



RESTRUCTURING PAPER  
ON A  
PROPOSED PROJECT RESTRUCTURING  
OF THE  
KARIBA DAM REHABILITATION PROJECT (RI)  
APPROVED ON DECEMBER 9, 2014  
TO  
THE REPUBLIC OF ZAMBIA

Water Global Practice  
Eastern and Southern Africa Region

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## ABBREVIATIONS AND ACRONYMS

AfDB	African Development Bank
DAB	Dispute Adjudication Board
EDF	European Development Fund
EHS	Environmental Health and Safety
EPP	Emergency Preparedness Plan
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
EU	European Union
FM	Financial Management
GBV	Gender Based Violence
GRM	Grievance Redress Mechanism
GRZ	Government of the Republic of Zambia
IBAT	Integrated Biodiversity Assessment Tool
IDA	International Development Association
KDRP	Kariba Dam Rehabilitation Project
KHPC	Kariba Hydro Power Company
LiDAR	Light Detection and Ranging
MTR	Mid-Term Review
PDO	Project Development Objective
PIU	Project Implementation Unit
PoE	Panel of Experts
RPF	Resettlement Policy Framework
SDR	Special Drawing Rights
SEA	Sexual Exploitation and Abuse
SH	Sexual Harassment
SIDA	Swedish International Development Cooperation Agency
STEM	Science, Technology, Engineering, and Mathematics
TS&S	Technical Services and Supervision
UA	Units of Aid
ZESCO	Zambia Electricity Supply Corporation
ZRA	Zambezi River Authority
ZVDF	Zambezi Valley Development Fund



**BASIC DATA**

**Product Information**

Project ID P146515	Financing Instrument Investment Project Financing
Original EA Category Full Assessment (A)	Current EA Category Full Assessment (A)
Approval Date 09-Dec-2014	Current Closing Date 28-Feb-2025

**Organizations**

Borrower The Republic of Zambia	Responsible Agency
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**Project Development Objective (PDO)**

Original PDO

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

**Summary Status of Financing (US\$, Millions)**

Ln/Cr/Tf	Approval	Signing	Effectiveness	Closing	Net Commitment	Disbursed	Undisbursed
IDA-55630	09-Dec-2014	20-Feb-2015	20-Aug-2015	28-Feb-2025	75.00	15.20	52.95
TF-19029	09-Dec-2014	20-Feb-2015	20-Aug-2015	30-Jun-2022	20.00	14.65	5.35

**Policy Waiver(s)**

Does this restructuring trigger the need for any policy waiver(s)?

No



**The World Bank**

Kariba Dam Rehabilitation Project (RI) (P146515)

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## I. PROJECT STATUS AND RATIONALE FOR RESTRUCTURING

### A. Introduction

1. **The Kariba Dam Rehabilitation Project was approved by the World Bank Board of Directors on December 9, 2014 and declared effective on August 20, 2015.** The current closing date is February 28, 2025. The project development objective (PDO) is to assist in improving the safety and reliability of the Kariba Dam. The project has three components: Component 1: Institutional and Project Management (US\$70.3 million); Component 2: Plunge Pool Reshaping (US\$99.3 million); and Component 3: Spillway Refurbishment (US\$124.6 million). The total project cost at appraisal was estimated at US\$294.2 million. The project is financed by International Development Association IDA Credit number 5563-ZM, US\$75 million equivalent) with co-financing from the Swedish International Development Cooperation (SIDA) (Grant number TF019029, US\$25 million), parallel financing by the African Development Bank (AfDB, US\$75 million equivalent) covering the institutional project support and the spillway rehabilitation activities, and the European Union – European Development Fund (EU-EDF, US\$100 million equivalent) for the plunge pool reshaping. Counterpart financing from the Zambezi River Authority (ZRA) is estimated at US\$19.2 million. The original project funding was reduced by US\$8.9 million (from US\$270 million to US\$261.1 million) due to the special drawing rights (SDR) and units of aid (UA) exchange rate fluctuations. The project is expected to benefit 3 million people through risk reduction and avoided disaster.

### B. Project Status

2. **Overall progress towards the achievement of the PDO as well as implementation progress are both rated Moderately Unsatisfactory.** Overall project implementation remains behind schedule, with cumulative delays estimated at three years, primarily driven by initial procurement and mobilization delays, unforeseen geotechnical conditions, and project management capacity limitations at the ZRA. The COVID-19 pandemic has also affected the pace of implementation. In 2020, parts and equipment manufacturing was stalled due to factory closures in China and Poland, and travel restrictions disrupted the mobilization of international staff working on the project. Although the project has in place a crisis management team and satisfactory protocols to promote a safe working environment amidst the pandemic, the effects of the pandemic had significant time and cost implications. This restructuring is expected to improve project performance, combined with actions taken by the ZRA to accelerate decision making, improve contract management and keep the works on track (see Action Plan in Annex 2). The PDO and IP will be upgraded following the restructuring.

3. **Cost escalations have accrued not only due to implementation delays but also due to additional geotechnical works** needed to address seepage that would occur during the dewatering as part of the plunge pool reshaping and maintenance works to enhance the functionality of the spillway. The implementation of works on the ground has gained momentum, with significant progress registered for the plunge pool and spillway in the last six months. As of May 15, 2022, the overall project disbursements stood at 35.4 percent (US\$93 million) of available project funds, and commitments represented 64 percent (US\$67 million) of available funding. The remaining US\$94.1 million of project funds will be used to cover the additional supervision costs, additional maintenance works for the spillway, and the grout curtain works. As such, reallocation of funds from IDA (and AfDB) is proposed to cover the additional costs for the plunge pool reshaping and potential cost escalations owed to the engineering complexities of the Kariba Dam works. Detailed implementation status by component follows below.



4. **Component 1: Institutional Support (US\$69.6 million, of which IDA US\$20.2 million, SIDA US\$10.0 million, AfDB US\$20.2 million, and ZRA US\$19.2 million).** This component aims at providing technical support to ZRA in securing the long-term safety and reliability of Kariba Dam. To date, only IDA, SIDA, and AfDB financing for this component has been made fully available, while ZRA has been experiencing difficulties securing resources to consistently finance project activities beyond staff costs. The Technical Services and Supervision (TS&S) contract had experienced inadequate structure and contractual staffing issues, and project management constraints at ZRA, which are being addressed. ZRA is currently working on an addendum for the TS&S to incorporate the additional supervision time for the plunge pool works as well as to enhance dam safety capacity with a finite element model, and ZRA is recruiting an additional procurement and contract management specialist. Furthermore, a Dispute Adjudication Board (DAB) was established for the spillway contract, with nominations drawn from the International Federation of Consulting Engineers Presidents List of Approved Adjudicators in December 2020.

