81 6,102	N/A	Advisory assistance and equipment for the control of water hyacinths on the White Nile; support to the spraying campaigns (by boat, lorry and helicopter); survey activities, analysis of chemical residues, establishments of workshops by present 2 experts.
Introduction of Jojoba Cultivation (SUD/77/012)	UNDP/OPE (A1, 3 B 3)	1978-1981 571	189	<p>Khartoum (Hydrocarbon producing plant)</p> <p>To assist the Government in arresting desert encroachment, improving soil conservation practices and generating additional income for the rural population of semi-arid region.</p> <p>Consultants, equipment and fellowships.</p>
ox-Plough training center	SCC	Ongoing	N/A	Introduction of <u>draft animals</u> for food production based at Ler, Mayom, Dolieb Hill and Rumbek, but intended to benefit Southern Region as a whole.
Jojoba Cultivation Project	EDF/EEC (B 5)	1979-1983 EUA 5,500	N/A	Introduction of <u>animal drawn implements</u> in traditional agriculture, includes provision of housing, offices, stores, vehicles, tools and technical assistance.

(1)	(2)	(3)	(4)	(5)
Training Awards	U.K. (B 3)	700,000 yearly	700,000	(UK) study fellowships in various fields.
Fellowships	Denmark (B 3)	Ongoing		22 full scholarships in various subjects.
Fellowships	Italy (B 3)	1979		17 Scholarships in various subjects; travel, tuition and maintenance.
Fellowships	Poland (B 3)	3-4 years 5-6 years		5 Post-graduate studies 30 Under-graduate studies
Fellowships Training and Seminars	Japan (B 3)	1979		32 fellowships in various subject; all travel and maintenance provided.

35.

(1)	(2)	(3)	(4)
WFP Project 542 EXP	(A1 - 4 B1, 2, 4, 5)	1978-1981 \$7,161,000	

(5)

WFP Project 542 EXP:

Scheme for sawmilling and Forestry Development in Southern Sudan

Approved duration:

Three years, inception June 1978 (with provision for two years extension).

Total Allocation:

US\$7,161,000

Source of Funds:

UN/FAO World Food Program Resource contribution and local transport.

Amount Disbursed:

Forty-four percent of commitment shipped as at 30 June 1980.

Government Contribution:

US\$18,483,400 equivalent

Resume of Project Activities:

Through partial payment of wages in commodities to workers involved on logging, sawmilling, carpentry and afforestation, the project intends to increase the viability of these sectors by using food as an incentive in food deficit-areas of Southern Sudan. Savings generated are used to purchase spares and equipment to facilitate forestry operations. The current phase of the project expanded activities from Bahr el Ghazal and Lakes Provinces to Eastern and Western Equatoria. Eventually, Jonglei and Upper Nile Provinces will be included. Forestry activities in the Southern Region have increased to include 4,800 workers and consequently, a project expansion to cover the final two years is being formulated.

Solar projects	Netherlands France Denmark U.K. IBRD (A1-4, B1, 2, 4, 5)	1980 ongoing	N/A	Numerous small solar energy projects involving intermediate technology.
----------------	--	-----------------	-----	---

(1)	(2)	(3)	(4)	(5)
Forestry Project	FRG (A1-4)	1974 onward 11,469	N/A	Southern Region Establishment of a model forestry unit in Kagelu and management of sawmills and a carpentry workshop (Juba); Advisory assistance by 5 experts in the fields of revising old forest inventories, reforestation; forest management, sawmilling and carpentry.
Forestry	Finland (A 1)	Sept. 1979 Oct. (1980) 300	100	Consultancy study on existing forestry resources and possibilities of afforestation especially in Blue Nile Province. Objectives to find out opportunities for establishing forestry based industries. Team of 2 experts
Additional note concerning center	UNDP/FAO (A1-5)	1978-1980 258	2	Khartoum To increase agricultural and livestock production through use of remote sensing for providing information necessary for planning agricultural development.
Water supply	UNICEF (A2 B5)	1975-1983 6,400 5,400	(4,100) (3,400)	Provision of supplies, equipment and technical assistance for borehole drilling, <u>handpump installation</u> and hafir rectification. S. Kordofan Bahr el Ghazal
Water development	ACROSS (et alia)	N/A	N/A	Drilling of 122 wells in Maridi, Mundri and Juba areas was completed; <u>handpumps</u> installed in most of these wells.

SECTOR VII - Transport and Communications

(1)	(2)	(3)	(4)	(5)
Transport Economist in the Ministry of Transport (SUD/74/038)	UNDP/UNDTCD (A1, 3 B5, 6)	1976-1981 334	52/(273)	Khartoum To establish a capacity for transport planning in the Ministry of Transport dealing with <u>various models of transport</u> . 2 Experts, supplies and equipment.
Program Aid	U.K. (B 5)	1978/9- 1981/2	15,000,000	6,500,000 Spares for <u>railways, power, river transport, agriculture, etc.</u>
Fourth railway project loan No. 467 T-SU credit 727 SU	IBRD IDA (C1,2,3)	1977-1982 US\$12 m. US\$ 8 m.		Comprises SRC's investment requirements during year 1977/78-79/80 of GOS Six Year Development Plan. Establish diesel <u>locomotive and wagon workshops, sleeper renewal</u> over 500 km of track, <u>rail upgrading</u> over 344 km; completion of <u>rail telecommunications network</u> ; purchase of <u>10 diesel locomotives and 400 wagons, locomotive spare parts, complete Atbara railway training school, technical assistance in workshop design and organization.</u>
Maintenance of the pipeline Port Sudan-Khartoum	FRG (A1,5,6)	1979-1981 2,373	N/A	Rehabilitation of the electrical section of the multi-product <u>pipeline from Port Sudan to Khartoum.</u> About 5 experts, some short-term experts and a mobile workshop.
Studies for the Port of Suakin	FRG (A1,3 B5,6)	1978 onward 3,220	N/A	Feasibility study for the future deep sea port Suakin and engineering studies on water supply, railway connection, road connection, <u>electricity supply and telecommunication</u> (i.e. infrastructure "outside the fence").

SECTOR VII - Transport (Continued)

(1)	(2)	(3)	(4)	(5)
Advisor to the Ministry of Transport	FRG (A1, 6)	1979-1980 282	N/A	Assignment of a transport economist to the Ministry of Transport (particularly for river transport questions) for the present for 2 years.
Advisory service for river transport corporation	FRG (A1, 3, 6, B, 5)	1974-1984 5,480	N/A	Consultancy services for River Transport; advisory services in the following fields: Operation of the fleet and the dockyard in Khartoum and Kosti; training of young skippers; introduction of an efficient accounting system; at present 4 experts in the field of workshop mechanics and accounting are assigned to the headquarters - Khartoum.
Infrastructure Project	FRG (A1, 3, 6)	1975 onward 23,051	N/A	Consultancy services and implementation (by a consultant company) of the rehabilitation of Juba-Maridi-Wau road to all weather standard (so far the section Juba-Maridi has been completed). Engineering design of the planned Busseiri Bridge. <u>Water Supply</u> measures in several rural centres along the road.

VI. H. Initial Environmental Examination

Project Country: Sudan
Project Title: Sudan Energy Planning
and Management Project
Project Number: 650 - 0059
Funding: \$6,600,000
IEE Prepared by: James Beebe, USAID Energy Officer
Action Recommended: Negative Determination
Action Recommended by: Arthur W. Mudge
Mission Director

Concurrence: Bureau Environmental Officer

Approved: _____

Disapproved: _____

Date: _____

I. Project Description

The Sudan National Energy Project is designed to deal with the immediate problems of improving the reliability and administrative capability of Sudan's electric power system while continuing the effort already begun in developing an indigenous capability for planning and policy formulation for the entire energy sector. Important elements of the project deal with policy formulation, organizational development, public education and improving the efficiency with which conventional energies are used. The project aims to remove key constraints to the economical and efficient use of energy through an energy sector planning and management program.

