PROJECT INFORMATION DOCUMENT (PID)
APPRAISAL STAGE

Report No.: PIDA13382

Project Name	Kariba Dam Rehabilitation Project (P146515)
Region	AFRICA
Country	Africa
Sector(s)	Hydropower (60%), Flood protection (20%), General water, sanitation and flood protection sector (20%)
Theme(s)	Water resource management (60%), Natural disaster management (40%)
Lending Instrument	Investment Project Financing
Project ID	P146515
Borrower(s)	REPUBLIC OF ZAMBIA
Implementing Agency	Zambezi River Authority
Environmental Category	A-Full Assessment
Date PID Prepared/Updated	08-Nov-2014
Date PID Approved/Disclosed	12-Nov-2014
Estimated Date of Appraisal Completion	23-Oct-2014
Estimated Date of Board Approval	11-Dec-2014
Decision	The team was authorized to upgrade the mission from August 18 to September 05 to appraisal and to proceed with negotiations subject to inclusion of several points highlighted by management.

I. Project Context

Country Context

The southern African region has experienced sustained economic growth and increasing prosperity over the past decade. The annual rate of GDP growth in 2011 averaged around 5.14 percent, with GDP for the region estimated at around US$575.5 billion. This has been largely driven by increasing demand for natural resource based commodities facilitated by increased peace and stability. With the population of the Southern African Development Community (SADC) region expected to more than double from around 280 million people in 2012 to more than 560 million over the next 30 years, and as the SADC region industrializes on its path to improved human development, the demand for power is likely to increase by 40 percent over the next decade. As a result, the electricity sector is seen as central to catalyzing infrastructure projects that drive both regional integration and economic growth, with energy security increasingly important to continued development across southern Africa.

Recognizing the importance of the energy sector to regional growth prospects, the SADC has

developed and implemented a comprehensive framework to facilitate integration. Energy plays a central role in this ambitious agenda through the Southern African Power Pool (SAPP). The SAPP was established in 1995 to provide a forum for regional solutions to electricity generation and provides for coordinated planning and operation of the regional power system. The current operations of the SAPP build on a concerted effort to establish a regional framework for energy security based on several regional strategic plans for energy development. These include the SADC Energy Cooperation Policy and Strategy in 1996, followed by the SADC Energy Action Plan in 1997 and the SADC Energy Activity Plan in 2000. Most recently, the Regional Infrastructure Development Master Plan and its Energy Sector Plan in 2012 have been adopted by the SADC Member States. These development strategies set out specific objectives for infrastructure development in energy and its subsectors, with the Energy Sector Plan and RIDMP defining the regional infrastructure requirements and conditions to facilitate the realization of key infrastructure by 2027.

The long-term growth prospects and security of the SAPP are heavily dependent upon availability of the hydropower resources of the Zambezi River basin. Hydropower remains an important but under-represented contributor to the SAPP, accounting for 17 percent (9,474 MW) of the overall generation capacity. The Zambezi River basin accounts for roughly 50 percent of this, with close to 5,000 MW of installed capacity and a similar amount planned for further development. In addition to the provision of firm energy, the centrality of the Zambezi River basin within the SAPP means that the hydropower schemes provide an important balancing element in the overall regional energy mix. Securing these resources is therefore critical to ensuring regional energy security and stability, and avoiding the regional blackouts that have undermined growth prospects in recent years as demand exceeds supply.

The peak demand of the SAPP was 45,315 MW in 2012 against an available capacity of 49,877 MW. Considering a 10.2 percent reserve requirement this is equivalent to a 173 MW shortfall for the southern African region. Aging infrastructure, decommissioning of some plants and limited investments in new generation has reduced the available capacity leading to a regional supply deficit between 2007 and 2012/13 manifest through rolling regional blackouts. In Zimbabwe, energy demand is estimated at over 2,000 MW with installed generation capacity approximately 1,960MW, of which only around 1,200MW is presently available for production. The result is a significant supply/demand gap of around 700MW, rising to 1,000MW during the winter season. There is also extensive suppressed energy demand that further dampens recovery and growth. In Zambia, demand is projected to increase from 1,600 MW in 2010 to about 2,400 MW in 2020. Investment needs in generation alone to provide required supply are estimated to be about US$6 billion in the next 10 years.

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Sectoral and institutional Context

The Kariba Dam and Hydro-Electric Scheme (HES) was constructed across the Zambezi River between 1956 and 1959 and has been central to energy security and supporting economic development in both Zambia and Zimbabwe. With a total installed capacity of 1,830 MW it is the second largest hydro-electric scheme in the Zambezi River basin after the Cahora Bassa complex (2,075 MW) situated downstream in Mozambique. While originally built to provide power to the rapidly developing mining economies of the then Federation of Rhodesia and Nyasaland (modern day Malawi, Zambia and Zimbabwe), the reservoir today has an important role in ensuring the stability of the SAPP and in regulating flows on the Zambezi River. Although the Zambezi River

Authority derives no direct revenue, the reservoir also supports important commercial and subsistence fisheries, tourism operations and small scale water supply for local towns and villages.