5. The ZRA is constrained financially largely due to unpaid water tariffs by both power utilities of Zimbabwe and Zambia over the years. Improving project management efficiency and effectiveness of ZRA would require project financing for selected staff in the PIU to mainstream project management activities and facilitate smooth project operations. ZRA has therefore requested financing of project management activities, such as project staffing costs out of the IDA (and AfDB) project envelope.

6. **Component 2: Plunge Pool Reshaping (US\$100.0 million EDF financing).** This component aims to stabilize the plunge pool of Kariba Dam and prevent further scouring, particularly along the weak fault/seam zone towards the dam foundations. Works began in March 2017. The construction of the cofferdam, required to isolate and dewater the plunge pool, is currently in an advanced stage, with piers 2 to 5 already completed. Foundation concreting works are ongoing on piers 6 to 8, after some delays due to turbulent underwater conditions resulting from operations of the south bank powerhouse of the dam. The plunge pool works have been further complicated by the permeability of the rock, which will require a grout curtain to be constructed before the dewatering of the plunge pool to curtail the expected seepage, thus allowing the works to take place under dry conditions. Although all key stakeholders have agreed upon the proposed grout curtain solution, there have been significant delays in finalizing the engineering designs and cost estimates for the additional works, including the supervision and contractor's costs resulting from the implementation delays. The compounded extensions of time and additional scope of work to manage these unforeseen technical challenges have resulted in cost overruns for this component, which are estimated at US\$20 million (including contingencies). As the financing from the EU comes from the 11th EDF (2014 to 2020), which is now closed, mobilizing additional EU financing to cover these cost overruns is not possible, thus requiring a reallocation of some of the savings from the IDA credit.

7. **Component 3: Spillway Refurbishment (US\$124.6 million, of which IDA US\$54.8 million, SIDA US\$15.0 million, and AfDB US\$54.8 million).** This component aims at improving the Kariba Dam operation and preventing the potential failure of the spillway control facility by replacing some of the built-in structures that are significantly deteriorated, as well as the concrete that has been affected by an alkali-aggregate reaction.<sup>1</sup> Works on the spillway commenced in November 2019. The sluice gates are located below the minimum operating level of the dam, thus requiring needle cofferdams (with the exception of sluice number 2) to create a watertight working environment for the refurbishment of the gates while

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<sup>1</sup> Alkali-aggregate reaction is a chemical reaction between the alkali in Portland cement and reactive minerals in aggregate and additives that takes place when moisture is present. This reaction results in the formation of a hygroscopic gel that absorbs water and expands, causing significant expansion / swelling and characteristic cracking of the concrete.



maintaining power generation from the dam. The original design at project appraisal was to refurbish one spillway sluice gate at a time, but after project approval and mobilization of the TS&S consultant, a revised design was agreed, with two sluice gates refurbished in parallel. This was expected to reduce the work schedule for refurbishment from eight years to four years, including site preparation and fabrication of parts and equipment, with completion originally expected by November 2023. As of May 2022, the fabrication of the stop beams, and needle cofferdams was complete and delivered to the site. Manufacturing of the emergency gate and its built-in parts was near completion, and evaluation of the potential supplier for the gantry crane was ongoing. On-site, preparations for the refurbishment of each sluice gate were advanced to different degrees, with hydro-demolition in progress in sluice number 6 and 2 and cofferdam preparations for sluices number 1, 3, 4, and 5. Based on the latest program of works, the completion date for these main works is October 2024, but this is expected to change based on an addendum for additional maintenance works.

8. Additional maintenance works initially planned as a variation order to the main spillway works are planned to be split into two phases. The first phase is to be carried out by the main contractor as part of the main spillway works. The cost, work schedule, and methodology have been agreed upon between ZRA and the contractor, and the contract amendment for these works was signed on November 26, 2021. The second phase will be tendered competitively and cannot be executed in parallel with the ongoing works, thus requiring the tendering to be completed afterward, which is likely to extend work on the spillway by 18 months beyond the current closing date. A potential extension of the closing date will be assessed in 2024, based on progress made.

9. **The project's overall procurement performance is moderately satisfactory**, and the procurement risk continues to be substantial. While ZRA has adopted the mitigation measures identified in the appraisal document and retained the services of a qualified procurement specialist, contract management requires significant improvements. All the major contracts for both works and engineering supervision have been procured earlier in the life of the project and are currently under implementation. However, ZRA faces persistent challenges in contract management and significant delays in implementing procurement decisions. To minimize project implementation delays, an action plan for streamlining the procurement review processes was agreed upon among ZRA and the financiers in 2021. In addition, the plan includes timely processing of procurement activities in the systematic tracking of exchanges in procurement (STEP) and ensure that all the milestones and key documents are up to date.

10. **The overall financial management (FM) arrangements were assessed as adequate for the current activities and proposed restructuring. The overall FM risk remains Moderate, and the FM performance rating is Moderately Satisfactory.** The project has remained up to date with its reporting obligations submitted on time and acceptable audit reports throughout implementation. The interim un-audited financial reports (IFRs) have been submitted on time and are of acceptable quality. For the fiscal year ending on December 31, 2020, the auditors expressed an unqualified audit opinion on the Project Financial Statements. However, the auditor observed that ZRA continues to face cash flow challenges due to delayed payments by both Zambia Electricity Services Corporation (ZESCO Ltd). and Zimbabwe Power Company. Due to the liquidity challenges that ZRA has faced over the years, it has defaulted on its repayments on the loan facility.

11. **Safeguard Compliance.** Overall, the project's environmental and social safeguards performance is rated Moderately Satisfactory (MS). An environmental and social impact assessment (ESIA), an environmental and social management plan (ESMP), and a Resettlement Policy Framework (RPF) was prepared for the project, approved, and disclosed. The environmental, health and safety risk remains High. ZRA and its service providers have improved the structure and capacity for environmental health and safety (EHS) management within the project. An additional training program is being developed to further enhance the project's EHS capacity.