II. Nature, Scope and Magnitude of Project Inputs

The project will provide technical assistance, participant training, in-country training, public education and limited support such as vehicles for technical advisors.

III. Identification and Evaluation of Environmental Impacts

An Impact Identification and Evaluation Form for the Project is attached to the IEE. This form indicates that no significant environmental impact will be expected from the activities of the project.

IV. Recommendations for Environmental Action

AID regulation (G) (Handbook 3 App 4 (B) permits a decision by the Agency not to require an Environmental Assessment on Environment Impact Statement where a proposed action does not significantly affect the human ecology.

Impact Identification and Evaluation Form

<u>Impact Areas and Sub-areas 1</u>	<u>Impact Identification and Evaluation 2</u>
-------------------------------------	---

A. Land Use

1. Changing the character of the land through:
 - a. Increasing the population----- N
 - b. Extracting natural resources----- N
 - c. Land clearing----- N
 - d. Changing soil character----- N
2. Altering natural defenses----- N
3. Foreclosing important uses----- N
4. Jeopardizing man for his works----- N
5. Other factors-----
-
-

B. Water Quality

1. Physical state of water----- N
2. Chemical and biological states----- N
3. Ecological balance----- N
4. Other factors-----
-
-

C. Atmospheric

1. Air additives----- N
2. Air pollution----- N
3. Noise pollution----- N
4. Other factors-----
-

D. Natural Resources

- 1. Diversion, altered use of water----- N
- 2. Irreversible, inefficient commitments----- N
- 3. Other factors
 - Improved inefficiency of energy use L
 - Increased use of environmentally sound renewable energy sources L

E. Cultural

- 1. Altering physical symbols----- N
- 2. Dilution of cultural traditions----- N
- 3. Other factors
 - _____
 - _____

F. Socio-Economic

- 1. Changes in economic/employment patterns----- N
- 2. Changes in population----- N
- 3. Changes in cultural patterns----- N
- 4. Other factors
 - _____
 - _____

5C(1) - COUNTRY CHECKLIST

Listed below are statutory criteria applicable generally to FAA funds, and criteria applicable to individual fund sources: Development Assistance and Economic Support Fund.

A. GENERAL CRITERIA FOR COUNTRY ELIGIBILITY

1. FAA Sec. 481. Has it been determined that the government of the recipient country has failed to take adequate steps to prevent narcotic drugs and other controlled substances (as defined by the Comprehensive Drug Abuse Prevention and Control Act of 1970) produced or processed, in whole or in part, in such country, or transported through such country, from being sold illegally within the jurisdiction of such country to U.S. Government personnel or their dependents, or from entering the U.S. unlawfully?

2. FAA Sec. 620(c). If assistance is to a government, is the government liable as debtor or unconditional guarantor on any debt to a U.S. citizen for goods or services furnished or ordered where (a) such citizen has exhausted available legal remedies and (b) the debt is not denied or contested by such government?

1. No

2. No

3. FAA Sec. 620(e)(1). If assistance is to a government, has it (including government agencies or subdivisions) taken any action which has the effect of nationalizing, expropriating, or otherwise seizing ownership or control of property of U.S. citizens or entities beneficially owned by them without taking steps to discharge its obligations toward such citizens or entities? 3. No
4. FAA Sec. 532(c), 620(a), 620(f), 620D; FY 1982 Appropriation Act Secs. 512 and 513. Is recipient country a Communist country? Will assistance be provided to Angola, Cambodia, Cuba, Laos, Vietnam, Syria, Libya, Iraq, or South Yemen? Will assistance be provided to Afghanistan or Mozambique without a waiver? 4. No
No
No
5. ISDCA of 1981 Secs. 724, 727, 728 and 730. For specific restrictions on assistance to Nicaragua, see Sec. 724 of the ISDCA of 1981. For specific restrictions on assistance to El Salvador, see Secs. 727, 728 and 730 of the ISDCA of 1981. 5. NA
6. FAA Sec. 620(j). Has the country permitted, or failed to take adequate measures to prevent, the damage or destruction by mob action of U.S. property? 6. No

- 7. FAA Sec. 620(k). Does the program furnish assistance in excess of \$100,000,000 for the construction of a productive enterprise, except for productive enterprises in Egypt that were described in the Congressional Presentation materials? 7. No

- 8. FAA Sec. 620(l). Has the country failed to enter into an agreement with OPIC? 8. No

- 9. FAA Sec. 620(o); Fishermen's Protective Act of 1967, as amended, Sec. 5. (a) Has the country seized, or imposed any penalty or sanction against, any U.S. fishing activities in international waters? 9.a. No

- (b) If so, has any deduction required by the Fishermen's Protective Act been made? 9.b. No

- *10. FAA Sec. 620(q); FY 1982 Appropriation Act Sec. 517. (a) Has the government of the recipient country been in default for more than six months on interest or principal of any AID loan to the country? (b) Has the country been in default for more than one year on interest or principal on any U.S. loan under a program for which the appropriation bill appropriates funds? 10.a. No
10.b. No

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11. FAA Sec. 620(s). If contemplated assistance is development loan or from Economic Support Fund, has the Administrator taken into account the amount of foreign exchange or other resources which the country has spent on military equipment? Reference may be made to the annual "Taking into Consideration" memo: "Yes, taken into account by the Administrator at time of approval of Agency OYB." This approval by the Administrator of the Operational Year Budget can be the basis for an affirmative answer during the fiscal year unless significant changes in circumstances occur.)
12. FAA Sec. 620(t). Has the country severed diplomatic relations with the United States? If so, have they been resumed and have new bilateral assistance agreements been negotiated and entered into since such resumption?
13. FAA Sec. 620(u). What is the payment status of the country's U.N. obligations? If the country is in arrears, were such arrearages taken into account by the AID Administrator in determining the current AID Operational Year Budget?
11. Not applicable
12. The GOS severed diplomatic relations with the United States in 1967, but they were resumed in 1972. The 1958 bilateral assistance agreement was reconfirmed and remains in effect.
13. Current

14. FAA Sec. 620A; FY 1982 Appropriation Act Sec. 520. Has the country aided or abetted, by granting sanctuary from prosecution to, any individual or group which has committed an act of international terrorism? Has the country aided or abetted, by granting sanctuary from prosecution to, any individual or group which has committed a war crime? 14. No
15. FAA Sec. 666. Does the country object, on the basis of race, religion, national origin or sex, to the presence of any officer or employee of the U.S. who is present in such country to carry out economic development programs under the FAA? 15. No
16. FAA Sec. 669, 670. Has the country, after August 3, 1977, delivered or received nuclear enrichment or reprocessing equipment, materials, or technology, without specified arrangements or safeguards? Has it transferred a nuclear explosive device to a non-nuclear weapon state, or if such a state, either received or detonated a nuclear explosive device, after August 3, 1977? (FAA Sec. 620E permits a special waiver of Sec. 669 for Pakistan.) 16. No

17. FAA Sec. 720. Was the country represented at the Meeting of Ministers of Foreign Affairs and Heads of Delegations of the Non-Aligned Countries to the 36th General Session of the General Assembly of the U.N. of Sept. 25 and 28, 1981, and failed to disassociate itself from the communique issued? If so, has the President taken it into account?

17. Yes

18. FAA Sec. 721. See special requirements for assistance to Haiti.

18. NA

B. FUNDING SOURCE CRITERIA FOR COUNTRY ELIGIBILITY

1. Development Assistance Country Criteria.

1. No

a. FAA Sec. 116. Has the Department of State determined that this government has engaged in a consistent pattern of gross violations of internationally recognized human rights? If so, can it be demonstrated that contemplated assistance will directly benefit the needy?

