

Operations Evaluation Department  
African Development Bank Group

2011

**Zambia:** Victoria Falls – Katima Mulilo  
132kV Interconnection Project  
Project Performance Evaluation Report





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## **Zambia:** Victoria Falls – Katima Mulilo 132kV Interconnection Project Project Performance Evaluation Report

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# Currency Equivalents

## Currency Unit – Zambia Kwacha (ZMK)

At Appraisal	At Project Completion	At Operations Evaluation
(September 1998)	(September 2008)	(July 2010)
1 UA = USD 1.34	USD 1.62	1 UA = USD 1.48
1 UA = ZMK 2 493.82	ZMK 5 204.89	1 UA = ZMK 7 374.42

# Weights and Measures

1 km (kilometre)	=	103 meters (m)
1kV (kilovolt)	=	103 Volts (V)
1kVA (kilovolt Ampere)	=	103 Volt Amperes (VA)
1 kW (kilowatt)	=	103 Watts (W)
1 kWh (kilowatt hour)	=	103 Watt-hours (Wh)
1MWh (megawatt hour)	=	103 kWh = 106 Wh
1 GWh (gigawatt hour)	=	103MWh = 106 kWh
1TWh (terawatt hour)	=	103 GWh = 109 kWh
1MVA(megavolt ampere)	=	103kVA
1MW (megawatt)	=	103 kW = 106 Watts (W)

# Fiscal Year

1 January – 31 December

# Abbreviations and Acronyms

ADF	African Development Fund	MOA	Ministry of Agriculture
AfDB	African Development Bank	MOL	Ministry of Labour
BPCR	Borrower Project Completion Report	MOU	Memorandum of Understanding
BSA	Bulk Supply Agreement	MYTF	Multi-Year Tariff Framework
CEC	Copperbelt Electricity Corporation PLC	NamPower	Namibia Power Corporation (Pty) Ltd
CODE	Committee for Development Effectiveness	NEPAD	New Partnership for Africa's Development
COMESA	Common Market for Eastern and Southern Africa	NORED	Northern Regional Electricity Distributor (Namibia)
CSO	Central Statistics Office	NWEC	North Western Energy Corporation Ltd
DBSA	Development Bank of Southern Africa	O&M	Operation and Maintenance
DRC	Democratic Republic of Congo	OHL	Overhead Line
ECB	Electricity Control Board (of Namibia)	OPEV	Operations Evaluation Department (of the AfDB)
ECZ	Environmental Council of Zambia	PAR	Project Appraisal Report
EIA	Environmental Impact Assessment	PB	Project Brief
EIRR	Economic Internal Rate of Return	PCR	Project Completion Report
EPB	Environmental Project Brief	PIU	Project Implementation Unit
ERB	Energy Regulation Board (of Zambia)	PRP	Power Rehabilitation Project (World Bank)
ESMP	Environmental and Social Management Plan	PPI	Producer Price Index
FE	Foreign Costs	PPSA	Power Purchase and Sales Agreement
FIRR	Financial Internal Rate of Return	PSD	Private Sector Development (reform programme)
FNDP	Fifth National Development Plan	PSP	Private Sector Participation
FY	Financial Year	REA	Rural Electrification Authority
GRZ	Government of Zambia	REMP	Rural Electrification Master Plan
IAES	Increased Access to Electricity Services Project (World Bank)	RMC	Regional Member Country
IPP	Independent Power Producer	ROI	Return on Investment
ITPC	Itezhi Tezhi Power Corporation	SADC	Southern African Development Community
KPI	Key Performance Indicator	SAPP	Southern African Power Pool
LC	Local Costs	TOR	Terms of Reference
LRMC	Long-Run Marginal Cost	WHS	World Heritage Site
M&E	Monitoring and Evaluation	ZAWA	Zambia Wildlife Authority
ME	Ministry of Environment	ZESA	Zimbabwe Electricity Supply Authority
MEWD	Ministry of Energy and Water Development	ZESCO	Zambia Electricity Supply Corporation Ltd
MFNP	Ministry of Finance and National Planning	ZiZaBoNa	Zimbabwe-Zambia-Botswana-Namibia Regional Power Corridor
MIS	Management Information System/s		



# Basic Project Data

## Preliminary Data

Country	Zambia
Project	Zambia Victoria Falls-Katima Mulilo 132kV Interconnection Project
Loan Number	2100150001100
Borrower	The Republic of Zambia
Guarantor	N/A
Beneficiary	Zambia Electricity Supply Corporation (ZESCO Ltd)
Executing Agency	Zambia Electricity Supply Corporation (ZESCO Ltd)

## A. Key Dates

	Appraisal Estimate	Actual
Loan Amount (UA/Million)	4.85	4.85
Loan Approval Date	Aug. 1999	Dec. 1999
Loan Signature Date	Sept. 1999	Feb. 2000
Date of First Disbursement	Nov. 1999	17 Mar. 2003
Date of Last Disbursement	Dec. 2001	21 Nov. 2006

## B. Selected Project Data

### Financing Plan (UA/Million)

Source	Appraisal Estimate May 1999				Actual Sept 2006			
	FE	LC	Total	%	FE	LC	Total	%
ADF	4.85	0.00	4.85	40.48	4.75	0.00	4.75	31.11
DBSA	3.92	0.00	3.92	32.72	1.85	0.00	1.85	12.12
NamPower	1.35	0.00	1.35	11.27	1.35	0.00	1.35	8.84
ZESCO	0.00	1.86	1.86	15.53	0.00	7.32	7.32	47.94
Total	10.12	1.86	11.98	100.0	7.94	7.32	15.27	100.0
%	84.47	15.53	100.0		52.00	48.00	100.0	

## C. Implementation Performance Indicators (against Appraisal)

	(UA million)	(%)	LC million (%)
Cost (Overrun)/Underrun	(2.18)	(22%)	5.46 (294%)
Time Overrun/Underrun	57 months		
Slippage on Effectiveness	25 months		
Slippage on First Disbursement	39 months		
No. of Extensions of Last Disbursement Date	3		
Project Implementation Status	Completed		

## D. Missions

No.	Types of Mission	Date	No of Persons	Person Days
1	Identification	Apr. 1997	NA	NA
2	Appraisal	18 Sept. 1998 – 2 Oct. 1998	3	NA
3	Supervision	28 Jan. 2000 – 4 Feb. 2000	1	5
4	Supervision	27 Nov. 2001 – 27 Nov. 2001	2	2
5	Supervision	29 Jun. 2001 – 9 Jul. 2002	2	10
6	Supervision	29 Oct. 2002 – 6 Nov. 2002	2	10
7	Supervision	25 May 2003 – 30 May 2003	1	5
8	Supervision	14 Oct. 2003 – 21 Oct. 2003	2	14
9	Supervision	17 May 2004 – 21 May 2004	3	15
10	Supervision	12 Nov. 2004 – 19 Nov. 2004	2	10
11	Supervision	27 Jun. 2005 – 6 Jul. 2005	2	16
12	Supervision/ Identification	22 Jun. 2006 – 30 Jun. 2006	2	NA
13	Completion	Sept. 2008	2	13
14	Post Evaluation	24 Feb. 2010 – 8 Mar. 2010 30 Mar. 2010	7	27