12. **Environment Policies.** The project is classified as Category A and has triggered OP 4.01, OP 4.11. The project's ESIA and ESMP were prepared in 2016 and updated and disclosed in October 2020. During the mid-term review (MTR, held virtually in November 2020), several significant shortcomings were revealed in the environmental management of the project, including non-compliances in the implementation of the ESMP (especially biodiversity and water quality monitoring), EHS management capacity constraints at ZRA and contractors, as well as environmental reporting. Since the MTR, ZRA, its TS&S consultant, and contractors have improved their team capacity for EHS management and reporting and have taken robust steps in COVID-19 tracking and management throughout the project area. Further improvements required for EHS management within the project site, have been under implementation. There are still outstanding issues with ecological (terrestrial and aquatic) and water quality monitoring, addressed by triggering OP 4.04 on Natural Habitats, considering the location of the Kariba Dam in the Zambezi River and the need to strengthen project support to protect the natural habitats surrounding Kariba Dam. OP 4.04 is triggered, although confined, the project area is located upstream of several protected areas and key biodiversity areas in both countries: (i) Zambia: Chiawa, Middle Zambezi Valley; (ii) Zimbabwe: Mana Pools, Hurungwe, Charara. The river is also a critical habitat for many migratory birds, endemic and critically endangered species. The regular biodiversity monitoring will enhance environmental management of the project sites and immediate surrounding areas. The updated ESIA includes detailed plans to reduce impacts on terrestrial and aquatic ecosystems and measures to monitor their effectiveness when applied.

13. **Dam Safety.** The project triggered OP4.37 on Dam Safety. A panel of experts (PoE) providing expertise in hydrology, concrete, geotechnical engineering, environmental, and social is in place and has held 12 meetings, providing valuable engineering, environmental, and social inputs to enhance project implementation and safety of the dam. The first draft of all dam safety plans (plan for construction supervision and quality assurance, the instrumentation plan, the operation, and maintenance plan, and the emergency preparedness plan) for the dam rehabilitation works have already been prepared and reviewed by the PoE, and are expected to be completed and start implementation prior to commencement of the plunge pool dewatering. The plans will also be updated for the rehabilitated configuration of the dam by the end of the project. The most recent 5-yearly inspection of the dam was carried out in August 2021 and concluded that the dam was in overall sound condition, considering its age and the ongoing rehabilitation works. The recommendations for ensuring the long-term safety of the dam will be integrated into the final version of the dam safety plans.

14. **Social Policies.** The project triggered OP4.12. Social risk management continues to be implemented in line with the revised ESIA and ESMP. Regular monitoring of contractor compliance is ongoing through monthly social reports, site inspections, social audits, and the implementation of corrective actions. The project grievance redress mechanism (GRM) is operational, providing a channel for communities and workers to register complaints and secure timely resolution. The GRM was enhanced to respond to complaints related to Gender-Based Violence (GBV), Sexual Exploitation and Abuse (SEA), and Sexual harassment (SH), including referral pathways that are survivor-centered. Grievances recorded to date have been resolved satisfactorily and closed. Efforts to address community benefits sharing are underway, though delayed, through the assessment of the Zambezi Valley Development Fund (ZDVF) aimed at strengthening institutional capacity in line with recommendations of the MTR. A consultant has been recruited and the final assessment report is expected by August 2022. Based on the recommendations received, the World Bank will engage with ZRA to explore medium to long term support to sustainably implement said recommendations. This will be in line with management recommendations from the MTR risk deep-dive to enhance community benefits sharing. Further, in line with the policy guidance from its shareholder countries, ZRA is committed to enhancing women's empowerment and would like to use project investments to promote and support science, technology, engineering, and mathematics (STEM) training for young girls in both countries.



15. **An updated economic analysis indicates that the project continues to generate strong economic returns due to the importance of hydropower as a source of electricity generation for both Zambia and Zimbabwe.** However, while considered separate from project implementation issues, ZRA has struggled financially in recent years due to non-payment of water tariffs by ZESCO and Kariba Hydro Power Company (KHPC), the two users of water from the Kariba dam. Hydropower generated from Kariba is by far the lowest-cost source of electricity for the two utilities, and water tariffs are a minor cost for the utilities; however, since 2017, payments to ZRA have lagged far behind billings. As of the end of 2021, ZESCO and KHPC owe ZRA US\$45.0 million and US\$24.4 million, respectively, which is more than four times ZRA’s annual operating expenses. These arrears in turn have reduced ZRA’s ability to pay its own expenses; as of the end of 2020, its trade payables had increased to US\$34.6 million. If ZRA is to be able to operate the rehabilitated dam sustainably, and to manage repayment of the on-lending for the investments, the respective governments will need to enforce payment of water tariffs. Additional information regarding ZRA’s finances, debt sustainability, and updated financial and economic analyses are provided in the Annex 1.

## II. DESCRIPTION OF PROPOSED CHANGES

16. **The proposed restructuring seeks to:** (i) reallocate IDA resources between components to finance part of the plunge pool refurbishment costs based on the updated technical analysis of the project; (ii) incorporate Project Implementation Unit (PIU) staff costs and salaries in the project operating costs to enhance project management efficiency; (iii) provide a 32-month extension of the SIDA grant co-financing to align with the current project closing date, February 28, 2025; (iv) add new intermediate indicators; (v) revise the repayment terms of the Subsidiary Agreement between the Ministry of Finance and National Planning of Zambia and the ZRA and update the Economic and Financial Analysis of the project; (vi) trigger safeguards policy OP 4.04 Natural Habitats, the ISDS, inclusive of Environmental and Social analysis has been updated and disclosed; and, (vii) update risk ratings.

17. **Revised component costs and disbursement estimates.** The proposed restructuring revises the costs of each of the project components to account for the funding shortfall of about US\$20 million, half of which will be financed through IDA (while the other half through AfDB funds) as a result of cost escalation linked to the required seepage reduction measures for the plunge pool works. Therefore, for the IDA financing, US\$10 million are allocated from Project Component 3 to 2, within the existing disbursement category, to co-finance the grout curtain for the plunge pool. Disbursement estimates are also being revised to reflect the delays as well as the current and expected implementation pace until the project closing date. The original and revised project costs are presented in Tables 1 and 2.

**Table 1. Original Project Financing**

Component	Total cost (US\$ million)	Financing (US\$ million equivalent)				
		ZRA	IDA	EDF	AfDB	SIDA
<b>1. Institutional Support</b>	69.6	19.2	20.2	0	20.2	10
<b>2. Plunge Pool Reshaping</b>	100	0	0	100	0	0
<b>3. Spillway Refurbishment</b>	124.6	0	54.8	0	54.8	15
<b>Total</b>	294.2	19.2	75	100	75	25



**Table 2. Revised Project Financing**

Component	Total cost (US\$ million)		Financing (US\$ million equivalent)*				
			ZRA	IDA	EDF	AfDB	SIDA
1. Institutional Support	53.1	9.1	18	0	16	10	
2. Plunge Pool Reshaping	120		0	10	100	10	0
3. Spillway Refurbishment	100		0	43.5	0	43.5	13
<b>Total</b>	<b>273.1</b>		<b>9.1</b>	<b>71.5*</b>	<b>100</b>	<b>69.5*</b>	<b>23*</b>

\*Considering exchange rate losses

18. **Change in the definition of Operating Costs.** The definition of operating costs in the IDA Financing Agreement has been amended to incorporate “Staff Salaries for the PIU staff,” as described in Table 3 below.