2. Economic Support Fund Country Criteria

a. FAA Sec. 502B. Has it been determined that the country has engaged in a consistent pattern of gross violations of internationally

a. No

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recognized human rights?
If so, has the country
made such significant
improvements in its human
rights record that
furnishing such
assistance is in the
national interest?

b. FAA Sec. 620B. If
ESF is to be furnished to
Argentina, has the
President certified that
(1) the Govt. of
Argentina has made
significant progress in
human rights; and (2)
that the provision of
such assistance is in the
national interests of the
U.S.?

b. NA

c. ISDCA of 1981, Sec.
726(b). If ESF
assistance is to be
furnished to Chile, has
the President certified
that (1) the Govt. of
Chile has made
significant progress in
human rights; (2) it is
in the national interest
of the U.S.; and (3) the
Govt. of Chile is not
aiding international
terrorism and has taken
steps to bring to justice
those indicted in
connection with the
murder of Orlando
Letelier?

c. NA

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5C(2) PROJECT CHECKLIST

Listed below are statutory criteria applicable generally to projects under the FAA and project criteria applicable to individual funding sources: Development Assistance (with a subcategory for criteria applicable only to loans); and Economic Support Funds.

CROSS REFERENCES: IS COUNTRY CHECKLIST UP TO DATE? HAS STANDARD ITEM CHECKLIST BEEN REVIEWED FOR THIS PROJECT?

A. GENERAL CRITERIA FOR PROJECT

1. FY 1982 Appropriation Act Sec. 523; FAA Sec. 634A; Sec. 653(b).

(a) Describe how authorizing and appropriations committees of Senate and House have been or will be notified concerning the project;
(b) is assistance within (Operational Year Budget) country or international organization allocation reported to Congress (or not more than \$1 million over that amount)?

a) Congressional Notification submitted August 10, 1982. Expired August 25, 1982.

b) Yes

2. FAA Sec. 611(a)(1). Prior to obligation in excess of \$100,00, will there be (a) engineering, financial or other plans necessary to carry out the assistance and (b) a reasonably firm estimate of the cost to the U.S. of the assistance?

2.a. Yes

2.b. Yes

3. FAA Sec. 611(a)(2). If further legislative action is required within recipient country, what is basis for reasonable expectation that such action will be completed in time to permit orderly accomplishment of purpose of the assistance? 3. No legislative action is required.
4. FAA Sec. 611(b); FY 1982 Appropriation Act Sec. 501. If for water or water-related land resource construction, has project met the standards and criteria as set forth in the Principles and Standards for Planning Water and Related Land Resources, dated October 25, 1973? 4. NA
5. FAA Sec. 611(e). If project is capital assistance (e.g., construction), and all U.S. assistance for it will exceed \$1 million, has Mission Director certified and Regional Assistant Administrator taken into consideration the country's capability effectively to maintain and utilize the project? 5. NA
6. FAA Sec. 209. Is project susceptible to execution as part of regional or multilateral project? If so, why is project not so executed? Information and conclusion whether assistance will encourage regional development programs. 6. No.

7. FAA Sec. 601(a). Information and conclusions whether project will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; and (c) encourage development and use of cooperatives, and credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture and commerce; and (f) strengthen free labor unions.
7. By upgrading the reliability of the BNG and building the capability of the GOS to more efficiently use energy the project will:
- a) lead to greater and more consistent production of export products.
 - b) foster private initiative and competition.
 - c) encourage development and use of cooperative and of unions; savings and loan associations
 - d) improve technical efficiency of industry, agriculture and commerce. It will have no measurable effect on discouraging monopolistic practices or strengthening free labor unions.
8. FAA Sec. 601(b). Information and conclusions on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).
8. U.S. technical assistance and equipment may be utilized by this project.
9. FAA Sec. 612(b), 636(h); FY 1982 Appropriation Act Sec. 507. Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the U.S. are utilized in lieu of dollars.
9. See financial plan. Foreign currencies owned by the United States will be utilized where possible in lieu of dollars.

10. FAA Sec. 612(d). Does the U.S. own excess foreign currency of the country and, if so, what arrangements have been made for its release? 10. No
11. FAA Sec. 601(e). Will the project utilize competitive selection procedures for the awarding of contracts, except where applicable procurement rules allow otherwise? 11. Yes
12. FY 1982 Appropriation Act Sec. 521. If assistance is for the production of any commodity for export, is the commodity likely to be in surplus on world markets at the time the resulting productive capacity becomes operative, and is such assistance likely to cause substantial injury to U.S. producers of the same, similar or competing commodity? 12. Not applicable
13. FAA 118(c) and (d). Does the project take into account the impact on the environment and natural resources? If the project or program will significantly affect the global commons or the U.S. environment, has an environmental impact statement been prepared? If the project or program will significantly affect the environment of a foreign country, has an environmental assessment been prepared? Does the 13. Yes.

project or program take into consideration the problem of the destruction of tropical forests?

- 14. FAA 121(d). If a Sahel project, has a determination been made that the host government has an adequate system for accounting for and controlling receipt and expenditure of project funds (dollars or local currency generated therefrom)?

14. Not applicable.

B. FUNDING CRITERIA FOR PROJECT

1. Development Assistance Project Criteria

a. FAA Sec. 102(b), 111, 113, 281(a). Extent to which activity will (a) effectively involve the poor in development, by extending access to economy at local level, increasing labor-intensive production and the use of appropriate technology, spreading investment out from cities to small towns and rural areas, and insuring wide participation of the poor in the benefits of development on a sustained basis, using the appropriate U.S. institutions; (b) help develop cooperatives, especially by technical assistance, to assist rural and urban poor to help themselves toward

a. The project will: (a) effectively involve the poor in development by extending access to the economy at the local level and spreading investment out from cities to small towns and urban areas. (b) help develop cooperatives, especially by technical assistance, to assist rural and urban poor to help themselves toward a better life and otherwise encourage democratic private and local governmental institutions. (c) support the self-help efforts of developing countries.

better life, and otherwise encourage democratic private and local governmental institutions; (c) support the self-help efforts of developing countries; (d) promote the participation of women in the national economies of developing countries and the improvement of women's status; and (e) utilize and encourage regional cooperation by developing countries?

b. FAA Sec. 103, 103A, 104, 105, 106. Does the project fit the criteria for the type of funds (functional account) being used?

b. Yes

c. FAA Sec. 107. Is emphasis on use of appropriate technology (relatively smaller, cost-saving, labor-using technologies that are generally most appropriate for the small farms, small businesses, and small incomes of the poor)?

c. No

d. FAA Sec. 110(a). Will the recipient country provide at least 25% of the costs of the program, project, or activity with respect to which the assistance is to be furnished (or is the latter cost-sharing requirement being waived for a "relatively least developed" country)?

d. Yes

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e. FAA Sec. 110(b).
 Will grant capital assistance be disbursed for project over more than 3 years? If so, has justification satisfactory to Congress been made, and efforts for other financing, or is the recipient country "relatively least developed"?

e. No

f. FAA Sec. 122(b). Does the activity give reasonable promise of contributing to the development of economic resources, or to the increase of productive capacities and self-sustaining economic growth?

f. Yes

g. FAA Sec. 281(b).
 Describe extent to which program recognizes the particular needs, desires, and capacities of the people of the country; utilizes the country's intellectual resources to encourage institutional development; and supports civil education and training in skills required for effective participation in governmental processes essential to self-government.

g. Project fulfills a need for a reliable source of energy for production and service sectors of the economy. It will rely on the country's intellectual resources as much as possible in order to encourage institutional development.

2. Development Assistance Project Criteria (Loans Only)

a. FAA Sec. 122(b).
 information and conclusion on capacity of

a. NA

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the country to repay the loan, at a reasonable rate of interest.

b. FAA Sec. 620(d). If assistance is for any productive enterprise which will compete with U.S. enterprises, is there an agreement by the recipient country to prevent export to the U.S. of more than 20% of the enterprise's annual production during the life of the loan?

b. Not applicable

c. ISDCA of 1981, Sec. 724 (c) and (d). If for Nicaragua, does the loan agreement require that the funds be used to the maximum extent possible for the private sector? Does the project provide for monitoring under FAA Sec. 624(g)?

c. Not applicable

3. Project Criteria Solely for Economic Support Fund

a. FAA Sec. 531(a). Will this assistance promote economic or political stability? To the extent possible, does it reflect the policy directions of FAA Section 102?

a. Not applicable

b. FAA Sec. 531(c). Will assistance under this chapter be used for military, or paramilitary activities?

b. No

c. FAA Sec. 534. Will ESF funds be used to finance the construction of the operation or maintenance

c. Not applicable

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of, or the supplying of fuel for, a nuclear facility? If so, has the President certified that such use of funds is indispensable to nonproliferation objectives?

d. FAA Sec. 609. If commodities are to be granted so that sale proceeds will accrue to the recipient country, have Special Account (counterpart) arrangements been made?

d. Not applicable

5C(3) - STANDARD ITEM CHECKLIST

Listed below are the statutory items which normally will be covered routinely in those provisions of an assistance agreement dealing with its implementation, or covered in the agreement by imposing limits on certain uses of funds.