Note: NA = not available

## E. Disbursements (UA '000)

### Annual Disbursements (UA '000 Equivalent)

Year	Projected	Actual
2001	410	--
2002	3 082	--
2003	8 489	108
2004	--	1 989
2005	--	6 977
2006	6 192	
Total	11 968	15 265

## F. Financial and Economic Internal Rates Return

Victoria Falls Katima Mulilo	Appraisal	PCR	PPER
Financial Rate Return	12.0%	24.4%	22.7%
Economic Rate of Return	15.1%	25.3%	28.1%

# Ratings Summary

No.	Evaluation Criteria	PCR	PPER
1.	Relevance and Quality at Entry	NC	Unsatisfactory
2.	Efficacy	NC	Satisfactory
3.	Efficiency	NC	Unsatisfactory
4.	Institutional Development Impact	NC	Unsatisfactory
5.	Sustainability	NC	Satisfactory
6.	Other Development Impacts	NC	Unsatisfactory
7.	Aggregate Performance Indicator	NC	Unsatisfactory
8.	Borrower Performance	Satisfactory	Unsatisfactory
9.	Bank Performance	Satisfactory	Unsatisfactory

NC: Not calculated

Note: PPER Ratings for the different components are based on the detailed ratings of the subcomponents of evaluation criteria. Refer to Appendix 1.

# Executive Summary

## 1. The Project

1.1 Zambia has approximately 6 000MW of potential hydroelectricity resources, of which about 1 600MW is exploited. Although the reserve margin has recently come under pressure, at the time the project was conceptualised the country was positioning itself as an exporter of surplus hydro capacity as well as a thoroughfare for regional power trade.

1.2 The Bank approved an ADF Loan of UA 4.85 million in December 1999 to cover about 40% of the total cost of the project (UA 11.98 million). The borrower was the Government of Zambia (GRZ) and the beneficiary and executing agency (EA) of the project was ZESCO. The project was co-financed by the Development Bank of Southern Africa (DBSA) and NamPower (Namibia).

1.3 The sectoral goal was to increase regional cooperation and integration based on the power flow between Zambia and Namibia. Secondly, the project would make available adequate and least-cost energy to the various economic sectors in Western Zambia (and Eastern Caprivi) to promote economic growth and improve quality of life. This goal had been the major original motivation but moderated as the trading potential of the project became apparent during implementation.

1.4 The main components of the project initially comprised of a 132kV/40MW single-circuit overhead line from Victoria Falls to Katima Mulilo via Sesheke. In response to the changed objective of exporting beyond the Caprivi, the design was modified in 2004 to a 220kV/200MW configuration. The design modification led to the project budget being revised to UA 11.04 million.

1.5 The project was completed in 2006 with a delay of approximately 57 months. The Bank's Project Completion Report (PCR) was prepared in 2009 following submission of the Borrower's PCR (BPCR). The PCR concluded that the project had improved the reliability of electricity services in the border towns in Namibia and the Western Region in Zambia, boosting economic activities and increasing incomes.

## 2. Implementation Performance

2.1 From loan signature to the last disbursement, the project registered a delay of 30 months compared with the Appraisal estimate. The main reasons for the delay initially were the Borrower being slow in fulfilling the loan conditions prior to entry into force, the delay in concluding the on-lending agreement and the hold up in appointing the engineering consultant. The time overrun during implementation relates to delays in the contractors' contracts becoming effective, the construction of additional foundation works and delays because of flooding in the project area.

2.2 Project expenditure overran the adjusted estimate by UA 4.23 million. The additional cost related to soil conditions (foundations and number and configuration of towers) was the main reason for the over-expenditure. This cost had to be borne by ZESCO after funding requests to AfDB and DBSA were turned down. The final unused AfDB loan balance (UA 0.10 million) was cancelled. There was a final disbursement slippage of about five years, requiring loan effectiveness to be extended three times.

## 3. Evaluation Methodology

The Operations Evaluation Department (OPEV) selected the project for evaluation in 2009 given its regional integration focus. The evaluation firstly draws on a review of project documents (including

the Appraisal Report, Bank's PCR, Supervision Mission Reports and Country Strategy Papers) and on discussions with Bank staff members. The second stage involved country missions that entailed key informant interviews and site inspections which were identified and coordinated in collaboration with the EA and the Ministry of Finance and National Planning (MFNP). Interviews were conducted with relevant national ministries, specialist government agencies, ZESCO, development partners, regional integration organisations and other stakeholders in Lusaka, Mongu, Katima Mulilo and Sesheke. Some interviews were conducted in Johannesburg and via telephone with Windhoek. Inspections were carried out at the Victoria Falls, Sesheke and Katima Mulilo substations, and along the line between these substations.

## 4. Main Findings

4.1 The project is rated relevant in view of its consistency with the Strategy of the Bank, the Borrower and other development partners. The project relevance today is further enhanced by its future role in the ZiZaBoNa regional power corridor. However, as regards quality-at-entry, the project is unsatisfactory. The project design has six main deficiencies related to risk and assumptions assessment, namely (i) it failed to acknowledge the looming Zambia supply shortage, (ii) it was based on over-estimated demand growth, (iii) it failed to commit NamPower to offtake at the planned supply level, (iv) other initiatives in the power sector were overlooked and it was assumed that the required supporting transmission and distribution projects in Western Zambia would take place naturally, (v) there were shortcomings with the configuration of the project as optimal supply option (given the multiple roles of the project) as well as (vi) specific environmental planning and management shortcomings.

4.2 The project is rated effective but there are shortcoming regarding the achievement of intermediate

and long term results. All physical outputs have been achieved, although some design issues have been identified and the capacity provided for in the Power Purchase and Sales Agreement (PPSA) is significantly below the line capacity. The short-term results related to increased power transfer and sales to Namibia have either already been achieved or have good prospects of being achieved. The measures for improved electricity distribution in Western Zambia show that although more customers are connected, their quality of supply is lower. Similarly, the intermediate results for power trade are positive but not at the distribution level. These results reflect the fact that the power transfer and sales objectives became more prominent than the distribution-related objectives in the course of the project.

4.3 The project experienced significant project implementation delays (approximately 57 months) that could have been avoided by prompt action and active management by the EA and the Borrower. Comparison with similar projects in the region shows that the project was not over-priced. The cost-effectiveness of line operations is within or close to international norms. A high FIRR is projected due to unanticipated events, specifically the arrangement to wheel power for ZESA/NamPower. The FIRR is in excess of the Appraisal but there is only a small projected economic premium over-and-above the financial return. The project efficiency is rated unsatisfactory.