**Table 3. Change in the Definition of Operating Costs**

Original definition	Revised definition
“Operating Costs “means the incremental costs incurred by the Project Implementing Entity, based on annual budgets approved by the Association on account of Project implementation, management, and monitoring, including fuel and operation and maintenance costs for vehicles; stationery and sundries; advertising and office running costs including services of office machines and equipment; purchase of materials for workshops; office supplies; communication charges; and venue for workshops and training.	“Operating Costs “means the incremental costs incurred by the Project Implementing Entity, based on annual budgets approved by the Association on account of Project implementation, management, and monitoring, <b>including Project Implementing Entity staff salaries but excluding salaries of civil servants</b> , fuel and operation and maintenance costs for vehicles; stationery and sundries; advertising and office running costs including services of office machines and equipment; purchase of materials for workshops; office supplies; communication charges; and venue for workshops and training.

19. **Extension of SIDA grant closing date.** The proposed restructuring also seeks to extend the SIDA grant closing date by 32 months, from June 30, 2022, to February 28, 2025, to align with the credit closing date. This is the second extension of the grant closing date. With this extension, the cumulative extension of the grant will be 65 months. As of February 2022, only 68 percent of funds disbursed and the full grant amount is committed in ongoing activities, most of which are in advanced stages of implementation. These activities, particularly institutional capacity building, will be necessary until the end of the project to ensure implementation efficiency and enhance ZRA project management and operational capacity.

20. **Change in the results framework.** The changes include additional intermediate indicators to measure progress in the IDA-financed plunge pool works and the additional maintenance works for the spillway. A new indicator has also been introduced to measure ZRA’s contribution to women’s empowerment and gender balance. The GBV measures prepared



and implemented under the project will apply to all activities involving women. Details of changes are provided in Table 4 below.

Table 4 – Changes in the results framework

Indicator	Unit of Measure	Baseline	Progress to Date	Target
<b>New Intermediate Indicators</b>				
Progress with grout curtain under the plunge pool works	percentage	0	0	100
Progress with additional maintenance works at the spillway	percentage	0	0	100
Women and girls accessing STEM training opportunities	number	0	0	20

21. **Changes to the repayment terms of the Subsidiary Agreement.** The restructuring will also include changes to the financing agreement to reflect the new proposed terms of the Subsidiary Agreement, as detailed in the table below. The changes in the Subsidiary Agreement are aligned with the findings of the MTR, which identified that the SA should be made consistent with respect to the treatment of interest charges – the text said that interest should be charged on disbursed amounts, while the amortization schedule included interest payments based on full disbursement of the loans and Interests should only be charged on disbursed amounts.

Table 5 – Changes to the repayment terms of the Subsidiary Agreement

Article	Original description	Revised description
Schedule 2, Section I. C. 1(a)	Repay: (i) the principal amount of the Credit made available under the Subsidiary Agreement (“Subsidiary Credit”) in US Dollars over a period of thirty (30) years commencing two years following the Effective Date; and (ii) interest on the principal amount withdrawn and outstanding from time to time at a rate of 2 percent per annum;	Repay: (i) the principal amount of the Credit made available under the Subsidiary Agreement (“Subsidiary Credit”) in US Dollars over a period of <b>thirty-two years (32) years</b> commencing two years following the Effective Date <b>of the Subsidiary Agreement</b> ; and (ii) interest on the principal amount withdrawn and outstanding from time to time at a rate of <b>1.25 percent per annum</b> ;

22. **An updated financial and economic analyses was undertaken for the Project Restructuring** based on updated revenue and expense information provided in the most recent financial statements (2019-2020) and the 2021 management financial reports (Annex 1). The financial analysis follows the same structure as the analysis done at project appraisal. As with the original analysis, because capital expenditures are very high relative to ZRA’s revenues and expenses, and because negligible additional water sales are expected in the with-project scenario, and, in the without-project scenario, the highly negative impacts of not undertaking the project only takes place many years in the future, the financial



returns to the project are very small. For the economic analysis, the revised internal rate of return is estimated to be 30.6 percent, or slightly below that at Appraisal.

23. **Change in safeguard policies. The OP/BP 4.04 (Natural Habitats) is triggered because the project site and associated works are conducted within natural and critical habitats.** Kariba is located upstream of several protected areas and key biodiversity areas in both Zambia and Zimbabwe. The Zambezi River is also a critical habitat for endemic, migratory, vulnerable, endangered, and critically endangered extinction species. Notable impacts of the works may include fish kills during underwater blasting and the presence of crocodiles in the plunge pool, which need relocation to allow for the civil works. Although the original project design did not trigger OP 4.04, the updated ESIA included provisions and detailed plans to monitor and reduce impacts in ecosystems, as well as provisions to monitor the effectiveness of those plans.

24. ZRA has assessed the project budget vis-à-vis required interventions and has made allocations to strengthen the implementation of safeguards measures, including biodiversity plans introduced with the updated ESIA, the implementation of the ESMP measures pertaining to compliance with OP 4.04, biodiversity monitoring (environmental deoxyribonucleic acid), capacity building and training, environmental audits, and implementation of the Hydropower Sustainability Standard, among others. Currently the allocation made is about US\$ 1.4 million. ZRA will assess and revise the budget allocations on a bi-annual basis and ensure that these activities are fully funded. The World Bank will monitor the compliance with the ESMP and OP 4.04 policy requirements and monitor that budget allocations remain adequate, during the supervision missions.

25. Finally, the risk ratings have been updated to reflect the current risk associated with the project. The Overall risk remains High, due to the complexity of the engineering intervention as well as the implementation arrangements involving two countries, Zambia and Zimbabwe and the bi-national institution that operates the dam. The mitigating measures include enhanced support to the ZRA, especially in contract management as well additional funding for the implementation of safeguards measures.