These items are arranged under the general headings of (A) Procurement, (B) Construction, and (C) Other Restrictions.

A. Procurement

- | | |
|---|-------------------|
| 1. <u>FAA Sec. 602.</u> Are there arrangements to permit U.S. small business to participate equitably in the furnishing of commodities and services financed? | 1. Yes |
| 2. <u>FAA Sec. 604(a).</u> Will all procurement be from the U.S. except as otherwise determined by the President or under delegation from him? | 2. Yes |
| 3. <u>FAA Sec. 604(d).</u> If the cooperating country discriminates against marine insurance companies authorized to do business in the U.S., will commodities be insured in the United States against marine risk with such a company? | 3. Yes |
| 4. <u>FAA Sec. 604(e); ISDCA of 1980 Sec. 705(a).</u> If offshore procurement of agricultural commodity or product is to be | 4. Not applicable |

financed, is there provision against such procurement when the domestic price of such commodity is less than parity? (Exception where commodity financed could not reasonably be procured in U.S.)

5. FAA Sec. 603. Is the shipping excluded from compliance with requirement in section 901(b) of the Merchant Marine Act of 1936, as amended, that at least 50 per centum of the gross tonnage of commodities (computed separately for dry bulk carriers, dry cargo liners, and tankers) financed shall be transported on privately owned U.S. flag commercial vessels to the extent that such vessels are available at fair and reasonable rates?

5. No

6. FAA Sec. 621. If technical assistance is financed, will such assistance be furnished by private enterprise on a contract basis to the fullest extent practicable? If the facilities of other Federal agencies will be utilized, are they particularly suitable, not competitive with private enterprise, and made available without undue interference with domestic programs?

6. Yes

7. International Air Transport. Fair Competitive Practices Act, 1974. If air transportation of persons or property is financed on grant basis, will U.S. carriers be used to the extent such service is available? 7. Yes
8. FY 1982 Appropriation Act Sec. 504. If the U.S. Government is a party to a contract for procurement, does the contract contain a provision authorizing termination of such contract for the convenience of the United States? 8. Yes

B. Construction

1. FAA Sec. 601(d). If capital (e.g., construction) project, are engineering and professional services of U.S. firms and their affiliates to be used to the maximum extent consistent with the national interests? 1. Not applicable
2. FAA Sec. 611(c). If contracts for construction are to be financed, will they be let on a competitive basis to maximum extent practicable? 2. Not applicable
3. FAA Sec. 620(k). If for construction of productive enterprise, will aggregate value of assistance to be furnished by the U.S. not exceed \$100 million? 3. Not

C. Other Restrictions

1. FAA Sec. 122(b). If development loan, is interest rate at least 2% per annum during grace period and at least 3% per annum thereafter? 1. Not applicable

2. FAA SEC. 301(d). If fund is established solely by U.S. contributions and administered by an international organization, does Comptroller General have audit rights? 2. Not applicable

3. FAA Sec. 620(h). Do arrangements exist to insure that United States foreign aid is not used in a manner which, contrary to the best interests of the United States, promotes or assists the foreign aid projects or activities of the Communist-bloc countries? 3. Yes

4. Will arrangements preclude use of financing:

a. FAA Sec. 104(f); FY 1982 Appropriation Act Sec. 525: (1) To pay for performance of abortions as a method of family planning or to motivate or coerce persons to practice abortions; (2) to pay for performance of involuntary sterilization as method of family planning, or to coerce or provide financial incentive to any person to undergo sterilization; (3) to pay for any biomedical research which 4.a. Yes

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relates, in whole or part, to methods or the performance of abortions or involuntary sterilizations as a means of family planning; (4) to lobby for abortion?

b. FAA Sec. 620(g). To compensate owners for expropriated nationalized property?

b. Yes

c. FAA Sec. 660. To provide training or advice or provide any financial support for police, prisons, or other law enforcement forces, except for narcotics programs?

c. Yes

d. FAA Sec. 662. For CIA activities?

d. Yes

e. FAA Sec. 636(i). For purchase, sale, long-term lease, exchange or guaranty of the sale of motor vehicles manufactured outside U.S., unless a waiver is obtained?

e. Yes

f. FY 1982 Appropriation Act, Sec. 503. To pay pensions, annuities, retirement pay, or adjusted service compensation for military personnel?

f. Yes

g. FY 1982 Appropriation Act, Sec. 505. To pay U.N. assessments, arrearages or dues?

g. Yes

h. FY 1982 Appropriation Act, Sec. 506. To carry out provisions of FAA section 209(d) (Transfer of FAA funds to

h. Yes

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multilateral organizations for lending)?

i. FY 1982 Appropriation Act, Sec. 510. To finance the export of nuclear equipment, fuel, or technology or to train foreign nationals in nuclear fields?

i. Yes

j. FY 1982 Appropriation Act, Sec. 511. Will assistance be provided for the purpose of aiding the efforts of the government of such country to repress the legitimate rights of the population of such country contrary to the Universal Declaration of Human Rights?

No

k. FY 1982 Appropriation Act, Sec. 515. To be used for publicity or propaganda purposes within U.S. not authorized by Congress?

k. No

VI.J. CIP Supplies List

The sheer number of commodities for the Blue Nile Grid prevents a complete listing of the commodities. A partial listing follows:

1. Outdoor freestanding 15 Kv vacuum breaker.
2. 11 Kv Distribution Capacitor Units.
3. Switching control for 11 Kv Distribution Capacitor.
4. Relay test sets and variable frequency generator.
5. 220 Kv system surge arresters.
6. 110 Kv system surge arresters.
7. 220 Kv power system pedestal type multi-ratio bush'g cts
8. 110 - 11 Kv substation transformer.
9. El Bager 110-33-11 Kv/17.5-10-10 MVA substation.
10. 110-33-11 Kv substation transformers.
11. Metal-clad air or vacuum breaker swichgear.
12. Station service-neutral growing zigzag transformer.
13. 115 Kv SF 6 outdoor / power circuit breakers.
14. 34.5 Kv SF 6 or vacuum outdoor power circuit breaker
15. Computer System.
16. Computer System software.
17. Miscellaneous vehicles.
18. Miscellaneous Equipment.
19. Maintenance Center & Machine Shop equipment
20. Building, prefabricated.
21. Telecommunication equipment.
22. Related engineering services.

AID/W	Agency for International Development, Washington D.C.
BNG	Blue Nile Grid Electric power system.
CIP	Commodity Import Program.
ESB	Electricity Supply Board, Ireland.
EPM	Energy Planning and Management Project.
GDP	Gross domestic product of goods and services.
GOS	Government of the Sudan.
GPC	General Petroleum Corporation.
IBRD	International Bank for Reconstruction and Development (World Bank).
MEM	Ministry of Energy and Mining.
NEA	National Energy Agency.
NEC	National Electricity Corporation.
ODA	Overseas Development Agency, U.K.
PID	Project Identification Document.
POL	Petroleum, oil and lubricants.
ST/EY	AID Science & Technology, Energy; Washington. D.C.
USAID	AID Mission, Sudan.