4.4 Project sustainability is rated as satisfactory, even though there are some residual risks associated with social and institutional sustainability. There are good prospects in terms of policy and political sustainability as the GRZ has laid down the development path for the electricity sector. This entails the commercialisation of the sector (increased autonomy to and financial self-reliance of ZESCO, allowing private suppliers, independent regulatory oversight by the Energy Regulation Board (ERB) and handling of social objectives

via Rural Electrification Agency (REA) within an integrated resource planning environment managed by GRZ (Ministry of Energy and Water Development). From a technical and environmental perspective there are no major risks. As far as financial sustainability is concerned, the FIRR assessment shows that once the NamPower supply agreement is fully operational, the project financial returns are likely to be strong, providing an acceptable return on the initial investment. ZESCO has performed unsatisfactorily against the ERB's Key Performance Indicators (KPIs) but the trend of the company's financial performance shows some improvement.

4.5 Nonetheless, social expectations in Western Zambia have not yet been met. Institutionally, there are project management capacity issues that need to be improved upon such as record keeping of operational performance and also documentation on the costing of the operation and maintenance of the interconnector, operation and maintenance at distribution level and maintenance planning and implementation. In addition, the project is not fully ringfenced from the rest of ZESCO and thus is exposed to the overall financial position of the company. Furthermore, top management turnover has been quite high in the recent years.

4.6 Other development impacts which can reasonably be anticipated have yet to be realised due to project delays and the fact that the project was not properly aligned with the REA and ZESCO Distribution programmes (although some distribution initiatives are now being pursued under the recently approved Rural Electrification Master Plan – REMP). However, the project implies the supply of “clean” (hydro) power to Western Zambia and the Eastern Caprivi region of Namibia rather than high carbon content charcoal and diesel-based generation. No communities were resettled away from their community and family or traditional land. The extent of the resettlement entailed moving individual family

units, where necessary, out of the power line servitude (due to the health and safety risks), onto adjacent land. Communities were therefore not displaced, and were more than adequately compensated monetarily.

4.7 The overall Borrower performance is unsatisfactory. Although the project has achieved its power transfer objectives and is being operated well, there were various shortcomings related to the overall project management, including covenants complied with late, a project redesign mid-stream which did not take into account all integration components, delays in implementation and weak post-project monitoring and evaluation (M&E).

4.8 The Bank performance is equally unsatisfactory. The Bank was not demanding of the project design and feasibility investigations, it did not manage the implications of the change in project design and did not intervene to manage delays during implementation. The Bank supervision assumed the project outcomes had been achieved without specifically confirming that it was indeed the case.

## 5. Conclusions

Overall, the project performance is unsatisfactory. The complexion of the project changed substantially during project implementation. The initial transmission project became an interconnector operation with the primary objective of exporting power to the Caprivi Region as well as to the whole of Namibia via an intra-connector that would be constructed by NamPower between the Namibian national grid and the Caprivi. The increased focus on the power trade with Namibia reduced the attention devoted to strengthening the electricity network in the Western Region of Zambia.

## 6. Lessons and Recommendations

6.1 The main lessons identified are related to the followings:

- Transmission projects can only achieve targets beyond short-term objectives of power transfer if they are backed up by the next links in the delivery chain (further transmission or distribution system);
- Transmission interconnector projects are complex. They involve many stakeholders, and are exposed to the electricity markets and exogenous factors of two or more countries so that their environment is particularly dynamic;
- The assessment of downstream demand and the contractual arrangement to secure that demand are crucial to secure commercial protection and off-take agreements;
- The elevation of this type of project to a category 1 would have ensured that a thorough EIA was conducted, identifying detailed and specific environmental and social aspects which would then have been adequately mitigated through a project and issues-specific Environmental and Social Management Plan (ESMP);
- Understanding the interplay between the project and policy dialogue and sector reform (including policies on tariffs and cost-recovery) is essential to project sustainability;
- Availability of monitoring data and statistics on the performance of the transmission line helps improve Zesco efficiency and operational effectiveness;

6.2 The recommendations to the Bank and the Borrower are as follows:

*Recommendations to the Bank and the Borrower*

- Transmission projects should be designed with identified supporting programmes for which

responsibilities are clearly assigned. Transmission projects should be “stress tested” to establish whether the building blocks are in place to ensure that the longer-term objectives are realised;

- The environment within which the project is carried out should be continuously monitored to determine whether crucial assumptions still apply. There should be regional oversight and guidance, and possibly also credit-enhancing tools (to offset risk that becomes unbearable for one party in the interconnector arrangements). This function can perhaps reside with the Southern African Power Pool (SAPP);
- Bank’s supervision should put greater emphasis on the financial and contractual arrangements. Given the importance and complexity of the PPSA concerning technical, commercial and legal issues, in future similar operations the Bank should also consider the possibility of providing assistance to its regional member countries in drafting and negotiating such PPSAs.

*Recommendations to the Bank*

- Although in-country requirements may only require a Project Brief, the Bank will safeguard its reputation by taking a more precautionary approach by categorizing the project to category 1 or 2, and similarly align itself with international best practice;
- Although the substations are managed and maintained in a satisfactory manner, future Bank operations may explore the reinforcement of institutional capacity by means of a tracking system and record keeping of operational data of the utility company;





# 1. The Project

## 1.1 Country and Sector Economic Context

1.1.1 Zambia is a landlocked country in central Southern Africa, with a population of 12.6 million. GDP (2008) is USD 14.3 billion. Gross National Income per capita is about USD 950/ann. and the poverty rate (population living below the poverty line) is 59%. The economy is dominated by mining and agriculture, reflecting the country's rich natural resources. Recent (2001-2009) GDP growth rates have been in the order of 5.4%/ann. although, given its primary nature, the economy is exposed to commodity price swings. Zambia's Vision 2030 envisages the country attaining middle income status by the year 2030, i.e. a required growth rate of about 6-7%/ann.

1.1.2 Zambia has approximately 6 000MW of potential hydroelectricity resources, of which about 1 600MW is harnessed. Major hydro power facilities are located at Kafue Gorge, Kariba North Bank and Victoria Falls. Other generation capacity is made up of off-grid small hydros, isolated diesel and gas turbine generation. Peak demand was 1 425MW in 2006, projected to increase to 1 559MW by 2012. The two major projects under development are the 120MW power station at the existing Itezhi Tezhi dam (to be constructed and operated by the Itezhi Tezhi Power Corporation (ITPC), a joint venture between ZESCO and TATA Africa Limited) and the 360MW Kariba North Bank Extension project (executed by ZESCO through the Kariba North Bank Extension Corporation Limited and funded by China Export and Import Bank and the DBSA). Based on the declared available capacity, the national reserve margin has about run out. About 22% of the population has access to grid-supplied electricity. Of the approximately 60% of the national population in the rural areas, about 3% have access to electricity.