### III. SUMMARY OF CHANGES

	Changed	Not Changed
Results Framework	✓	
Components and Cost	✓	
Loan Closing Date(s)	✓	
Disbursement Estimates	✓	
Overall Risk Rating	✓	
Safeguard Policies Triggered	✓	
Economic and Financial Analysis	✓	
Technical Analysis	✓	
Social Analysis	✓	
Environmental Analysis	✓	
Implementing Agency		✓
DDO Status		✓
Project's Development Objectives		✓
PBCs		✓
Cancellations Proposed		✓
Reallocation between Disbursement Categories		✓
Disbursements Arrangements		✓
EA category		✓
Legal Covenants		✓
Institutional Arrangements		✓
Financial Management		✓
Procurement		✓
Implementation Schedule		✓
Other Change(s)		✓



IV. DETAILED CHANGE(S)

COMPONENTS

Current Component Name	Current Cost (US\$M)	Action	Proposed Component Name	Proposed Cost (US\$M)
Component 1: Institutional and Project Management	70.30	Revised	Component 1: Institutional and Project Management	53.10
Component 2: Plunge Pool Reshaping	99.30	Revised	Component 2: Plunge Pool Reshaping	120.00
Component 3: Spillway Refurbishment	124.60	Revised	Component 3: Spillway Refurbishment	100.00
<b>TOTAL</b>	<b>294.20</b>			<b>273.10</b>

LOAN CLOSING DATE(S)

Ln/Cr/Tf	Status	Original Closing	Revised Closing(s)	Proposed Closing	Proposed Deadline for Withdrawal Applications
IDA-55630	Effective	28-Feb-2025			
TF-19029	Effective	30-Sep-2019	30-Jun-2022	28-Feb-2025	28-Jun-2025

DISBURSEMENT ESTIMATES

Change in Disbursement Estimates

Yes

Year	Current	Proposed
2015	0.00	0.00
2016	1,040,049.85	1,040,049.85
2017	1,306,594.76	1,306,594.76
2018	2,185,081.18	2,185,081.18
2019	3,941,350.11	3,941,350.11
2020	7,742,228.11	7,742,228.11



2021	5,074,250.55	5,074,250.55
2022	12,000,000.00	12,000,000.00
2023	10,000,000.00	22,000,000.00
2024	9,000,000.00	24,000,000.00
2025	8,000,000.00	18,700,000.00

**SYSTEMATIC OPERATIONS RISK-RATING TOOL (SORT)**

Risk Category	Rating at Approval	Current Rating
Political and Governance		● Moderate
Macroeconomic		● Moderate
Sector Strategies and Policies		● Low
Technical Design of Project or Program		● High
Institutional Capacity for Implementation and Sustainability		● Substantial
Fiduciary		● Moderate
Environment and Social		● High
Stakeholders		● Moderate
Other		
Overall		● High

**COMPLIANCE**

**Safeguard Policies**

Safeguard Policies Triggered	Current	Proposed
Environmental Assessment (OP) (BP 4.01)	Yes	Yes
Performance Standards for Private Sector Activities OP/BP 4.03	No	No
Natural Habitats (OP) (BP 4.04)	No	Yes
Forests (OP) (BP 4.36)	No	No
Pest Management (OP 4.09)	No	No
Physical Cultural Resources (OP) (BP 4.11)	Yes	Yes



Indigenous Peoples (OP) (BP 4.10)	No	No
Involuntary Resettlement (OP) (BP 4.12)	Yes	Yes
Safety of Dams (OP) (BP 4.37)	Yes	Yes
Projects on International Waterways (OP) (BP 7.50)	Yes	Yes
Projects in Disputed Areas (OP) (BP 7.60)	No	No



**Results framework**

COUNTRY: Eastern and Southern Africa

Kariba Dam Rehabilitation Project (RI)

**Project Development Objectives(s)**

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

**Project Development Objective Indicators by Objectives/ Outcomes**

Indicator Name	PBC	Baseline	End Target
<b>Number of people benefitting in the project area through risk reduction and avoided disaster</b>			
Number of people benefitting in the project area through risk reduction and avoided disaster (Text)		3,000,000 at risk from failure	3,000,000 people no longer at risk from failure
<b>Emergency Preparedness Plan adopted and operationalized</b>			
Emergency Preparedness Plan adopted and operationalized (Yes/No)		No	Yes

**Intermediate Results Indicators by Components**

Indicator Name	PBC	Baseline	End Target
<b>Component 1: Institutional and Project Management</b>			
Emergency Preparedness Plan Updated (Text)		Existing EPP limits operations due to dam safety concerns	Updated EPP adopted and operationalized
Dam Break Analysis Completed and Integrated into the EPP (Text)		Limited information available	Flood inundation and risk maps integrated into EPP



Indicator Name	PBC	Baseline	End Target
Women and girls accessing STEM training opportunities (Number)		0.00	20.00
<b>Action: This indicator is New</b>	<b>Rationale:</b> <i>ZRA is committed to enhancing the gender balance by supporting the training of young female technicians.</i>		
<b>Component 2: Plunge Pool Reshaping</b>			
Plunge Pool: Volume Excavated (Cubic Meter(m3))		0.00	300,000.00
Progress with grout curtain under the plunge pool works (Percentage)		0.00	100.00
<b>Action: This indicator is New</b>	<b>Rationale:</b> <i>This indicator will allow for better progress monitoring for the additional works to reduce seepage below the plunge pool cofferdam.</i>		
<b>Component 3: Spillway Refurbishment</b>			
Spillway: Gates Refurbished (Text)		0 gates refurbished	6 gates refurbished
Spillway: Rule Curve (Text)		Rule curve reduced by 3.5m	Rule curve restored to full supply level
Progress with additional maintenance works at the spillway (Percentage)		0.00	100.00
<b>Action: This indicator is New</b>	<b>Rationale:</b> <i>This indicator will measure the progress on the additional maintenance works for the spillway.</i>		



**The World Bank**

Kariba Dam Rehabilitation Project (RI) (P146515)

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**Annex 1  
Economic and Financial Analysis  
Restructuring Updates**

1. As part of the restructuring of the Kariba Dam Rehabilitation Project (KDRP), the team updated the financial and economic analyses undertaken at project appraisal, as well as reviewed the current financial situation of the Zambezi River Authority (ZRA). The results of these exercises are presented here.

**I. Recent Financial Performance of the Zambezi River Authority**

2. ZRA is a financially autonomous organization that generates operating revenue through water tariffs charged to the Zambian and Zimbabwean power companies ZESCO and the Kariba Hydro Power Company (KHPC), respectively. A 2016 Water Purchase Agreement between the ZRA and the two companies re-set water tariffs for 2016, 2017, and 2018, setting a fixed fee of US\$6.55 million each year, to be split between the two companies, and a variable tariff of US\$0.42067 per 1,000 m<sup>3</sup> water, the latter of which would be increased by two percent each year.<sup>2</sup> An addendum to the agreement in 2019 continued the fee structure, including the annual variable fee increase. The tariff schedule was agreed such that ZRA’s revenues would be sufficient to repay the concessional debt associated with the rehabilitation of Kariba Dam.

