

PROJECT INFORMATION DOCUMENT (PID) CONCEPT STAGE

Report No.: PIDC1082

Project Name	Energy Sector Technical Assistance Project (P145581)
Region	AFRICA
Country	South Sudan
Sector(s)	General energy sector (100%)
Theme(s)	Infrastructure services for private sector development (50%), Other environment and natural resources management (25%), Other public sector governance (25%)
Lending Instrument	Technical Assistance Loan
Project ID	P145581
Borrower(s)	Republic of South Sudan
Implementing Agency	Ministry of Electricity and Dams
Environmental Category	B-Partial Assessment
Date PID Prepared/ Updated	13-Jun-2013
Date PID Approved/ Disclosed	15-Jul-2013
Estimated Date of Appraisal Completion	23-Dec-2013
Estimated Date of Board Approval	15-Jul-2014
Concept Review Decision	

I. Introduction and Context

Country Context

A. Country Context

Following years of conflict, newly independent Republic of South Sudan (RSS) is in the process of nation-building and conflict prevention. After a tumultuous past, RSS became the world's newest nation and Africa's 55th country on July 9, 2011, following a peaceful Referendum in January 2011. The Referendum was foreseen as part of the 2005 Comprehensive Peace Agreement (CPA) signed by the Government of the Republic of the Sudan and the southern-based rebel group, the Sudan People's Liberation Movement (SPLM).

As a new nation without a history of institutions, laws and regulations, or administration accepted as legitimate by its society, RSS had to build its government and institutions from scratch. Core

administrative structures and mechanisms of political representation are only beginning to emerge, and the government still struggles to provide basic services to the population. Outside a few oil enclaves, RSS remains a relatively undeveloped, subsistence economy. The challenge of organizing its government and enhancing the development agenda on many fronts simultaneously is daunting indeed. This is particularly true for a country where the economic and Millennium Development Goals (MDG) indicators on infrastructure, health, and education are amongst the lowest in Africa.

Despite relatively high GDP figures (boosted by petroleum revenues), it is estimated that 51% of the population lives below the poverty line. The FY2012 gross domestic product (GDP) was estimated to be over US\$ 15 billion with a population of nearly 10 million while the per capita GDP was US\$ 1,858 and the gross national income (GNI) was US\$ 785 per capita (SSA average is US\$ 1,176). Most of the growth comes from petroleum revenues which account for 80% of the GDP and 98% of exports. Following disruptions in 2012, oil flow resumed in April 2013 as a result of an oil agreement between Sudan and South Sudan (March 2013). For South Sudan, oil revenues are conservatively expected to amount to US\$4.2 billion for FY2013/14. The economic growth rate is estimated to be 6-7% per annum (but was expected to slow down in 2012 due to disruptions in the petroleum sector), with commercial centers, such as Juba, emerging as the fastest growing cities on the continent. In the post-independence period, the consumer price index (CPI) also shot up to 51% (FY2012).

To promote growth and prosperity through efficient use of resources, the Government of Republic of South Sudan (GRSS) planned the South Sudan Development Plan (SSDP), FY2011-13, including plans for investments in key economic sectors. RSS is a large country of 647,095 sq. km and possesses considerable natural resources (oil and gas, hydropower, etc.). However, currently, subsistence agriculture provides a living for the vast majority of the population. SSDP was introduced with the objective of recovering from conflict and with the goal of moving onto a fast-track development path through use of its vast natural resources. Under the SSDP, large-scale investments, particularly focusing on rapid expansion of the road network and provision of energy infrastructure, were planned.

In April 2012, RSS also became the newest member of the World Bank Group, and now has access to International Development Association (IDA), the Bank's fund for the poorest countries. Bank Group's first strategy paper, the Interim Strategy Note (ISN), was approved by the Board in March 2013 (FY13-14) focusing on building basic foundational institutions for peace and prosperity.