1.1.3 The electricity sector is governed by the Ministry of Energy and Mineral Development (MEWD), in terms of the Electricity Act of 1995 (as amended in 2003) and the National Energy Policy of 2008. The major policy objectives are migration towards cost-reflective tariffs, commercialisation and autonomy of ZESCO from GRZ, private sector participation in the power sector and independent regulation. For electricity, the policy supports the extension of electricity services to households, small business and industrial sectors, and encourages interconnection with neighbouring states.

1.1.4 The Energy Regulatory Board (ERB) was created in 1995 as an independent organisation responsible for issuing licences and setting tariffs. In order to enhance ZESCO's efficiency, in 2007 the ERB adopted a multi-year incentive tariff framework (MYTF) that is based on the use of self-enforcing incentives in the form of Key Performance Indicators (KPIs). The purpose of the KPIs is to motivate ZESCO to improve profitability and delivery of quality service to its customers. ZESCO's performance against the KPIs has been below expectations as explained in the following sections of the report.

1.1.5 The Rural Electrification Authority (REA) was established in 2003 to roll out electrification in rural areas. The national rural electrification approach aims at improving the backbone transmission infrastructure from which grid-based rural extensions tap off. The Rural Electrification Master Plan (REMP) will become public soon.

1.1.6 Although not a statutory monopoly, the Zambia Electricity Supply Corporation Ltd (ZESCO) is the dominant, vertically-integrated national supplier of electricity. It is a fully state-owned limited-liability company, reporting to a board of directors.

ZESCO is the Executing Agency for the project under review. The MYTF process is intended to bring ZESCO to cost-reflectivity. Under the MYTF for 2008-2010, the ERB granted increases of 27% (2008), 16% (2009) and 11% (2010), subsequently (July 2009) increased to 35% for 2009/10 and 26% for 2010/11. The ERB's target is "cost reflectivity by 2012".

1.1.7 The GRZ has established the Office for the Promotion of Private Power Investment (OPPI) to manage the execution of new power developments and assist with the necessary studies. These developments point to an increasing role for private investment in large-scale, commercial power infrastructure.

1.1.8 The other major electricity utilities are (a) the Copperbelt Energy Corporation (CEC) PLC supplying the copper mines in Copperbelt Province and (b) North Western Energy Corporation (NWE) Ltd which currently supplies power to the Lumwana Mining Corporation's housing complex and will in future supply the non-mining areas around Lumwana in North-Western Province. Both these utilities purchase power from ZESCO under long-term bulk supply agreements (BSAs), and have distribution and supply contracts with their respective customers.

1.1.9 ZESCO and CEC are both operating members of the Southern African Power Pool (SAPP). SAPP coordinates the development of the regional transmission system. Zambia is geographically central to SAPP, being both a power supplier and transit link for the region. SAPP is supporting the development of the North-South transmission axis from the DRC to South Africa, as well as the central transmission corridor tying together Zimbabwe, Zambia, Botswana and Namibia (ZiZaBoNa). The Victoria Falls-Katima Mulilo interconnector, although not originally conceptualised as such, is earmarked to play an important role in the roll-out of the ZiZaBoNa initiative.

1.1.10 Major recent support to the electricity sector has come through the World Bank's Power Rehabilitation Project (PRP) under which the three major hydropower generation plants were rehabilitated, as well as transmission and distribution systems in selected areas. The PRP commenced in February 1999 and concluded in December 2005. Under the Increased Access to Electricity Services (IAES) project, support is provided in the form of ZESCO efficiency improvement, access expansion and technical assistance for both ZESCO and REA. The IAES was planned to commence in April 2008. The AfDB has provided two loans to Zambia in the power sector: for the restoration of Kafue Gorge (as part of the PRP) and the Victoria Falls-Katima Mulilo interconnector (the subject of this review).

## 1.2 Project Formulation

1.2.1 Originally, ZESCO supplied Western Zambia from Victoria Falls power station at 66kV and Katima Mulilo was islanded from any grid, self-supplying by means of diesel generation. In 1991 ZESCO extended supply to Katima Mulilo at 11kV and upgraded the supply to 66kV in 1995. In February 1997, ZESCO and NamPower (Namibia) agreed to increase the supply to 132kV with a transfer capacity of 40MW. An inter-governmental MOU was signed in October 1997 and an inter-utility MOU in 1998. The Bank identified the project in April 1997, conducted an appraisal mission in September 1998 and submitted the Project Appraisal Report (PAR) in May 1999. The loan was approved in December 1999.

1.2.2 The project was largely conceptualised and shaped by the two utilities themselves. There is evidence of adequate discussions to ensure country ownership of the project and extensive interaction between the two utilities during project formulation. There are indications of preliminary discussions with developers of farming blocks in Western Zambia but the linkage between the project and promotion of irrigated agriculture and small scale industry never

materialised. Findings from the evaluation mission suggest that there was very limited involvement of the ultimate beneficiaries of the project at local level in Western Zambia.

1.2.3 The project was formulated based on a feasibility investigation but due to inadequate record keeping, findings on project formulation are hampered by the non-availability of the final feasibility report. The draft report that was made available assesses the load forecast, alternative line routes and conductor type selection. The assessment shows a modest growth load forecast, however it does not reflect the step-wise load growth that would later support the motivation to increase the line capacity. Alternative line routes were investigated which proved notably inaccurate at the design review stage.

1.2.4 From an environmental point of view, the types of impacts of a project of this nature are well understood and defined. The Environmental Project Brief (EPB) is correct that the environmental and social impacts should be low for this type of project. However, environmentally and culturally the area around Victoria Falls is complex and additional assessment should have been required. Although the environment (bio-physically and socially) between Victoria Falls, Sesheke and Katima Mulilo is relatively homogeneous, there are distinct variations in vegetation type, landscapes and ecological systems which placed further constraints on the project, e.g. dambo areas (shallow wetlands) which presented construction constraints.

### 1.3 Objectives and Scope at Appraisal (Logical Framework)

1.3.1 The project intervention framework, including development objectives and indicators and the expected linkages between inputs, activities, outputs and development goals, is shown in Appendix 5.

1.3.2 Retrospectively, the sector goal was to increase regional cooperation and integration based on the power flow between Zambia and Namibia. Secondly, the project would make available adequate and least-cost energy to the various economic sectors in Western Zambia (and Eastern Caprivi) to promote economic growth and improve quality of life. This goal had been the original motivation for the project but it became less important as the power trade/export component assumed greater importance during project implementation.

1.3.3 The project outcomes were, in the short-term, to increase and improve power availability for Namibia and in Western Zambia, and in the medium-term, to improve the financial position of ZESCO and electricity consumers.

1.3.4 The expected results related to improved power availability were to secure power transfer (reflected in increased line transfer capacity, increased power transfer, reliability of power transfer and cost-effective transmission line operations), improved power distribution (reflected in increased access to power supply and improved reliability of power supply at the distribution level) and increased power trade (in the form of increased sales to Namibia). The results related to the improved financial position of ZESCO would reflect in increased foreign exchange earnings and an improvement in the overall financial performance of the company. The results related to the financial position of customers would show in the form of a reduction in the cost of their energy basket based on increased electricity consumption.