VI. L. Technical Glossary

bb1	barrel of 42 U.S. gallons (35 Imperial gallons)
gasoil	a middle range petroleum distillate used widely as a transport fuel, a boiler fuel for steam-raising in small electric power stations and a heat source for commercial processes. Chemical and physical properties are almost identical with diesel fuel.
GWh	gigawatt-hours (10^9 watt-hours) a measure of the amount of electric power generated over time, usually one year
LPG	liquefied petroleum gas, chiefly composed of propane and butane; derived from petroleum refining, bottled and sold as domestic and commercial fuel.
MW	megawatts (10^6 watts), a measure of electric power generating capacity
power facto.	a measure of the effective work rate of an electric motor
Stepout well	oil or gas well drilled close to a known deposit; semi-exploratory in nature.

VI.M

EXTRACTS FROM PROVISIONAL ORDER
THE NATIONAL ELECTRICITY CORPORATION
ACT, 1982

President of the Republic

In accordance with Article 106 of the Constitution I hereby make the following order:

First Chapter

Title and Commencement

1. This Provisional Order may be cited as "The National Electricity Corporation ACT, 1982" and shall come into force from the date signed.

Repeal

2. By this the Public Electricity and Water Corporation Act, 1978 shall be deemed annulled.

Interpretation

3. In this act, unless the context otherwise requires:

- "The Corporation": means the National Electricity Corporation established in accordance with Article "4" of this Act.
- "The Minister": means the Minister of Energy and Mining.
- "The Regulations": means the regulations set up in accordance with Article "36".
- "The Board": means the Board of Directors appointed in accordance with Article "13".
- "The Consumer": means any person or firm that is supplied with electricity by the Corporation.
- "The General Manager": means the Corporation's General Manager appointed in accordance with Article "20".
- "Price Lists": means the list of prices of delivered electricity determined by the Corporation, contributions and costs specified according to the regulations.
- "The National Electricity Grids": means the Blue Nile Grid which includes the generating stations at Roseires Dam, Sennar Dam and the transmission lines connecting them, and the Eastern District Grid which includes the generating stations at Khashm, El Girba, Gedaref and Halfa. It also means any other grids that might be established in the future.

"The Distribution Network":

means any conductor or other means that is used in electricity distribution and delivery of electricity services to an urban, a suburban or a village at 33 KV or less, including every insulator, pole, support or other means that is necessary for these conductors. This also includes any instrument connected to these means.

"Electrical Equipment": means the engines, machines, electricity lines, keys, transformers, meters, lamps or any other equipment that is used in delivering or consuming electricity.

"Electricity Plants": means the generating stations of all kinds, transmission lines, distribution network, buildings, constructions, machines and instruments that are necessary for the generation, transmission, distribution and delivery of electricity.

Chapter Two

Establishment of the Corporation,

Its Objects and Powers

Establishment of the Corporation

. There shall be established an independent corporation to be known as "The National Electricity Corporation" which shall have its own corporate personality, perpetual succession and a public seal, and it may sue or be sued in its own name.

Devolution of the Corporation's

Assets and Liabilities

. There shall devolve to the Corporation whatever the Minister decides of the assets and liabilities of the Public Electricity and Water Corporation established in accordance with the P.E.W.C. Act, 1978.

Head Office and Branches

. The Corporation's head office shall be in Khartoum Province and it may establish branches in or out of the Sudan.

Objects of the Corporation

. The Corporation shall work towards achieving the following objects:

A. To utilize the national energy resources economically in order to secure the Country's needs of electrical power for the different sectors and to grow and expand its business in proportion to the growth of those sectors.

B. To introduce the international developments in the electricity production and services business in such a way that suits the circumstances and environment of the Sudan.

C. To carry out its operations on a commercial basis to achieve profits as specified by the Board that should enable the Corporation to attain its development plans.

Responsibilities and Powers

of the Corporation

8. Without prejudice to any other law, and to realize its objects, the Corporation shall exercise the following responsibilities and powers:

- A. The construction and management of the electrical plants of the national grids in order to supply the distribution networks for the consuming areas that can be supplied from the national grid.
- B. The construction and management of the electrical plants for the distribution network of Khartoum province to serve the consumers of the province.
- C. The generation, transmission of electricity from the national resources and wholesaling it to the regional administrations through the distribution networks that are connected to the national grids, and in accordance with the prices lists and the technical specifications determined by the Corporation.
- D. Setting up the technical specifications and determinants for the distribution networks nationally and regionally to ensure a unitary electrical system over the country.
- E. Offering consultancy and technical services to any customer on a commercial basis.
- F. Supplying itself with machines, equipments, spare parts, means of transport and services and other production equipment by purchase, import or any other means, and within the limitations of its budget and in accordance with the regulations.
- G. Entering into contracts with agency or organization inside or outside the Sudan and in accordance with the regulations.
- H. Improving the efficiency of its employees and those of the regional administrations through qualifying and training. Each regional administration is to pay for the training of its people as determined by the Corporation.
- I. Borrowing from the banks, corporations or any other sources inside or outside the Sudan if it deems that necessary for attaining its objectives.
- J. Investing its surplus money in any suitable enterprise to raise the value of its properties or increase its revenues.
- K. Manufacturing electrical equipment for use in the Corporation's plants, for sale or for letting for appropriate prices.
- L. Establishing companies or acquiring shares in private or public companies.
- M. Running any other business it deems necessary and suitable for achieving its goals.

The Corporation's Capital

9. The capital of the Corporation comprises the following:

- A. Allocations contributed by the government.
- B. The revenues it receives for the services and business it undertakes.
- C. The money transferred from the reserves or any other source to the capital.

Financial Resources of the Corporation

10. The financial resources of the Corporation comprise the following:

- A. Allocations contributed by the government.

- B. The revenues from the services and business it undertakes.
- C. Proceeds of capital investments and stocks.
- D. Loans, gratuities, subsidies and wills.

Continuation of Employees

11. All of the employees working for the electricity utilities and services who devolve to the Corporation in accordance with Article "5" of this Act continue in the service of the Corporation and shall be treated as though they were recruited in accordance with this Act.

Chapter Three

The Administrative Body of the Corporation

Supervising the Corporation

12. The Minister shall supervise the Corporation and he may - whenever he deems it suitable and necessary - give general specific directions to the Board regarding the business of the Corporation that shall not prejudice the content of this Act and the Board shall observe the said directions.

Establishment and Constitution of the Board

13. There shall be established a "Board of Directors" for the Corporation; it shall consist of a Chairman and a suitable number of members whose appointment and remunerations shall be decreed by the President on the recommendations of the Minister.

Duties of the Board

14.(1) The Board shall be responsible to the Minister for conducting the Corporation's business, implementing its general policy, performing its duties as prescribed in this Act and taking whichever decision it deems suitable for achieving the Corporation's objectives.

(2) Without prejudice to the generality of section (1) of this Article, the Board shall exercise the following duties:

- A. Approving the organizational framework.
- B. Approving the budget, its profit and loss statement, and the final accounts of each fiscal year.
- C. Entering into contracts and exercising every authority on behalf of the Corporation.
- D. Studying the reports on the Corporation's business and taking appropriate resolutions to improve performance.
- E. Appointing employees and developing their service conditions.
- F. Providing the Minister with periodical reports on the Corporation's business and activities or any other information he requires.

(3) The Board may delegate any of its powers to the Chairman or the General Manager.