Sectoral and Institutional Context

B. Sectoral and Institutional Context

Energy Sector is in its Infancy

As is the case in much of rural Africa, majority of the energy consumed at the household level in South Sudan is used for cooking and lighting. According to the 2011 National Baseline Household Survey, 96% of the population use firewood or charcoal as the primary fuel for cooking (which typically constitutes 90% of the energy used in a rural household). In terms of lighting, over 50% of the population use firewood as the primary source, 20% depend on kerosene/paraffin, and 2% use captive power (generators). Of the remaining population, 27% have no access to lighting sources, and only about 1% of the population have access to grid electricity, most of these consumers are in Juba city area with the remaining in Malakal, Wau, and Renk. The per capita electricity

consumption of South Sudan is about 10 kWh (Figure 1) - the lowest compared its neighboring countries (average per capita electricity consumption for the Sub-Saharan Africa (SSA) is about 80 kWh).

Presently, the total installed capacity for the country is 30 MW, of which, only 22 MW is operational (12 MW in Juba, 2 MW in Wau, 5 MW in Malakal - see Figure 2 below for a map of electrified cities). The electricity supply is exclusively based on thermal generators (diesel and heavy fuel oil, HFO) and mostly services rich residential customers and some commercial centers in the cities, whereas most of the industries and businesses rely on captive power for electricity needs. Apart from the 3 government-run distribution networks mentioned above, donor funded projects (NRECA/USAID) also run mini-grids in the town of Yei (1.2 MW), Kapoeta (0.8 MW) and Maridi (0.8 MW).

There is no transmission back-bone or interconnected grid network. The electrical distribution system consists of 3 isolated networks in the commercial centers of Juba, Wau and Malakal totaling about 15 km of 11 kV lines plus some other minor electrified areas (mini-grids implemented by donors) and an interconnection with Sudan to Renk Town.

The total number of customers connected to the electricity network is approximately 22,000 (including 1,500 customers connected to the NRECA/USAID mini-grids). Remainder of the population does not have access to any modern sources of energy and, as mentioned above, rely on firewood as their primary source of energy. Also, currently, there are no Government programs for rural energy access or off-grid distributed energy generation. However, in the past, some programs have provided solar street lighting in Juba, solar home systems, as well as solar lanterns to a few rural communities.

Energy Sector Growth and the Need for Investment

Energy sector growth related investments were outlined in the 'Economic Development Pillar' of the SSDP. The objective of the plan was to achieve diversified private sector led economic growth for employment generation and improved livelihood and called for an ambitious investment program of US\$ 700 million for the electricity sector as a key driver of growth in South Sudan. The development of energy, mineral and mining sectors (including oil and electricity) were identified as the key priorities for the Government.

Large scale investment is needed for enhancing grid-based access, increasing generation capacity, and establishing regional interconnections. In FY2012, total energy sales in South Sudan were estimated to be 70 GWh with the peak load of 22 MW. Based on the economic growth rates in the post-independence period, the demand for electricity is expected to increase at around 7-8% per annum in the medium to long term. However, the electricity demand growth rate is expected to be much higher in the near term, given the fact that the sector is starting from a very low base (expected to be over 30% in FY2013/14 tapering to 15% by FY2016). There is also a substantial amount of suppressed demand. It is estimated that South Sudan will have a total peak load demand of nearly 100 MW by FY2016 with energy sales of nearly 200 GWh by FY2016. The number of customers connected to the grid would increase to over 55,000 from the current 22,000 (Figure 3 below).

The anticipated increase in demand and the planned investments in supply and network expansion

will mean that the energy sector in RSS will grow at a rapid pace. In the coming years, the Ministry of Electricity and Dams (MOED) and the South Sudan Electric Corporation (SSEC) plan to continue focusing on expansion of the distribution network and connecting many households (mainly urban and peri-urban). MOED and the SSEC are keen on establishing sound operations and maintenance principles to increase efficiency, reduce losses and to offer a higher quality of service to its customers while also initiating demand side management measures.