1.3.5 As regards the physical component so the project, the initial design was for 190 km of 132kV single-circuit overhead line (OHL) from Victoria Falls to Katima Mulilo via Sesheke; a 1 x 40MVA 220/132kV transformer and outgoing 132kV feeder bay at Victoria Falls sub-station; and a 132kV incoming feeder bay, a 1 x 25MVA 132/66kV transformer

and bay, an outgoing 66kV bay and a 7.5MVA reactor at Katima Mulilo sub-station. Sesheke would be back-fed on the existing 66kV Sesheke-Katima Mulilo line operating in reverse. This design was modified in 2004 to a 220kV/200MW configuration – as described in section 3.2.

## 1.4 Financing Arrangements – Bank and Others

Total project cost at Appraisal amounted to UA 11.98 million, subsequently revised to UA 11.04 million. The project was to be financed from ADF (UA 4.75 million), ZESCO (UA 3.48 million), NamPower (UA 1.35 million) and co-financing from DBSA (UA 1.85 million). ADF, DBSA and NamPower were to cover the foreign exchange cost of the project (UA 7.56 million (68%) for the revised project) and ZESCO was to meet local cost (UA 3.48 million (32%) at revision). The Borrower was the GRZ and the loans were on-lent to ZESCO, the beneficiary and Executing Agency (EA) under the specified terms and conditions in the loan agreement. The actual financing arrangements changed as discussed in section 3.4.1.

## 2. The Evaluation

### 2.1 Evaluation Methodology and Approach

2.1.1 The Operations Evaluation Department (OPEV) selected the project for evaluation in 2009 given its regional integration focus. The preparation of the PPER three years after project completion in 2006 should have allowed sufficient time for impacts to be visible. Following the Bank's revised guidelines,<sup>1</sup> this PPER reassesses the Victoria Falls – Katima Mulilo Interconnector Project and derives lessons.

2.1.2 The first stage of the evaluation drew on a review of project documents (including the Appraisal Report, Bank's PCR, Supervision Mission Reports and Country Strategy Papers) and on discussions with Bank staff members.

2.1.3 The second stage entailed country missions that comprised key informant interviews and site inspections which were identified and coordinated in collaboration with the EA and the Ministry of Finance and National Planning (MFNP). Interviews were conducted with relevant national ministries, specialist government agencies, ZESCO, development partners, regional integration organisations and other stakeholders. Interviews were conducted in Lusaka, Mongu, Katima Mulilo and Sesheke. After the mission, some interviews were conducted in Johannesburg and via telephone with Windhoek. Inspections were carried out at the Victoria Falls, Sesheke and Katima Mulilo substations, and along the line between these substations.

### 2.2 Key Performance Indicators and Availability of Baseline Data

2.2.1 The PAR proposes three key indicators and respective baseline data, one for short-term (increased network capacity) and two intermediate-term

(increase in electricity consumption and increased electrification level) results indicators. The "increased network capacity" indicator cannot be verified by measurement yet (the line has not yet been loaded to capacity), but can be calculated (which calculation shows that the nominated capacity should be achievable). The two intermediate indicators can be measured.

2.2.2 The three selected results indicators are all incorporated in the retrospective logical framework, which has been expanded as discussed in section 1.3 and shown in Appendix 6. The short-term "increased network capacity" indicator now forms part of the set of results indicators for power transfer, which set further includes indicators of power transfer reliability and cost-effectiveness. The "electrification level" indicator now forms part of the short-term indicator set addressing increased access to power supply, and the "electricity consumption" remains part of the intermediate indicators related to electricity distribution.

2.2.3 The availability of recent and baseline indicator data differs across the various indicator sets. In cases where baseline data was not available (short-term result indicators associated with "power transfer" and "cost effectiveness of line operations") the approach was to use benchmarks. It should be noted that one of the access to power indicators (level of electrification) excludes the Sesheke district as this does not form of the ZESCO Western Region. In terms of power sales and trade with Namibia, baseline data was available in the PCR and recent data is maintained by ZESCO. Under the distribution indicators, the energy basket costs are based on typical values of

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<sup>1</sup> Revised Guidelines on Project Completion Report (PCR) Evaluation Note And Project Performance Evaluation Report (PPER)

alternative energy supplies in Sub-Saharan Africa. The consumption growth indicator is as calculated from ZESCO data and compared with the baseline as projected in the PAR.

## 3. Implementation Performance

### 3.1 Loan Effectiveness, Start-up and Implementation

3.1.1 The project registered a slippage of 57 months in the completion date compared with the Appraisal estimate. The main reasons for the slippage initially were (i) delays in the fulfilment of loan conditions for first disbursement, (ii) delay in concluding the on-lending agreement, (iii) delay in appointing the engineering consultant, (iv) procurement delays related to effectiveness of contractors' contracts, and (v) construction of additional foundation works and delays because of flooding in the project area.

3.1.2 Loan Effectiveness: the Bank's benchmark on loan processing from Appraisal until loan effectiveness is usually 12 months but in this particular case it took approximately 24 months. This was made up of two months between approval of the loan (December 1999) and loan signature (February 2000) as well as 22 months between loan signature and loan effectiveness (December 2001). The delays in loan effectiveness were mostly related to the conclusion of the on-lending agreement and the appointment of the engineering consultant.

3.1.3 The list of loan covenants is described in Appendix 7. Of the conditions precedent to the loan coming into effect, all four were complied with, although the Long Run Marginal Cost (LRMC) action plan was submitted later than required. Of the conditions for first disbursement, five were complied with and the action plan for reducing accounts receivable took the form of a plan to implement a customer information system. With regard to "Other Conditions" two covenants have not been complied with despite the Bank's continued dialogue with the Borrower. The covenants are as follows: (a) submission of evidence of tariff increases according to the LRMC action plan (LRMC had not been achieved by

31 December 2008 as required) and (b) reduction of accounts receivable to 90 days (which had not been achieved by FY 2001/2). Despite the tariff increases of 27% in 2008, 16% in 2009 and 11% in 2010, ZESCO had not yet achieved cost-based tariffs. The ERB target for cost-reflectivity is 2012. The accounts receivable indicator, although in excess of 90 days, has improved and in the first quarter of 2009 it was reported as 133 days.

3.1.4 Start-Up and Implementation: slippage after the first disbursement related mostly to an additional eight months for the contractors' contracts to become effective (which period overlapped the update of project design to 220kV that is explained in the following sections) and an additional four months during the period of actual construction (related to additional foundation works and delays because of flooding in the project area). The delays in the appointment of the consultant could have been mitigated by the use of advance procurement. The cause of the construction delay is specific, and therefore does not imply that the original schedule was unrealistic. However, the original schedule for procurement of the contractor did not provide for a 150 day bid validity period as permitted in the actual tender documents.