The Kariba Dam is a double curvature concrete arch dam, standing at 128m tall with a crest length of 617m and a reservoir capacity of 181km3. This makes it one of the largest reservoirs in the world. The submerged orifice gated spillway comprises six submerged flood sluices located in the central part of the dam wall, with a lower level of +455.37 m. The minimum operating level of the reservoir is +475.5 m. The maximum discharge capacity of the spillway is approximately 9,000 cubic meters per second. The highest recorded discharge from the dam was 7,300 cubic meters per second for flood control in 1978 (combined outflow through four fully open gates and the power stations). The active storage at the Full Supply Level of +488.5m is 64.5 km3. This includes 23.2 km3 of flood control capacity that has to be made available at the beginning of each flood season (February to April) for flood attenuation.

The Kariba Reservoir supplies water to two underground hydropower stations located on the North (left) bank in Zambia and on the South (right) bank in Zimbabwe. The two power stations were constructed with a combined capacity of 1,200 MW, later upgraded to 1,226 MW and more recently increased to 1,830 MW, generating approximately 10,035 GWh annually under normal operating conditions. Each country has its own power station operated by the respective national power utility and current expansion programs are expected to increase the installed capacity to a total of 2,130 MW by 2017. The Kariba North Bank Power Station in Zambia was built and commissioned between 1975 and 1977 with four turbines uprated over the years to provide 720 MW and is now operated by ZESCO, the national utility. The recently completed expansion project has installed two 180 MW turbines on the North Bank, increasing the total capacity of the North Bank Power Station to 1,080 MW. The Kariba South Bank Power Station in Zimbabwe was commissioned in 1960 with six turbines that have been uprated over the years to have a current capacity of 750 MW and is now operated by ZPC, the national utility. In 2013, Zimbabwe signed a US$319 million non-concessional loan with China Eximbank to finance the expansion of the Kariba South Bank Power Station with two additional 150 MW turbines, increasing the total capacity to 1,050 MW.

After 50 years of operation serving the southern African region, the Kariba Dam now requires a series of rehabilitation works for its continued safe operation. A failure to invest in the timely rehabilitation of the dam will result in the gradual degradation of key dam safety features associated with the structure to a level that is not acceptable in accordance to international standards. These works include: 1.a) the design, fabrication and installation of an emergency spillway gate and a new gantry to prevent uncontrolled loss of water in the event of floodgate failure, which would result in water levels dropping below the minimum operational levels and interrupting power production; 1. b) the refurbishment of the upstream emergency gate / stop-beam guides and replacement of secondary concrete to secure their smooth operation and, 2) reshaping of the plunge pool downstream of the dam to limit scouring and erosion that could potentially undermine the dam foundations, leading to dam failure.

II. Proposed Development Objectives

The Project Development Objective is to assist in improving the safety and reliability of the Kariba Dam.

III. Project Description

Component Name

Component 1: Institutional and Project Management

Comments (optional)

The objective of this component is to provide the necessary support to assist the Zambezi River Authority in securing the long-term safety and reliability of the Kariba Dam Hydro-Electric Scheme and will be co-financed by IDA, Sweden and the African Development Bank through a combination of joint co-financing and parallel co-financing of individual activities.

Component Name

Component 2: Plunge Pool Reshaping

Comments (optional)

The objective of this component is to stabilize the plunge pool and prevent further scouring, particularly along the weak fault / shear zone towards the dam foundations and will be financed by the European Development Fund (EDF11) in parallel to the other components of the Kariba Dam Rehabilitation Project.

Component Name

Component 3: Spillway Refurbishment

Comments (optional)

The objective of this component is to improve the operation and prevent potential failure of the spillway control facility and will be jointly co-financed by the IDA, Sweden and the African Development Bank.

IV. Financing *(in USD Million)*

Total Project Cost:	294.20	Total Bank Financing:	75.00
Financing Gap:	0.00		

For Loans/Credits/Others	**Amount**
BORROWER/RECIPIENT	19.20
International Development Association (IDA)	75.00
African Development Bank	75.00
EC European Development Fund (EDF)	100.00
Free-standing Single Purpose Trust Fund	25.00
Total	294.20

V. Implementation

Implementation of the Kariba Dam Rehabilitation Project will take an estimated 10 years and will be executed under the Zambezi River Authority. The ZRA has been established by Zambia and Zimbabwe as a bi-lateral organization with responsibility for development and management of the shared sections of the Zambezi River between the two countries. Four main strategic functions are outlined in the schedule to the Zambezi River Authority Acts Nos. 17 and 19 of 1987 of Zambia and Zimbabwe, respectively. Included among these responsibilities are operating, monitoring and maintaining dams on the Zambezi River and submitting development plans and programmes to the ZRA Council of Ministers for approval.

VI. Safeguard Policies (including public consultation)

Safeguard Policies Triggered by the Project	**Yes**	**No**

Environmental Assessment OP/BP 4.01	×	
Natural Habitats OP/BP 4.04		×
Forests OP/BP 4.36		×
Pest Management OP 4.09		×
Physical Cultural Resources OP/BP 4.11	×	
Indigenous Peoples OP/BP 4.10		×
Involuntary Resettlement OP/BP 4.12	×	
Safety of Dams OP/BP 4.37	×	
Projects on International Waterways OP/BP 7.50	×	
Projects in Disputed Areas OP/BP 7.60		×

Comments (optional)

VII. Contact point

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