3. This analysis of ZRA’s recent financial performance is based on available audited financial statements (2018-2020) and unaudited management financial reports for 2021. The reports show that while ZRA’s finances are acceptable, even strong – on an accounting basis, on a cash basis the picture is very different. As a result of unpaid water tariffs by both ZESCO and KHPC over several years, ZRA has been unable to fully pay its expenses or to service its debt to the Government of the Republic of Zambia (GRZ).<sup>3</sup> Following several years of non-payment in accordance with the loan terms, the amounts outstanding were restructured in late 2021, with repayments to be made over a period of 30 years. Repayment of amounts of the loan that have not yet been disbursed will be scheduled on the new terms, a two-year grace period; repayments over 30 years; and an interest rate of 1.25 percent, based on actual disbursements. The restructured terms will make repayment of the loans significantly less burdensome than the original loan terms.

4. ZRA’s financial results between 2018 and 2021, in simplified form and on an accounting basis, are presented below.

**Simplified ZRA Financial Results (US\$ ‘000)<sup>1</sup>**

	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021<sup>2</sup></b>
<b>Revenues</b>				
Fixed Fees	6,550	6,550	6,550	6,550
Variable Fees	19,262	17,601	17,155	32,290
<b>Total Revenues</b>	<b>25,812</b>	<b>24,151</b>	<b>23,705</b>	<b>38,840<sup>3</sup></b>
<b>Expenses</b>				

<sup>2</sup> The agreement also establishes discounted tariffs for amounts above the annual water allocation when additional water is available, and penalties for amounts above the allocation when additional water is not available. Since the signing of the agreement, there has not been a surplus of water.

<sup>3</sup> The debt was on-lending of the IDA credit and the AfDB loan for the KDRP, with repayment terms agreed prior to project start. Those terms resulted in significantly front-loaded repayments and higher interest rates than in the International Financial Institution lending.



	2018	2019	2020	2021 <sup>2</sup>
Personnel	10,354	9,142 <sup>4</sup>	9,928	8,253
Other Operational Expenses	653	622	427	235
Administrative Expenses	3,556	2,826	1,710	712
Board Expenses	909	826	3,920	445
<b>Total Operating Expenses</b>	<b>15,472</b>	<b>13,426</b>	<b>12,457</b>	<b>9,645</b>
<b>Net Operating Revenue</b>	<b>10,340</b>	<b>10,725</b>	<b>11,248</b>	<b>29,195</b>
Depreciation (non-cash expense)	3,526	3,786	3,473	3,717
<b>Net Revenue (Loss)</b>	<b>6,814</b>	<b>6,939</b>	<b>7,775</b>	<b>25,478</b>

- ❖ ZRA’s revenues and expenses are denominated in US Dollars. It therefore is not exposed to exchange rate risks on debt denominated in US Dollars, and its exchange rate risks in other international currencies is probably less than if it operated in Zambian or Zimbabwean currency. That said, its two customers – ZESCO and Zimbabwe Hydro Power – operate in local currencies, and therefore ZRA is subject to the risk of its customers being unable to pay in US Dollars.
- ❖ Based on unaudited management financial reports.
- ❖ Billings in 2021 are significantly higher than previous years due to fees for water use above the allocated amount.
- ❖ An additional US\$11.36 million was charged to personnel expenses in 2019, for total personal expenses of US\$20.5 million. This amount was included as an ordinary expense in the audited financial statements; however, as it was a one-time charge related to staff restructuring, it has been removed from this presentation to ease comparison with previous years. ZRA expects that its annual staffing-related expenses will be reduced by about US\$4 million per year as a result of the restructuring.

5. A few key observations from the above:

- Based on the accounting results, ZRA would appear to be in a strong financial position, with sufficient net operating revenues to cover debt obligations, as well as to set aside cash reserves to be used for special investments or rehabilitation. For example, the 2019 extraordinary expense of US\$10.36 million for staff restructuring could have been paid from cash reserves.
- The large jump in billings in 2021 was due to water demand from ZESCO and KHPC well above the amount of water allocated to each of them, triggering penalties for usage above the allocation. However, because ZESCO and KHPC have not been paying their invoices, this has not resulted in additional cash available to ZRA.
- The drop in operating expenses in 2020 and, more noticeably, in 2021, was the result both of COVID-related limitations, as well as of cash constraints. Regardless of the reason, it was an indication that there is some flexibility in administration and management of ZRA expenditures.

6. In contrast to the strong performance on an accounting basis, on a cash basis ZRA has significant financial struggles. Its financial statements indicate multiple issues of cash shortages due to uncollected billings from ZESCO and KHPC, which in turn has resulted in accumulated amounts owed to suppliers and services and unpaid debt obligations to the GRZ. While some of the debt was due to a front-loaded loan-repayment schedule, which has since been corrected and restructured, most of the pressures on ZRA are due to non-payment of billings by ZESCO and KHPC. The following summarizes the causes of the pressures on ZRA’s cash:

- **Uncollected Billings:** As of the end of 2021, ZESCO owed ZRA US\$45.0 million, US\$18.6 million of which accrued during 2020 and 2021. KHPC owed ZRA US\$24.4 million, US\$16.6 million of which accrued during 2020 and 2021. In addition, with respect to KHPC, it has not been possible to transfer some amounts owed to ZRA due to currency



restrictions – US\$12.6 million in additional amounts owed is held in Zimbabwean banks and is not able to be transferred.

- **High debt-related payments:** Through 2020, ZRA debt repayment obligations to GRZ (related to onlending for the KDRP) had been based on a debt amortization schedule prepared during project appraisal, which assumed significantly faster project implementation and loan disbursement. Despite significant delays in implementation and very low disbursements from the loan, ZRA was, on paper, obligated to make both interest payments and principal repayments based on the original amortization schedule. Debt restructuring was agreed in late 2021 for the amounts already disbursed, which was allowed to be repaid over a 32-year period, including a two-year grace period. In addition, terms for the remaining amounts to be borrowed were agreed to be based on amounts withdrawn (vs. a predetermined schedule), with repayments also over a 32-year period, and at an interest rate of 1.25 percent.

7. Pressures on ZRA’s cash availability began to directly affect its ability to pay its expenses beginning in 2018, during which year ZRA’s trade payables increased by US\$5.56 million. As of the end of 2019, trade payables for goods and services had increased to US\$26.8 million, and by the end of 2020, to US\$34.6 million. These amounts do not include formal debt to GRZ, and indicate how little revenue, in cash, ZRA has received from its two customers.

## II. Revised Financial Projections and Debt Sustainability Analysis

8. Revised financial projections have been made in order to assess the likely ability of ZRA to cover its debt obligations related to the project. These projections have been made based on restructured subsidiary lending agreements, although with simplified repayment terms due to the uncertainty of the timing of disbursements.<sup>4</sup> The analysis incorporates the following financial and operational information, updated from the appraisal analysis.