### 3.2 Project Design Modifications

3.2.1 The original project logic was to transfer power to Western Zambia (improved quality of supply) and the Caprivi (which could not be feasibly linked to the Namibia grid), at a capacity of 40MW, made possible by the power generation surplus in Zambia. A Power Purchase and Supply Agreement (PPSA) was signed in 1998 for NamPower to offtake 40MW from the 132kV line. During project implementation, ZESCO and NamPower explored the possibility of extending the export of power not just to the border

town in Namibia but to the whole of Namibia. The concept was to upgrade the interconnector and link it to an intra-connector that NamPower was planning to construct between the Namibia national grid and the Caprivi. This in turn led to a significant change in the initial project design. In November 2003, ZESCO and NamPower agreed to increase the line voltage to 220kV and the transfer capacity to 200MW meaning that the regional integration dimension assumed greater emphasis as the project was no longer a mere cross-border connection. By February 2004, ZESCO and NamPower requested the Bank to support increasing the voltage and transfer capacity. The Bank gave its “no objection” to the increase in May 2004 based on (amongst others) the power supply surplus position in Zambia and (implicitly) that Namibia would have the facility to import the nominated capacity. Nonetheless, the agreement on the 200MW was not signed. Negotiations on the 200MW were not concluded, eventually being replaced by discussions on 100MW. In the end, the revised PPSA was signed for 100MW, of which 50MW firm and 50MW non-firm (effective January 2010).

3.2.2 For the substations, design modifications made included changing the configuration at Victoria Falls sub-station (220kV outgoing feeder bay) and at Katima Mulilo sub-station (220/66kV transformer), doing away with the VAr reactor at Katima Mulilo and installing a 1 x 25MVA 220/66kV transformer at Sesheke. The modifications flowed naturally from upgrading the line voltage and capacity to the 220kV/200MW configuration. The revised cost of the sub-station components was USD 2 million (70%) higher than the appraised estimates. This increase would be partly attributable to the design modifications, but could also relate to under-estimation at Appraisal.

3.2.3 For the line construction, the design was revised so that the OHL length was increased from 190 km to 231 km. The line length had originally been

underestimated by ZESCO. This had minimal cost impact as the PIU had originally over-estimated the line unit cost in tandem with under-estimating the line length – the two effects largely cancelling out. The longer line length was known by the time the contractors’ bids closed, so that the additional time impact cannot be established with certainty. But assuming that the duration of the construction part of the contract (as opposed to design/engineering, procurement and site establishment) relates linearly to time, the additional 40 km would have added some three months to the project duration.

3.2.4 During construction, the low load-bearing capacity of the soil required the re-design of the foundations, changing some tower types, increasing the number of line sections and a change in the tower fitting quantities. These had been under-designed by ZESCO, based on insufficient geo-technical investigations, the modification of which added an additional third to the project cost. It should be noted that detailed geotechnical investigations were specifically removed from the original engineering services TOR as a “cost-saving” measure. The higher foundation specifications, together with flooding in the project area during construction, added about USD 4 million to the project cost. Commissioning overran the line construction schedule, mostly related to the flooding rather than design changes.

3.2.5 After project completion, a shunt reactor had to be connected at Sesheke to maintain voltage within design parameters. It was relocated from Katima Mulilo, and the cost was borne by NamPower.

### 3.3 Socio-Environmental Considerations during Implementation

During project implementation certain environmental and social constraints were uncovered which in some cases were not anticipated during the assessment phase of the Environmental Project Brief (EPB)



and which contributed to time delays and additional costs: (a) flooding of the project site prevented access and caused delays during construction, although this eventuality had been foreseen in the project design phase; (b) burial remains were discovered at Sesheke substation, which possibility had been foreseen in the Project Brief (PB) and the EMP but still held back construction; and (c) additional costs were incurred due to an unanticipated forestry tax. Of the above delays, the significant setback was flooding which held up construction for four months.

### 3.4 Adherence to Project Costs, Disbursements and Financing Arrangements

3.4.1 The project cost was estimated at UA 11.98 million, subsequently revised to UA 11.04 million. Actual expenditure amounted to UA 15.27 million (overrun of UA 4.23 million, borne by ZESCO). Although various individual project components were priced inaccurately originally (line cost, substation cost, project management cost and costs related to delays in appointing contractors), their under/over estimation either cancelled out or could be accommodated in the project financial contingencies. The additional cost related to soil conditions (foundations, number and configuration of towers) was the main reason for the over-expenditure. This cost had to be borne by ZESCO after funding requests to AfDB and DBSA were turned down.

3.4.2 Of the AfDB loan amount of UA 4.85 million, a total of UA 4.75 million was disbursed. The unused loan balance (UA 0.10 million) was cancelled.

3.4.3 Due to project delays, particularly the fulfilment of conditions precedent for first disbursement, the dates on the disbursement profile were revised. The deadline for last disbursement was extended three times. The project was finally commissioned on 16 September 2006.

3.4.4 The effective DBSA funding commitment reduced in the course of the project. Although the PCR notes that the DBSA reduced the loan amount due to concerns about ZESCO's financial health, evidence from the evaluation mission points to the depreciation of the Rand (the DBSA lending currency) as the most plausible reason. Notwithstanding the fact that the DBSA increased the size of the loan facility for its ZESCO programme, the original loan was in Rand and at time the Rand weakened substantially against the USD which led to an effective reduction in the UA and USD amount of the loan. In 1998, at Appraisal, the exchange rate of Rand/USD was approximately 4.82 against an exchange rate of roughly 8.56 in 2002 and an exchange rate Rand/USD of approximately 6.11 in 2006 (project completion).

**Table 1: Appraised, Revised and Actual Disbursement**

Funding Source	Appraisal May 1999		Revision May 2004		Actual Sept. 2006	
	UA m	%	UA m	%	UA m	%
ADF	4.85	40.5	4.85	43.9	4.75	31.1
DBSA	3.92	32.7	1.38	12.5	1.85	12.1
NamPower	1.35	11.3	1.33	12.1	1.35	8.8
ZESCO	1.86	15.5	3.48	31.5	7.32	47.9
Total	11.98	100.0	11.04	100.0	15.27	100.0
%	100.0		100.0		100.0	

### 3.5 Project Management, Reporting, Monitoring and Evaluation Achievements

3.5.1 The project was initially planned to be overseen by a Steering Committee (SC) composed of senior managers of ZESCO and NamPower. Each utility would have overseen the project components in its territory. In the case of ZESCO, this would have been in the form of a Project Implementation Unit (PIU). In practice, the SC was not implemented. Monitoring of the project was carried out by the two senior managers responsible for transmission projects who then provided feedback to the management of the two companies.

3.5.2 The original scope of the project contemplated engineering consultant services for engineering design works, preparation of tender documents, evaluation of tenders and supervision of construction works. In 2002, this scope was reduced to save costs and to develop in-house capacity. The consultant's role was reduced to reviewing the detailed engineering design, preparation of tender documents and supervision of the tendering process. The PIU became responsible for design and construction supervision.