Energy Sector Challenges and Opportunities

The generation capacity relies completely on thermal generators and diversifying the generation mix and increasing the installed capacity remain challenging. Due to the reliance on hydrocarbons (diesel and HFO), the electricity supply is expensive and unreliable (difficulties of maintaining thermal plant equipment, spare parts, etc.). In recent months, there have been supply outages due to oil revenue share arrangements with Sudan, rapid variations in fuel prices, GRSS's inability to purchase and import the expensive fuel oil, and logistical and transportation challenges associated with the supply chain. After Sudan and South Sudan reached a new 'Matrix Agreement' in March 2013, oil flow resumed in April 2013, however, production has not yet reached full capacity.

There is a need to take a holistic approach in ascertaining the availability of generation resources as well as for identifying financing sources under a least cost investment plan for expansion. The generation resources could include, inter alia, fossil fuels, hydropower, solar power, wind power, geothermal, other renewable resources, as well as imports of electricity through a bilateral interconnection or a regional power pool. The initial goal of the Government is to heavily invest in hydropower generation in the coming years. However, the development of large hydropower plants will take many years to complete, the supply scenario in the coming five years (short term targets) will continue to be limited to thermal sources (Figure 4, 5, and 6 below). By FY2016, the total (planned) installed capacity in South Sudan is expected to be about 100 MW with energy generation capacity of about 250 GWh. Also, GRSS is in discussions with various donor organizations and financiers for the development of the 42 MW Fula Rapids Hydropower Project. Financing of these investments will require coordinated efforts of the Government, the donor community, as well as the private sector.

There are potential opportunities for South Sudan to participate in regional power trade via the East Africa Power Pool (EAPP). For example, Ethiopia and South Sudan could gain from closer cooperation and have already signed a Memorandum of Understanding to this effect. Ethiopia has a regional comparative advantage in hydropower which can be generated at a much cheaper cost than many other countries in the region. Other options to be considered for interconnections could be from South Sudan to Sudan and Uganda. South Sudan is also part of the Nile Equatorial Lakes Subsidiary Action Program (NELSAP) which is part of the Nile Basin Initiative (NBI) and, in the long term, participation in regional power trade is a major goal for the GRSS (see Figure 7 below).

Unfortunately, the capacity of the sector institutions to plan, initiate, and manage the investments is severely lacking. The implementation agencies are inadequately equipped to undertake large scale infrastructure development projects. Despite employing large number of personnel, the sector institutions lack the technical knowledge as well as operational and managerial experience.

Clarity of institutional responsibilities within the sector has not been achieved. The pre-independence interim Government established the Ministry of Energy and Mining (MOEM) in

2009. The MOEM had the responsibility of policy development and sector planning for the petroleum, energy and minerals sector. However, in the post-independence era, the MOEM was divided into the MOED and the Ministry of Petroleum and Mining (MOPM). An Electricity Act has been drafted and submitted for ratification to the Ministry of Justice (MOJ) and the Parliament, however, it is yet to be approved in light of the new ministries and other institutional changes. Under the Electricity Act, it was also proposed that the power utility, the SSEC, would be set-up as an autonomous entity (currently, SSEC is functioning as a department under the MOED). As the Government finalizes the details of the new arrangements, it is hoped that the Electricity Act and associated regulations will help in the proper organization of the sector institutions.

South Sudan's overall goal in the energy sector is to enhance affordable access to modern energy services to the masses with appropriate speed and cost-effectiveness. In this regard, grid-based electrification of the country is a worthy vision to have, however, universal electrification of remote rural parts of the country is a long term proposition. In the coming five years, the planned grid-based expansion would only increase access to about 3% of the population at a per capita investment of US\$ 3,500. Each connection costs the households approximately US\$ 500-600 in fee, meter/wiring, and other charges. Furthermore, the electricity tariff rate in South Sudan is one of the highest in the region with average tariff being US\$ 0.25/kWh (see Figures 8 and 9 below). The high cost of connection and the high monthly utility charges are prohibitive for many households.