ZRA Financial and Operational Information	
Base-year (2020) operating revenues	
Fixed charges	US\$6.55 million
Volumetric charges	US\$0.4645/1,000 m <sup>3</sup>
Water sales	39,000 mill. m <sup>3</sup>
Total operating revenue	US\$24.6 million
Base-year operating expenses (cash basis)	US\$13.9 million*
Annual inflation adjustment of fixed and volumetric revenues and expenses	2%
Maintenance expense rate	1%

\* Adjusted from pandemic-year lows for this exercise.

<sup>4</sup> The debt projections assume (i) a restructured sub-loan for amounts already disbursed from the IDA credit of US\$5.8 million; (ii) a sub-loan, on new terms, for the remaining amount of the IDA credit of US\$70.3 million; and (iii) a sub-loan, on new terms, for an amount of US\$30.0 million equivalent, representing the amount of the AfDB loan.



<b>Revised Financing/On-lending Information</b>	
On-lending amount	US\$106.1 million
Maturity	32 years
Grace period	2 years
Repayment period	30 years
Interest rate	1.25%
Annual principal repayment (flat principal repayments for 30 years)	US\$3.57 million
Annual interest payment (declining interest payments)	Based on disbursed loan amount

9. The following indicates the resulting net cash flows, debt service, and debt-service coverage ratios for the initial years of the project.

#### **Debt-Service Coverage Ratio (US\$ million)**

	<b>2022</b>	<b>2023</b>	<b>2024</b>	<b>2025</b>	<b>2026</b>	<b>2027</b>	<b>2028</b>	<b>2029</b>	<b>2030</b>
Net Operating Income, not including interest expense or depreciation	11.4	11.5	11.6	11.7	9.7	9.8	9.8	9.9	10.0
Principal Repayments			3.6	3.6	3.6	3.6	3.6	3.6	3.6
Interest Payments (estimated)	0.5	0.8	1.0	1.2	1.3	1.2	1.2	1.1	1.1
Total Debt Service	0.5	0.8	4.6	4.8	4.9	4.8	4.8	4.7	4.7
<b>Debt Service Coverage Ratio</b>	<b>23.0</b>	<b>15.3</b>	<b>2.5</b>	<b>2.5</b>	<b>2.0</b>	<b>2.0</b>	<b>2.1</b>	<b>2.1</b>	<b>2.2</b>

10. The projections indicate that, as long as ZRA receives the payments owed it by ZESCO and KHPC each year, ZRA should be able to service its debt without issue. However, if the current situation, in which amounts owed by ZESCO and KHPC are not paid – continues, ZRA will not be able to pay its operating expenses or debt obligations.

### **III. Updated Financial Analysis**

11. An updated financial analysis was undertaken for the Project Restructuring based on updated revenue and expense information provided in the most recent financial statements (2019-2020) and the 2021 management financial reports. The analysis follows the same structure as the analysis done at project appraisal: pro-forma profit-and-loss and simplified cash-flow statements, incorporating the non-grant-financed project capital expenditures as well as estimated impacts on operations over a 30-year period, were prepared on a with- and without-project basis in order to estimate the direct financial returns of the project to ZRA. As with the original analysis, because capital expenditures are very high relative to ZRA's revenues and expenses, and because negligible additional water sales are expected in the with-project scenario, and, in the without-project scenario, the highly negative impacts of not undertaking the project only takes place many years in the future, the financial returns to the project are very small. The following summarizes the core assumptions of the projections.



<b>ZRA Financial and Operational Information</b>		
	<b>At Appraisal</b>	<b>At Restructuring</b>
Base-year operating revenues:		
Fixed charges	US\$5.04 million	US\$6.55 million
Volumetric charges	US\$0.34/1,000 m <sup>3</sup>	US\$0.4291/1,000 m <sup>3</sup> (2016)
Water sales	39,000 mm <sup>3</sup>	39,000 mm <sup>3</sup>
Total operating revenue	US\$18.85 million	US\$22.95 million (2016)
Base-year operating expenses (cash basis)	US\$12.38 million	US\$15.27 million (2016)
Annual inflation adjustment of fixed and volumetric revenues and expenses	0% (real prices)	0%
<b>With-Project Assumptions</b>		
Non-grant-funded project costs	US\$133.25 million	US\$115.0 million
End-project water sales	42,000 mm <sup>3</sup>	42,000 mm <sup>3</sup>
Maintenance expense rate (% of value of rehabilitated assets)	1%	1%
Annual avoided extraordinary expenses	US\$1 million	US\$1 million
Project implementation period	10 years	10 years
<b>Without-Project Assumptions</b>		
Reduction in water sales due to lowering of the rule curve:		
Year 5	0%	0%
Year 10	5%	5%
Year 15	8%	8%
Year 20	11%	11%
Year 25	16%	16%
Year 30 (decommissioning for the purpose of hydro-electric generation)	100%	100%
Annual maintenance expenses following decommissioning	US\$2 million	US\$2 million

12. The original with- and without-project financial analysis calculated a financial internal rate of return of negative 0.18 percent, and a net present value (NPV), at a discount rate of 2 percent (the expected rate of ZRA’s borrowing at that time), of negative US\$44.1 million. With the revised project costs and timeline estimated at the time of restructuring, the FIRR and NPV have remained roughly the same. The following summarizes the results.

<b>Results of With- and Without-Project Financial Analysis</b>		
	<b>At Appraisal</b>	<b>Restructuring</b>
Financial Internal Rate of Return (FIRR)	- 0.18%	-0.10%
NPV (discount rate of 2%)	- US\$44.1 million	- US\$42.3 million

13. The Cost-Benefit Analysis undertaken at project appraisal has been updated for the Restructuring. As at appraisal, the analysis considers the cost of the without-project scenarios as the cost to replace electricity production that is lost due to (i) the lowering of the operational rule curve over time and (ii) de-commissioning of the dam for hydroelectric



purposes in the long term. In fact, the importance of lower electricity production has become even clearer since appraisal, as for several years the regional drought resulted in lower electricity production from the Kariba dam. ZESCO reported multiple years of financial losses in large part due to the high cost of replacing power that it could no longer produce using its hydropower dams, including Kariba. Those losses were also cited in ZESCO's inability to pay its water invoices to ZRA. In addition, the losses of power during brown-outs and the costs of mitigating them by business and households have had significant, if non-quantified, impacts on the economy.