3.5.3 Compared with the positions required in the Loan Agreement, the PIU did not have an Accountant or Procurement Specialist. These functions were performed outside the PIU but within ZESCO.

3.5.4 The Bank's general conditions applicable to loan and guarantee agreements require the Borrower to submit quarterly progress reports and annual project financial audits. Throughout implementation, the Bank registered its concern regarding continued delays in the submission of progress and audit reports. There is sufficient evidence to confirm that ZESCO submitted nine quarterly reports, against the 19 quarters between December 2001 and September 2006 and only two audit reports (March 2004 and March 2005), albeit late.

## 4. Performance Evaluation and Ratings

### 4.1 Relevance of Goals and Objectives & Quality at Entry Assessment

4.1.1 Relevance: the project is relevant in view of its consistency with the objectives of the Government for the country and energy sector but is less satisfactory in terms of quality at entry. The project objectives are consistent with the principles of Zambia's Vision 2030 and Fifth National Development Plan (FNDP) in which the main focus for the energy sector is to increase the current level of access to electricity, and in the long term to ensure that Zambia has reliable, economically sustainable and environmentally sound energy supply. The project is relevant to the National Energy Policy (2008) which promotes electricity extension within Zambia and encourages interconnection with neighbouring states, and the national rural electrification approach, in that it improves the backbone transmission infrastructure from which grid-based rural extensions tap off.

4.1.2 Furthermore, the project remains relevant to the Joint Assistance Strategy for Zambia 2007-2010 (JASZ) which supports creating an enabling environment for electricity and reaping the positive effects of increasing access to electricity. In the energy sector, the Bank's Country Support Strategy (CSP) 2007-2010 pursues a multi-national goal, i.e. the development of regional power interconnectivity projects that have already been identified by NEPAD, SADC, COMESA and SAPP. These regional organs all support economic development in general, and the increased integration of the regional power pool via interconnectors.

4.1.3 At the regional level, there are indications that the Victoria Falls – Caprivi area is likely to become a major future power corridor and one of the first initiatives in that context is the ZiZaBoNa

central transmission corridor. Although not envisioned originally, the relevance of the Bank's project is therefore further enhanced by its future role in this initiative. ZiZaBoNa supports regional linkages that circumvent the current regional flows via South Africa by channelling power between Zimbabwe, Zambia, Botswana and Namibia. In the first phase of ZiZaBoNa, 100MW will be transferred from ZESA (Zimbabwe) to NamPower, wheeled over the Victoria Falls-Katima Mulilo 220kV line (under a 15-year contract, commencing 2012). This would therefore increase the line loading to about 10MW (Western Zambia load) plus 50MW firm (ZESCO-NamPower) plus 100MW (ZESA-NamPower), i.e. about 160MW (or nearly all) of the total capacity of 200MW.

4.1.4 Quality at Entry (QaE): the project as conceptualised responded to ZESCO's requirements in terms of reinforcement of supply to Western Zambia and sale of surplus capacity. It also addressed NamPower's requirements to improve supply to Katima Mulilo. However, the project at entry falls short in the following key respects: (a) it failed to acknowledge the looming Zambia supply shortage, (b) it was based on over-estimated demand growth, (c) it failed to commit NamPower to off-take at the planned supply level, (d) other initiatives in the power sector were overlooked and it was assumed that the required supporting transmission and distribution projects in Western Zambia would take place naturally, (e) there were shortcomings with the configuration of the project as optimal supply option (given the multiple roles of the project) as well as (f) specific environmental planning and management shortcomings. In addition, the timeframe to meet the loan conditions were not realistic given the environment and sector context at the time of project preparation.

4.1.5 In terms of Zambia's supply position, the country ran out of surplus generating capacity as mine demand grew strongly and (more importantly) the delay in the Power Rehabilitation Project (PRP) of the World Bank took out of operation a quarter of the national generation capacity so that Zambia became a net importer of power, i.e. at the time of project revision and design upgrade 220kV/200MW, ZESCO did not have surplus capacity to export as had originally been assumed.

4.1.6 As far as demand projections are concerned, the demand forecast was based on possible, rather than probable off-take. In the 132kV/40MW configuration, projected load growth tracked likely economic growth. However, for the 220kV/200MW configuration, step increases were foreseen in Western Zambia and Caprivi based on industrial agriculture employing large irrigation pump motors (e.g. sugar estate at Katima Mulilo, farming block at Kaoma) and step-wise growth in Namibia generally. Trend-based projections usually suffice when supply conditions are stable. When conditions change in a step manner, the cost of potentially redundant capacity makes the forecasting process more onerous and would usually call for commercial protection such as off-take agreements.

4.1.7 The off-take agreement (PPSA with NamPower) for the line upgrade only finally materialised after project completion. The project complexion changed substantially over its development as the original plan to transmit 40MW (1996) was increased to 200MW (2004), with 150MW envisaged to be contracted to NamPower and the remaining 50MW earmarked for Western Zambia. The actual contract signed in January 2010 made provision for 50MW firm on a take-or-pay basis, and 50MW non-firm on an as-needed basis after intervention from the ERB. The project capacity has therefore remained largely under-utilised since commissioning in 2006, and will only be partly used from mid-2010. Notwithstanding

the fact that demand in the initial years of operation (2006 to 2012) have and are estimated to fall significantly short of expectations, the indications are that the line will be more extensively utilised thereafter, to the extent that it will achieve its financial objectives. A wheeling agreement for 100MW is envisaged, supplied by ZESA to NamPower, tentatively to be in effect from 2012.

4.1.8 Furthermore, the project formulation was based on the assumptions that two other initiatives would be synchronised with the project, i.e. (a) the NamPower interconnector, and (b) distribution/supply in Western Zambia. The intention during the negotiation of the 200MW PPSA was that commissioning of the 220kV project line and the Namibia intra-connector would be synchronised, but NamPower delayed constructing the interconnector. Although NamPower undertook to construct it, there is no evidence that this commitment was made contractually. Second, there was no plan to upgrade the existing 66kV line from Sesheke northwards which was a fatal shortcoming in the assumptions for the project. The result is that there is availability of transmission capacity for three off-takers: ZESCO Distribution, NamPower/NORED at Katima Mulilo and NamPower (for the Namibia grid), but either the required network components are not in place and/or the available capacity significantly exceeds the actual (realised) demand, so the project has remained largely under-utilised since commissioning. There should have been an agreement committing NamPower to construct and commission the line by a pre-determined date. The mis-timing of national components of cross-border infrastructure happens regularly and is a challenge to regional integration. ZESCO should have coordinated its own internal plans so that power evacuation from Sesheke and distribution within Western Zambia was supported by transmission, distribution and supply investments and roll-out plans.