Despite the high tariff and connection costs, there remain financial viability concerns for SSEC due to the high cost of generation and high technical and commercial losses and poor billing record. In FY2012, SSEC's operational revenue (based on 70 GWh of electricity sold and about 99 GWh of electricity generated) were about US\$ 17 million, and its operating expenses were US\$ 71 million (see Figure 10 below). The average cost of generation was US\$ 0.70/kWh and the average tariff from sales was US\$ 0.25/kWh. On top of that, the system losses are in the range of 30%. Furthermore, the commercial losses due to poor billing and collection are estimated to be around 40-50%. Consequently, the SSEC relies on heavy Government subsidy amounting to about US\$ 0.54 for every kWh of energy generated in South Sudan (99 GWh generated in FY2011). In FY2012, GRSS's subsidy to the electricity sector was around US\$ 54 million, or, 4% of GRSS's annual budget expense.

By FY2016, the fiscal impact of implicit subsidy to the energy sector is estimated to increase to US\$ 133 million, equivalent to 8% of GRSS's budget (see Figure 11 below). As the SSEC currently functions as a department within the MOED, the financial losses are directly absorbed by the MOED (implicit subsidy). In the longer term, GRSS needs to focus on cost-effective means of providing modern energy services. This can be achieved through an improvement in performance of SSEC, a decrease in cost of generation (by clean, low-cost energy, such as: hydropower), by increase in the efficiency of the system, and by introduction of cost-effective off-grid renewable energy (RE) and energy efficiency (EE) solutions.

Currently, there are no formal GRSS programs for promoting off-grid renewable energy and energy efficiency technologies in South Sudan. While grid extension to all parts of the country remains a long term goal, incorporation of off-grid solutions, in parallel, is a very viable and cost-effective way of providing modern energy services to remote parts of South Sudan. These products and services are not only useful in off-grid areas but are also useful to those within the grid-connected areas unable to afford a connection. Potential options for such initiatives include: Lighting Africa, a joint program of the World Bank and the International Finance Corporation (IFC), which can assist

in accelerating the development of commercial off-grid lighting markets - based on solar portable lights (SPLs); and Africa Clean Cooking Energy Solutions (ACCES) which can assist in promoting the adoption of efficient cook stoves and sustainable fuel supply chains. Other possible programs can include: biogas units (large cattle herds are maintained by most rural communities), small-scale wind-based generation projects (stand-alone systems in remote villages), low-voltage (LV) mini-grid networks (supplied by generation sources, such as, mini-hydropower plants), etc.

Relationship to CAS

C. Higher Level Objectives to which the Project Contributes

The World Bank's Interim Strategy Note (ISN) for South Sudan for FY2013-14 outlines engagement on: (i) improving economic management and governance for effective local service delivery, and (ii) expanding productive employment opportunities. The overarching focus of the Bank's program in South Sudan in the coming years will be to help the country move from fragility to stability by beginning to lay the foundations for effective and accountable institutions that use the country's own resources to respond to its citizens' needs and promote economic opportunities and improve livelihoods.

Within the electricity sector, GRSS's focus is on rapid development of generation capacity and expansion of the power grid network. In this regard, the Government is keen on the development of the Fula Rapids Hydropower Project (FRHPP) in the coming years. This FRHPP would be the focal point of the donor engagement in the coming years. On-going collaborative approach amongst the GRSS and the energy sector partners (IDA, IFC, Norway, African Development Bank, Japan, USAID, and Egypt) is contributing to the development of the FRHPP (and associated transmission and distribution system) which could provide up to 42 MW of additional capacity to the Juba area as well as assist the overall development of the sector. Given the limited financial resources available under IDA, the Bank, in coordination with GRSS and donor partner agencies, is supporting the development of sector capacity and technical assistance which can prepare the sector for future expansion and assist in mobilizing financing from various sources.

In order to assist the GRSS in analyzing sector challenges and opportunities, the Bank recently prepared the South Sudan Electricity Sector Strategy Note (ESSN, P120044). The ESSN, in line with the ISN, recommended a holistic and longer term perspective for sector development in order to establish the electricity sector in a cost-effective manner. The ESSN also recommended key actions for laying the foundation of the energy sector with implementation to be carried out in a phased approach of short-term, medium-term, and long-term programs.