14. The with-project assumptions are largely the same as at appraisal. The overall cost of the project is estimated to have fallen approximately 11 percent, though the implementation period, while delayed several years, remains 10 years (as at Appraisal). The project team received current information regarding the cost of electricity generation at the two power plants, as well as for electricity generation elsewhere within their systems (as a proxy for the cost of replacement power, for use in the without-project scenario), and the economic analysis was revised based on this new information. Given worldwide patterns of increasing costs of electricity generation, this assumption is probably conservative. Updated assumptions are provided below.

<b>With-Project Assumptions</b>		
	<b>At Appraisal</b>	<b>At Restructuring</b>
Project costs	US\$ 294.3 million	US\$ 261.9 million
Project implementation period	10 years	10 years
Start-of-project water delivery	39,000 mill. m <sup>3</sup>	39,000 mill. m <sup>3</sup>
End-of-project water delivery	42,000 mill. m <sup>3</sup>	42,000 mill. m <sup>3</sup>
Loss of generation capacity at recommended operating rule curve	11%	11%
Loss of generation capacity following completion of plunge pool rehabilitation works	5%	n/a (plunge pool rehabilitation now expected at end-of-project, rather than mid-project)
Loss of generation capacity following completion of all works	0%	0%
Cost of electricity generation at Kariba North	US\$ 0.00742	US\$ 0.0095*
Cost of electricity generation at Kariba South	US\$ 0.02593	US\$ 0.0045**

\* Estimated cost at the time of the MTR (2020); ZESCO reported in May, 2022 that the cost of power generation at Kariba North was US\$0.16 per kWh, which is more than 16 times the previously reported cost, more than 35 times the cost reported at Kariba South, and would make it easily the most expensive source of power for ZESCO. As the reported cost is highly unlikely, the previously reported cost of US\$0.0095 has been used in the updated analysis.

\*\* Provided by Zimbabwe Electricity Supply Authority in May, 2022.



Without-Project Assumptions		
	At Appraisal	At Mid-Term
Start-of-project water delivery	39,000 mill. m <sup>3</sup>	39,000 mill. m <sup>3</sup>
Base annual electricity generation	9,720 GWh	9,720 GWh
Loss of generation capacity at year 1 recommended operating rule curve	11%	11%
Estimated losses of generation capacity:		
In year 5	13%	13%
In year 10	16%	16%
In year 15	19%	19%
In year 20	22%	22%
In year 25	27%	27%
In year 30 (decommissioning for the purposed of hydroelectric generation)	100%	100%
Cost of electricity generation at Kariba North	US\$ 0.00742	US\$ 0.0095*
Cost of electricity generation at Kariba South	US\$ 0.02593	US\$ 0.0158*
Cost of replacement power	US\$ 0.165 kWh	US\$ 0.1017**

\* See Note for the With-Project Assumptions.

\*\* Average cost of power generation throughout the ZESCO system, not including Kariba North, as reported by ZESCO in May, 2022.

15. Taking into account the above revised assumptions, the revised internal rate of return is estimated to be 30.6 percent, or slightly below that at Appraisal. The Net Present Value of the investment, at a discount rate of 6 percent (reflecting the long-lived nature of the dam and the rehabilitation works), is calculated at approximately US\$2.77 billion. Using a traditional discount rate of 10 percent, the NPV is calculated to be US\$1.1 billion.

Results of With- and Without Project Economic Analyses		
	At Appraisal	At Restructuring
Internal Rate of Return (IRR)	33%	30.6%
NPV (at a discount rate of 6%)	US\$3.5 billion	US\$2.77 billion
NPV (at a discount rate of 10%)	US\$1.3 billion	US\$1.1 billion

16. As at appraisal, several scenarios were modeled to estimate the project’s sensitivity to various risk factors and the robustness of the above results. The results of these updated sensitivity analyses are as follows:

Scenario 1: 30% increase in project costs	
Internal Rate of Return (IRR):	26%
NPV (discount rate of 6%)	US\$2.7 billion
NPV (discount rate of 10%)	US\$1.04 billion
Scenario 2: Cost of replacement power falls to US\$0.08/kWh	
Internal Rate of Return (IRR):	27%
NPV (discount rate of 6%)	US\$2.1 billion
NPV (discount rate of 10%)	US\$821 million
Scenario 3: 30% Cost of replacement power increases to US\$0.20/kWh	
Internal Rate of Return (IRR):	41%
NPV (discount rate of 6%)	US\$5.8 billion
NPV (discount rate of 10%)	US\$2.4 billion



17. The robustness of the results of the economic analysis is due almost entirely to the fact that hydropower generation remains the least expensive mode of power generation; while nearly any form of replacement power is relatively high cost. At the time of Restructuring, replacement power was estimated at approximately US\$0.10 per kWh (slightly less than the estimate at appraisal), which is approximately 10 times the estimated cost of power generation at Kariba North and 20 times the cost of power generation at Kariba South.



**Annex 2**

**Action plan to improve project performance**

**Current key actions agreed with Government of the Republic of Zambia (GRZ) and Government of Zimbabwe (GoZ) and the Zambezi River Authority (ZRA) to improve project performance during the Joint Mission in May 2022**

<b>N</b>	<b>Action to be taken/Status on Action</b>	<b>Action By</b>	<b>Targeted Date</b>	<b>Status/Next Steps</b>
1	Close oversight of progress and implementation performance by line Ministries of Energy of the two countries	GRZ and GoZ	Ongoing	Monthly check-ins with line ministries and financiers agreed in October 2021 have been discontinued. The financiers have requested to resume.
2	Finalize the procurement of a procurement and contract management specialist	ZRA	August 15, 2022	Key additional capacity for ZRA. Terms of Reference cleared.
3	Reassessment of allocation of workforce of TS&S and associated contract extension/amendment. Adequate justifications for all additional resources and deployment (field vs home office) required.	ZRA	June 30, 2022	Ongoing
4	Submit for the financier review the tender package for the seepage reduction works.	ZRA	July 7, 2022	Ongoing. Draft Tender prepared and being adjusted with updated grouting scope
5	Submit for financiers review the implementation plan and interface management plan for the seepage reduction works	ZRA	June 20, 2022	Ongoing. A first draft is prepared and requires updating with the current grouting done by the existing contractor.
6	Launch the procurement of the seepage reduction works	ZRA	July 15, 2022	Originally package due by end of May 2022 but TS&S asked for more time, given ongoing works under the EU contract.
7	Submit for the financiers review the checklist and evidence of the minimum dam safety requirements prior to dewatering	ZRA	June 10, 2022	S Update Submitted, next update on June 27, 2022.
8	Hold a meeting with the World Bank environmental team to coordinate proposed training plan and EHS management system	ZRA	July 2022	Planned
9	Complete the project restructuring	World Bank/AfDB	June 30, 2022	Ongoing