VI.N. GOS Request for Project

VI.O. SUDAN ENERGY PLANNING AND MANAGEMENT PROJECT

BUDGET (US \$000)

USAID Contribution

Item	<u>PY1</u>	<u>PY2</u>	<u>PY3</u>	<u>PY4</u>	<u>PY5</u>	<u>Total</u>
<u>NEC</u>						
Long-term TA						
Chief of Party (48 PM)	-	165.6	183.6	200.4	219.6	769.2
Purchasing & stores (18 PM)	100.0	138.0				238.0
Finance, Planning Budget (24 PM)	-	-	183.6	200.4	-	384.0
Energy Efficiency & Load Management (12 PM)	-	-	183.6	-	-	183.6
Sub-total (102 PM)	100.0	303.6	550.8	400.8	219.6	1574.8
Short-term TA (30 PM ^{a/})	488.0	117.0	128.7	109.9	86.5	930.1
Total TA	588.0	420.6	679.5	510.7	306.1	2504.9
Training						
Short-term-U.S. (15 PM)	-	28.4	46.2	-	-	74.6
Short-term-Local	-	13.0	42.9	47.1	51.9	154.9
Total Training	-	41.4	89.1	47.1	51.9	229.5
Commodities						
4 vehicles	45.0	15.0	-	-	-	60.0
Other	75.0	14.7	8.7	10.6	7.4	116.4
Total Commodities	120.0	29.7	8.7	10.6	7.4	176.4
Total NEC	708.0	491.7	777.3	568.4	365.4	2910.8

a/ Excluding Bechtel PM

b/ Includes Bechtel's foreign exchange costs

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USAID Contribution (Continued)

Item	<u>PY1</u>	<u>PY2</u>	<u>PY3</u>	<u>PY4</u>	<u>PY5</u>	<u>Total</u>
<u>MEM/NEA</u>						
Long-term TA						
Chief of Party ^{a/} (48 PM)	-	165.6	183.6	200.4	219.6	769.2
Pricing/allocation analyst (18 PM)	-	82.8	183.6			266.4
Planning analyst (30 PM)	-	-	183.6	200.4	109.8	493.8
Sub-total (96 PM)		248.4	550.8	400.8	329.4	1529.4
Short-term TA (32 PM ^{b/})	<u>.00.0</u> ^{b/}	<u>130.0</u>	<u>214.5</u>	<u>109.0</u>	-	<u>553.5</u>
Total TA	00.0	378.4	765.3	509.8	329.4	2082.9
Training						
Long-term-U.S. (24 PM)	-	24.5	26.9	-	-	51.4
Short-term-U.S. (10 PM)	-	25.0	27.5	-	-	52.5
Short-term-third Country	-	22.0	24.0	27.0	-	73.0
Short-term-local	-	52.0	57.2	62.8	69.2	241.2
Total Training	-	123.5	135.6	89.8	69.2	418.1
Commodities						
3 2 vehicles	30.0	15.0	-	-	-	45.0
Other	<u>53.0</u>	<u>12.5</u>	<u>36.5</u>	<u>5.4</u>	<u>6.6</u>	<u>114.0</u>
Total Commodities	83.0	27.5	36.5	5.4	6.6	159.0
Total MEM/NEA	183.0	529.4	937.4	605.0	405.2	2660.0

^{a/} Time is split between MEM and NEA.

^{b/} Excludes E/DI PM.

^{c/} Includes E/DI Foreign Exchange Costs.

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USAID Contribution (Continued)

Item	<u>PY1</u>	<u>PY2</u>	<u>PY3</u>	<u>PY4</u>	<u>PY5</u>	<u>Total</u>
<u>GPC</u>						
Short-term TA (22 PM)		5.0	100.1	94.2	69.2	328.5
Commodities	<u>15.0</u>	<u>32.7</u>	<u>5.7</u>	<u>-</u>	<u>-</u>	<u>53.4</u>
	15.0	97.7	105.8	94.2	69.2	381.9
Project Evaluation	-	-	28.4	-	17.3	45.7
Totals	906.0	1118.8	1848.9	1267.6	857.1	5998.4
Contingency (10%)	<u>90.7</u>	<u>111.9</u>	<u>184.9</u>	<u>126.8</u>	<u>85.7</u>	<u>600.0</u>
Grand Total	996.7	1230.7	2033.8	1394.4	942.8	6598.4

Sudan Energy Planning and Management Project
Budget (\$000)

Estimate of GOS contribution from Recurrent Budget ^{1/}

Item	<u>PY1</u>	<u>PY2</u>	<u>PY3</u>	<u>PY4</u>	<u>PY5</u>	<u>Totals</u>
1. NEC: 15 person years of salaries (7000/yr) ^{2/}	105	126	151	181	218	781
2. NEA 30 person years of salaries (5000/yr) ^{2/}	150	180	216	259	311	1116
3. GPC 10 person years of salaries (7000/yr) ^{2/}	<u>70</u>	<u>84</u>	<u>101</u>	<u>121</u>	<u>145</u>	<u>521</u>
	325	390	468	561	674	2418
	=====	=====	=====	=====	=====	=====

1/ 20% local inflation compounded annually is included.

2/ estimates of yearly staff contribution to project activity and average weighted annual salaries.

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SUDAN ENERGY PLANNING AND MANAGEMENT PROJECT
BUDGET (US\$ 000)

GOS CIP Contribution (Trust Fund = TF; Project Account = PA)

	<u>PY1</u>		<u>PY2</u>		<u>PY3</u>		<u>PY4</u>		<u>PY 5</u>		<u>Totals</u>		<u>Total CIP</u>
	<u>F</u>	<u>PA</u>	<u>TF</u>	<u>PA</u>	<u>TF</u>	<u>PA</u>	<u>TF</u>	<u>PA</u>	<u>TF</u>	<u>PA</u>	<u>TF</u>	<u>PA</u>	
<u>NEC</u>													
Long-term TA	20.8	-	57.2	-	144.0	-	119.0	-	43.4	-	384.4	-	384.4
Short-term TA	<u>225.0</u>	-	<u>38.7</u>	-	<u>46.8</u>	-	<u>43.4</u>	-	<u>37.5</u>	-	<u>391.4</u>	-	<u>391.4</u>
Total TA	245.8	-	95.9	-	190.8	-	162.4	-	80.9	-	775.8	-	775.8
Local Consulting & Studies.					50.0	75.0		75.0		50.0		250.0	250.0
<u>Training</u>													
Short-term U.S.	-	-	-	4.0	-	6.0	-	-	-	-	-	10.0	10.0
Short-term local	-	-	<u>11.0</u>	<u>0.9</u>	<u>27.8</u>	-	<u>38.0</u>	<u>0.9</u>	<u>39.9</u>	-	<u>116.7</u>	<u>1.8</u>	<u>118.5</u>
Total training	-	-	11.0	4.9	27.8	6.0	38.0	0.9	39.9	-	116.7	11.8	128.5
Commodities	<u>3.0</u>	-	<u>24.0</u>	-	<u>28.0</u>	-	<u>34.0</u>	-	<u>41.6</u>	-	<u>131.8</u>	-	<u>131.8</u>
Total NEC	248.8	-	130.9	54.9	246.6	81.0	234.4	75.9	162.4	50.0	1024.3	261.8	1286.1
<u>MEM/NEA</u>													
Long-term TA			63.6		144.0		119.0		109.4		436.0		436.0
Short-term TA	<u>105.5</u>		<u>43.0</u>		<u>78.0</u>		<u>43.4</u>		-		<u>269.4</u>		<u>269.4</u>
Total TA	105.5		106.6		222.0		162.4		109.4		705.0		705.4
Local Consulting & Studies	-	-	-	10.0	-	40.0	-	30.0	-	20.0	-	100.0	100.0
<u>Training</u>													
Long-term-U.S.	-	-	-	1.0	-	1.0	-	-	-	-	-	2.0	2.0

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GOS CIP Contribution (Continued)