As a direct result of the ESSN recommendations, the Bank is preparing a capacity building needs assessment report and a report on distribution system efficiency improvement program (ESMAP, P144307). The proposed Energy Sector Technical Assistance Project (ESTAP, P145581) will address many of the immediate issues identified in the ESSN and the subsequent engagements. These include: support for comprehensive sector planning, capacity building, efficiency improvement, and initiation of complementary off-grid energy access enhancement projects. The World Bank intends to continue being an active partner in the development of the energy sector and to support GRSS in attracting traditional and non-traditional partners for energy infrastructure development.

II. Proposed Development Objective(s)

Proposed Development Objective(s) (From PCN)

Development Objectives

The project development objective (PDO) of the Energy Sector Technical Assistance Project (ESTAP) is to strengthen the capacity of the GRSS to facilitate the development of its (i) energy sector planning capabilities, (ii) electrical distribution efficiency, and (iii) off-grid electrification programs.

Beneficiaries

The primary beneficiaries of the ESTAP Project will be the implementing agencies, MOED and SSEC, through the program of technical assistance and capacity building. Indirectly, the energy sector, as a whole, will benefit from better long term planning, increased efficiency, and improved performance. Furthermore, the South Sudanese people will benefit due to improved efficiency and the introduction of off-grid renewable energy solutions.

Key Results (From PCN)

Key outcome indicators to measure progress on the project objective are:

- (i) Indicator One: An energy sector least cost investment plan has been delivered;
- (ii) Indicator Two: Number of prepaid energy meters installed under this project;
- (iii) Indicator Three: Number of solar lighting devices distributed under this project;
- (iv) Indicator Four: Direct project beneficiaries (number), of which female (%).

III. Preliminary Description

Concept Description

A. Concept

For the GRSS to lay the foundation for the development of the energy sector, it needs to focus on the following four key areas in the coming years: (i) improving sector planning, (ii) building sector capacity, (iii) improving distribution system efficiency, and (iv) initiating off-grid energy access enhancement programs. The ESTAP Project will address all of these four key areas identified as part of the ESSN report development process and the ensuing discussions with the Government. The ESTAP Project will be part of continued World Bank support to improve sector performance, and contribution to growth and sustainable development for the years to come in South Sudan's energy sector.

While the ESTAP Project is proposed to be financed as an IDA Credit, it is also likely to receive support from Bank-executed trust funds and programs, such as: Africa Renewable Energy Access Program - II (AFREA II), Lighting Africa, ACCES, etc. Applications for funding from various Bank-executed trust funds are under review and subject to approval.

B. Description

The proposed ESTAP Project consists of the following four components:

Component 1: Least Cost Investment Plan (Indicative Cost: \$1.35M): In order to design the electric

power generation system of the future in South Sudan, it is important to carry out detailed technical planning - which has not yet been carried out in South Sudan. There have been some specific technical studies conducted by donor organizations (Such as: NRECA Mini Grid Study in 2007, Norfund FRHPP Study in 2009, NBI/NELSAP Hydropower Expansion and Regional Integration Study in 2013, etc.) and the recent Energy Sector Strategy Note (ESSN) by the World Bank. However, a detailed least cost investment plan (LCIP) is needed to develop a framework that could assist the Government to attract financing for infrastructure development as well as effectively coordinate with donor partners.

The LCIP will include an assessment of demand and load forecasting using market and household surveys as well as economic growth and consumption patterns. Associated to this task would be the development of to plan for a generation expansion plan that not only considers the cost and availability of generation resources in South Sudan, but also considers the appropriate plant availability (sufficient reserve margin), reliability (low supply interruption frequency), diversity of the generation mix (risk mitigation), and respect for the environment (renewable energy). Further, a distribution network expansion plan considering appropriate capacity of lines and substation will be developed. The plan would also consider available regional interconnections and describe the long term plans to develop a transmission back-bone in the country. The overall objectives of the LCIP are to kick-start a program for future investment to increase energy access that would contribute to poverty reduction and boost the economic development of the country.