Item	PY1		PY2		PY3		PY4		PY 5		Totals		Total CIP
	TF	PA	TF	PA	TF	PA	TF	PA	TF	PA	TF	PA	
Short-term-U.S.	-	-	-	-	2.0	-	2.0	-	-	-	-	4.0	4.0
Short-term-Third Country	-	-	-	1.0	-	1.0	-	1.0	-	-	-	3.0	3.0
Short-term-local	-	-	47.4	-	57.2	-	68.5	-	82.2	-	255.3	-	255.3
Total training	-	-	47.4	2.0	57.2	4.0	68.5	3.0	82.2	-	255.3	9.0	264.3
Commodities	2.0	-	18.0	-	21.6	-	25.8	-	31.2	-	98.6	-	98.6
Total MEM/NEA	107.0	-	172.0	12.0	300.8	44.0	256.7	33.0	222.8	20.0	1059.3	109.0	1168.3
GPC													
Short-term-TA	-	-	21.5	-	36.4	-	37.2	-	30.0	-	125.1	-	125.1
Local consulting fund	-	-	-	30.0	-	30.0	-	10.0	-	-	-	70.0	70.0
Total GPC	-	-	21.5	30.0	36.4	30.0	37.2	10.0	30.0	-	125.1	70.0	195.1
CIP Summary													
Technical Asst.													
Long-term	20.8	-	120.8	-	283.0	-	238.0	-	152.8	-	820.4	-	820.4
Short-term	330.5	-	103.2	-	161.2	-	124.0	-	67.5	-	786.4	-	786.4
Total TA	351.3	-	224.0	-	449.2	-	362.0	-	220.3	-	1606.8	-	1606.8
Local consulting & Studies	-	-	-	90.0	-	145.0	-	115.0	-	70.0	-	420.0	420.0
Training													
Long-term U.S.	-	-	-	1.0	-	1.0	-	-	-	-	-	2.0	2.0
Short-term U.S.	-	-	-	4.0	-	8.0	-	2.0	-	-	-	14.0	14.0
Short-term-third country	-	-	-	1.0	-	1.0	-	1.0	-	-	-	3.0	3.0

GOS CIP Contribution (Continued)

Item	PY1		PY2		PY3		PY4		PY5		Totals		
	TF	PA	TF	PA	TF	PA	TF	PA	TF	PA	TF	PA	Total CIP
Short-term local	-	-	58.4	0.9	85.0	-	106.5	0.9	124.1	-	372.0	1.8	375.8
Total training	-	-	58.4	6.9	85.0	10.0	106.5	3.9	124.1	-	372.0	20.8	394.8
Commodities	5.0	-	42.0	-	50.4	-	60.2	-	72.8	-	230.4	-	230.4
Project evaluation	-	-	-	-	10.4	-	-	-	7.5	-	17.9	-	17.9
Total	356.3		324.4	96.9	595.0	155.0	528.7	118.9	422.7	70.0	2227.1	440.8	2667.9
Contingency 10%	35.6		32.4	9.7	59.5	15.5	52.9	11.9	42.3	7.0	222.7	44.1	266.8
Grand Total	391.9		356.8	106.6	654.5	170.5	581.6	130.8	465.0	77.0	2449.8	484.9	2934.7

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VI. P. PID Review Cable

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R 202037Z MAY 82
FM SECSTATE WASHDC
TO AMEMBASSY KHARTOUM 2160
BT
UNCLAS STATE 138581

ZIM

STATE 138581 5/20

ACTION: AID

INFO: AMB

ADCM/ECON

CHRON

AIDAC

F.O. 12065: N/A

TAGS:

SUBJECT: ENERGY PLANNING AND MANAGEMENT PROJECT - 620-0059

5/1/82
Cable 6/19/82
J.M.T.

1. A REVIEW OF PID FOR SUBJECT PROJECT WAS HELD MONDAY, 26 APRIL 1982. THE PROJECT COMMITTEE RECOMMENDED APPROVAL OF THE PID AND DEVELOPMENT OF THE PROJECT AT ESTIMATED LCP LEVEL OF DOLS 6.6 FOR INITIAL FUNDING IN FY 1.0. THE MISSION IS CONGRATULATED ON A WELL-PREPARED PAPER. MISSION DIRECTOR WILHE WAS PRESENT FOR THE REVIEW.

2. FOLLOWING ARE THE MAJOR ISSUES WHICH WERE RAISED DURING THE PID REVIEW. THE MISSION SHOULD TAKE THESE ISSUES INTO CONSIDERATION IN PREPARING THE PROJECT PAPER.

A. ENERGY CONSERVATION: THE POINT WAS MADE THAT WHILE CONSERVATION IS IMPORTANT, THE EMPHASIS ON PUBLIC RELATIONS IS INAPPROPRIATE. THE CONSERVATION ISSUE WOULD BETTER BE APPROACHED THROUGH REALISTIC PRICING AND TAX POLICIES AND THROUGH BUILDING A GCS CAPACITY TO PERFORM ENERGY AUDITS. PUBLIC RELATIONS EFFORTS ON CONSERVATION WOULD MUST APPROPRIATELY BE A GCS RESPONSIBILITY REFLECTING GCS'S GROWING SENSITIVITY TO CONSERVATION AND CARRIED OUT THROUGH TOTALLY INDIGENOUS PUBLIC RELATIONS PROGRAM. ALTHOUGH REDUCING THE PR PORTION OF THE PROJECT OR

LOWERING THE LEVEL OF EFFORT FOR IT IS SUGGESTED. IT WAS RECOGNIZED THAT OTHER CONSERVATION EFFORTS SUCH AS INCREASING THE CAPACITY TO CONDUCT ENERGY AUDITS AND ADJUST PRICING AND LOADS ARE IMPORTANT AND SHOULD REMAIN IN THE PROJECT.

B. ECONOMIC ANALYSIS: IT IS RECOGNIZED THAT USING ECONOMIC ANALYSIS FOR PROJECTS WHICH CONSISTS MOSTLY OF T.A. AND TRAINING PRESENTS PARTICULAR PROBLEMS IN TERMS OF COST/BENEFIT MEASUREMENT. THE ECONOMIC ANALYSES WHICH HAVE BEEN MOST SUCCESSFUL FOR T.A. PROJECTS LATELY ARE GOOD NARRATIVES WHICH OUTLINE THE FLOW OF BENEFITS. AID/W WILL SUPPLY DESIGN TEAM WITH EXAMPLES AT MISSION'S REQUEST.

C. COMMODITY PURCHASE: THE DIFFERENCES IN THE OFFICIAL AND PARALLEL MARKETS ARE SUCH THAT IT WILL BE NECESSARY TO ANALYZE THE PRICE AND FOREIGN EXCHANGE RATE STRUCTURE

Best Available Document

THAT WILL BE USED IN THE PURCHASE AND RESALE OF THE COMMODITIES TO BE IMPORTED FOR THIS PROJECT. IT IS QUESTIONABLE AT THIS POINT AS TO WHETHER USING THE OFFICIAL RATE IS THE MOST EFFICIENT.

D. IMPLEMENTATION PLAN: IN WORKING OUT PROJECT IMPLEMENTATION PLAN, DESIGN TEAM SHOULD EMPHASIZE TIMELY AND SUBSTANTIAL NEA AND BEWC IMPROVEMENTS IN EMPLOYEE TERMS OF SERVICE (UNDER THE RELIABILITY/MANAGEMENT IMPROVEMENT AND ENERGY PLANNING COMPONENTS), TO MINIMIZE RISK OF BRAIN DRAIN AMONG PROJECT TRAINEES.

E. EVALUATION: PP TEAM SHOULD CONSIDER HOW THE COMPUTER SYSTEM CAN BE PROGRAMMED SO THAT EVALUATION OF THE SYSTEM CAN TRACK IMPROVEMENT/PERFORMANCE OVER TIME. PP TEAM SHOULD CONSIDER HOW COMPUTER MODEL OF SUDAN ENERGY SYSTEM ENVISIONED IN RELIABILITY/LOAD MANAGEMENT COMPONENT OF PROJECT, CAN BE PROGRAMMED SO THAT EVALUATION OF THE SYSTEM CAN TRACK IMPROVEMENT/PERFORMANCE OVER TIME.

F. MANPOWER ASSESSMENTS AND TRAINING: THE NUMBER OF SHORT-TERM, OUT-OF-COUNTRY TRAINING AND VISITS WARRANTS THAT IT SHOULD BE TIED TO THE MANPOWER LEADAT GUIDANCE WHICH WILL BE DEVELOPED DURING THE PROJECT. IT IS NOTED THAT LONG-TERM TRAINING PRIORITIES ARE TIED TO MANPOWER ANALYSIS. IN THAT "SHORT-TERM" CAN MEAN AS MUCH AS 3-6 MONTHS OF TRAINING, IT OUGHT TO BE RATIONALIZED WITHIN THE ENTIRE RANGE OF ENERGY TRAINING NEEDS IN THE SAME FASHION AS THE PROPOSED LONG-TERM TRAINING.