Component 2: Capacity Building Program (Indicative Cost: \$1.35M): A comprehensive capacity building program will be initiated under ESTAP for improved technical, managerial, and operational skills. This Component will support the development of a comprehensive capacity building program, based on the recently carried out needs assessment report, and will also support the implementation of the program activities. Despite employing a large number of people, skilled manpower base is not available to the sector.

Focused training, based on the recommendations of the recently carried out needs assessment report, will improve the efficiency and capacity of the sector. This would include areas such as planning and design of infrastructure project, project implementation, procurement management, financial management, management tools and systems, and environmental and social safeguards management, etc. As the sector anticipates growth that would increase the size of the national utility in a very short period, it is important to plan for the future when implementing a capacity building program.

As a first IDA operation in the energy sector in South Sudan, this Component will also provide implementation support for the ESTAP Project by providing appropriate expertise to the Project Implementation Unit (PIU).

Component 3: Distribution Efficiency Improvement Pilot Program (Indicative Cost: \$1.1M): The grid-based electricity situation in South Sudan is characterized by routine power outages and lack of efficiency in the distribution system. Many consumers do not have meters, or have meters that have not been calibrated, cleaned, nor received any form of maintenance in at least ten years. According to SSEC, their outdated equipment causes large system losses estimated to be over 30%, however, this claim remains to be verified as the measurement systems are inadequate. Furthermore, commercial losses due to theft and low bill collection rate (estimated to be around 40-50%) are also high. If left unchecked, the inefficiency will continue to propagate in the grid network.

This Component will finance the development of a program for distribution network efficiency improvement, based on the recommendations of the report on distribution network efficiency improvement program. The Component will also include support for launch of a pilot program for pre-paid energy meters in Juba area. The efficiency program under this Component will support the development of sound principles for operating and maintaining the grid network. The program will also build consumer awareness for theft prevention.

Component 4: Off-Grid Energy Access Pilot Program (Indicative Cost: \$0.7M): While universal electrification is the long term vision of the GRSS, incorporation of off-grid renewable energy solutions for rural electrification is a very viable and cost-effective way of providing modern energy services to remote parts of South Sudan.

This Component will finance an analysis of possible off-grid energy access programs. Following the analysis, a program for off-grid access enhancement will be development. This Component will also support the preparation and launch of pilot projects, based on the recommendation of the analytical studies. Initiatives such as: efficient lighting (Lighting Africa), clean cooking (ACCES), as well as other activities such as mini-grid implementation programs will be supported.

Project Costs

Total cost of the four Components described above is expected to be approximately US\$ 4.5 million, of which, up to US\$ 4.0 million will likely be financed by IDA as a TA Credit (terms TBD). The remaining amount, US\$ 0.5 million will likely be financed by Bank-executed trust funds and programs (such as: AFREA II/Lighting Africa/ACCES).

IV. Safeguard Policies that might apply

Safeguard Policies Triggered by the Project	Yes	No	TBD
Environmental Assessment OP/BP 4.01	x		
Natural Habitats OP/BP 4.04		x	
Forests OP/BP 4.36		x	
Pest Management OP 4.09		x	
Physical Cultural Resources OP/BP 4.11		x	
Indigenous Peoples OP/BP 4.10		x	
Involuntary Resettlement OP/BP 4.12		x	
Safety of Dams OP/BP 4.37		x	
Projects on International Waterways OP/BP 7.50		x	
Projects in Disputed Areas OP/BP 7.60		x	

V. Financing (in USD Million)

Total Project Cost:	4.00	Total Bank Financing:	4.00
Total Cofinancing:		Financing Gap:	0.00
Financing Source	Amount		

BORROWER/RECIPIENT	0.00
International Development Association (IDA)	4.00
Total	4.00

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