3. IEE: NEGATIVE DETERMINATION OF THE IEE ACCEPTABLE.

4. MISSION IS AUTHORIZED TO APPROVE PP IN FIELD. HAIG

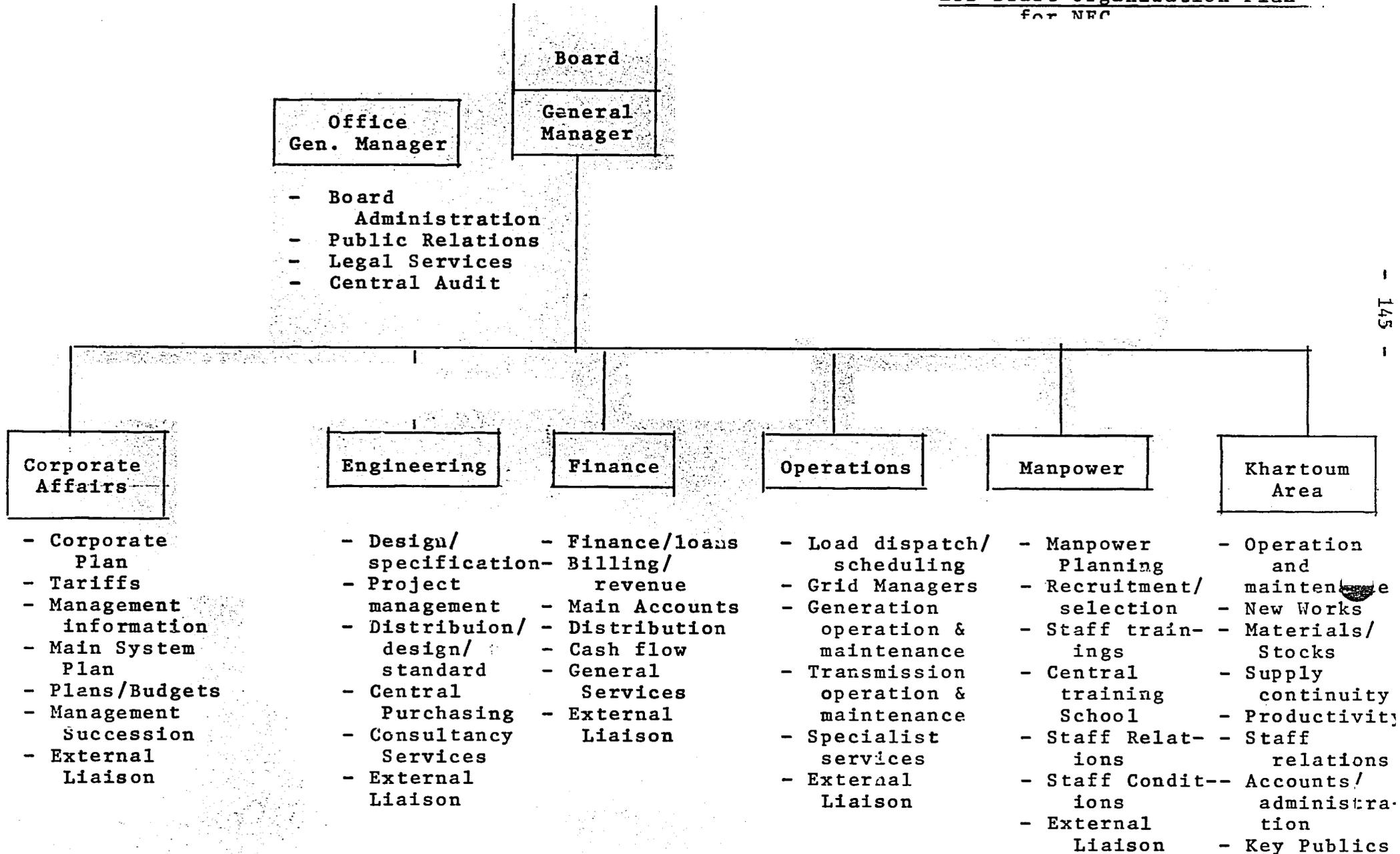
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Best Available Document

Annex Q:

ESB Draft Organization Plan
For NEC

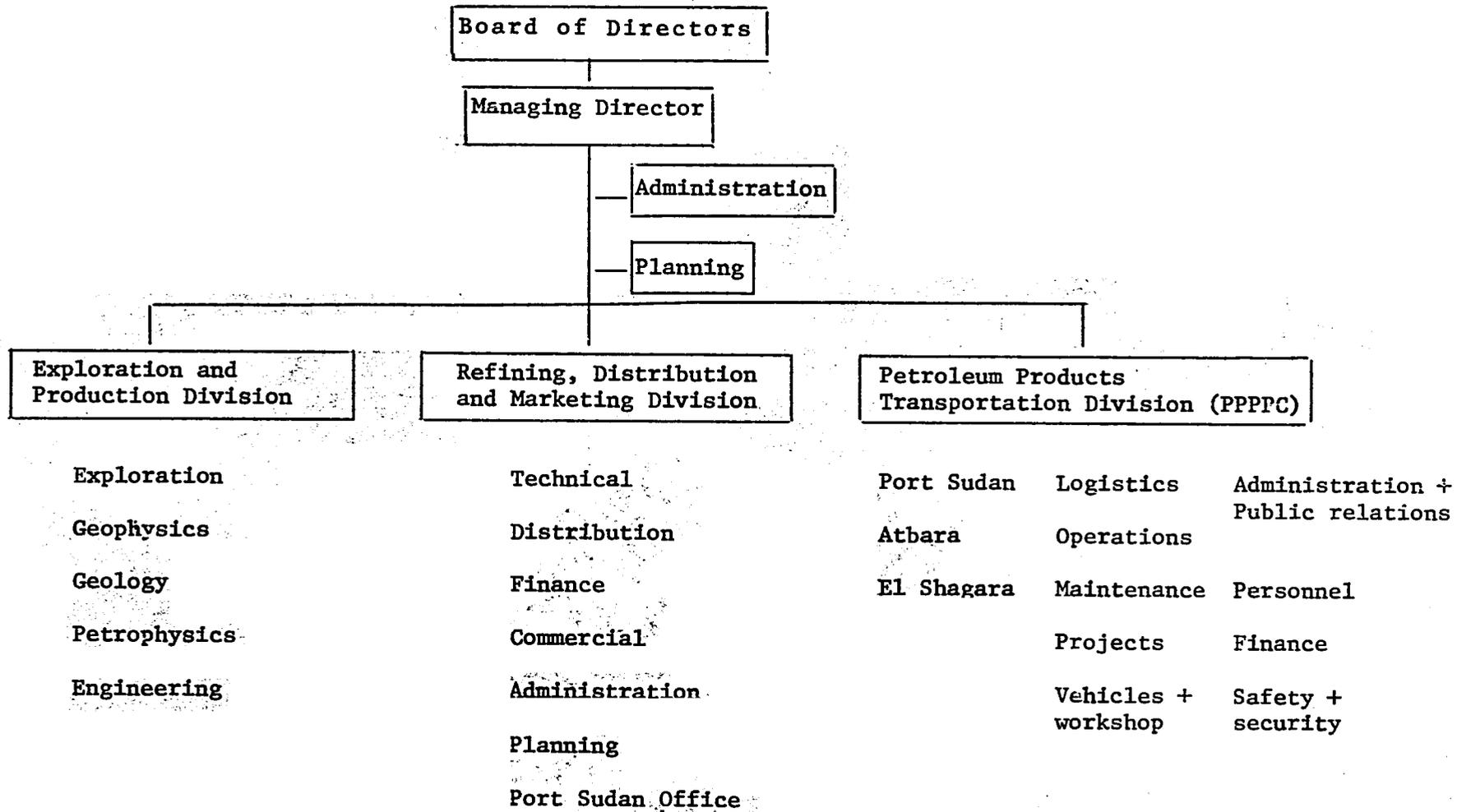


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Annex R

Organization Chart

General Petroleum Corporation



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