4.1.9 Regarding project engineering design, the evaluation is based on the local supply to both Western Zambia and Katima Mulilo (Namibia), as well as supply to the NamPower grid. The supply configuration for both Katima Mulilo and the NamPower grid seems optimal in principle. The limitation lies with the local supply in Western Zambia, which when considered in isolation, does not seem to be an optimal solution given the relatively long 66kV overhead powerline from Sesheke to Mongu and eventually to Kaoma. The supply configuration results in poor voltage regulation which in turn results in the total capacity of the powerline not being realised. The non-completion of the Namibia intra-connector required a VAR reactor to be connected at Sesheke, i.e. a retrofit after commissioning of the project. Further, the lack of redundancy in transformers at Victoria Falls Substation (11/220kV), Sesheke Substation (220/66kV) and Zambezi Substation (220/66kV) is of concern, particularly in relation to ZESCO honouring the terms and conditions of the PPSA agreement on continuity of supply. Each of these substations is equipped with only one transformer, with high risk on the Victoria Falls transformer given that it has been in service for over 40 years (although refurbished a few years ago). Supply could be supported via the Kafue-Livingstone 220kV OHL, although there are also reportedly constraints on that line section.

4.1.10 Further, the Environmental Council of Zambia (ECZ) was familiar with the AfDB environmental and social policies and guidelines, and understood that these were an integral part of the project and that these were effectively congruent with the requirements of Zambian law. However, based on the precautionary principle the project should have been treated as a more demanding Category I project (i.e. requiring a more extensive Environmental Impact Assessment), for reasons of archaeological implications (e.g. graves and other heritage sites), bio-zones affected (three forests) and

the fact that the line passes through a World Heritage site. Inadequate environmental safeguards (in the EMP) and procedures (monitoring) were put in place upon approval of the project. At the start-up of the project, the fact that the existing power station was built and has been in operation in a game park since 1935 was not contentious. However, as a result of increased expertise of Zambian Wildlife authority (ZAWA) and the fact that the line had to pass through forest area, the environmental aspects of the project became increasingly contentious, particularly when Zambian graves and bones of fallen Namibian soldiers were found.

4.1.11 The last QaE shortcoming relates to unrealistic targets to fulfil the loan covenants – the Project required a multitude of loan conditions, including agreements (on-lending agreement, debt-swap agreement, and PPSA) as well as conditions related to sector reform. However ZESCO's institutional capability was not properly assessed. As a result, two of the loan conditions, as explained in section 3.1, remain unfulfilled up to now.

## 4.2 Achievements of Objectives and Outputs (“Efficacy”)

4.2.1 Overall, the project is rated as effective. The site inspection findings indicate that outputs have been achieved. The physical outputs (line and substations) were constructed to a satisfactory standard although there are specific concerns regarding the choice of equipment (refurbished transformer at Victoria Falls substation), inadequate protection (Victoria Falls and Sesheke substations), and redundancy (all three substations). There was little resettlement required and therefore only limited compensation in the way leave for loss of a limited number of structures.

4.2.2 Line transfer capacity has increased from 10MW prior to the project, up to 50MW (already proven as part of commissioning of the Namibia intra-connector) and expected to be 200MW.

Power transfer has increased from about 10.2MW to 27MW (2010), anticipated to grow to 60MW in 2011. Approximately 9.5MW out of the 60 MW would flow to Western Zambia and 50MW to NamPower. By the same date (2011) the Appraisal had projected power transfer to be 18MW, and the PCR at 70MW. The following graph presents the projected growth in power transfer. The firm supply to NamPower commences mid-2010 (supply to NamPower under the non-firm part of the PPSA is not shown). Wheeling from Zimbabwe Electricity Supply Authority (ZESA) to NamPower is expected from mid-2012. By 2013, total uptake should be in the order of 160MW (compared with 20MW at Appraisal and 101MW in the PCR). Regarding power transfer capacity, even though the maximum transfer capacity could not have been measured yet, estimations suggest that the nominated 200MW transfer capacity should be achievable.

4.2.3 Short term results: the reliability of transfer, as measured in transmission line availability, was 97.8% (unavailable for eight days) in FY2009/10, compared with the norm in developed countries of about 99% (five days unavailability). Line operations

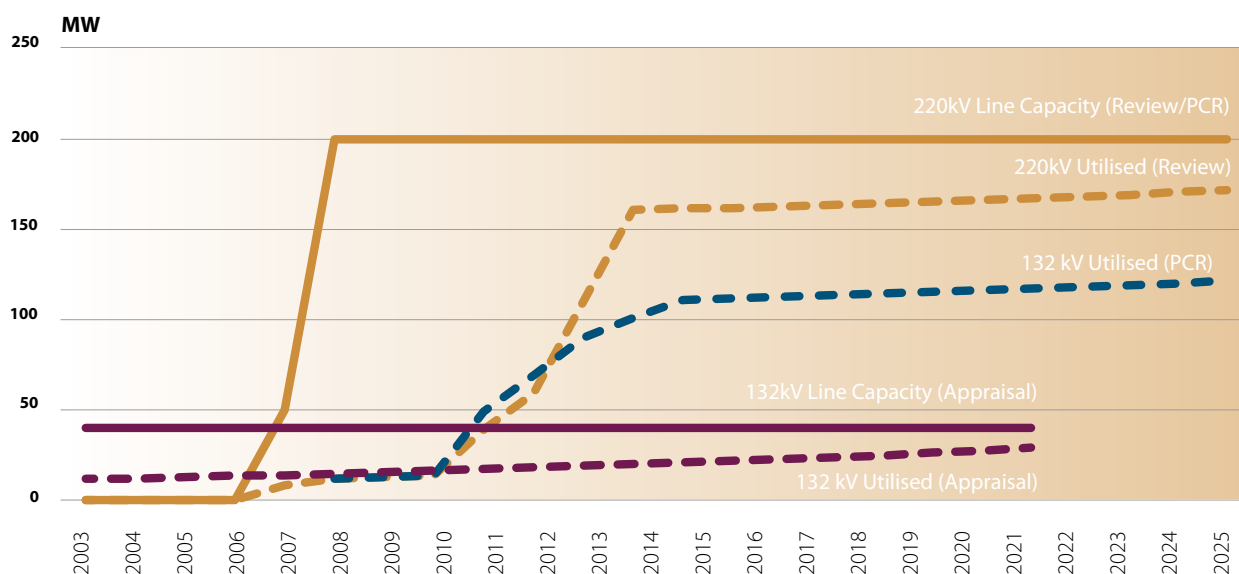
are cost-effective, the ratio of direct O&M costs being 1.65% in FY2010/11 compared with an international norm of 2.1%.

4.2.4 For electricity distribution, as measures of increased access to power supply, the tempo of electrification in ZESCO’s Western Region has been about 12%/ann. since 2006, compared with a rate of about 4%/ann. as assessed in the PCR. The level of electrification has therefore risen to about 4.7% compared with the 3.3% projected at Appraisal. The reliability of supply at distribution level has, however decreased on all measures since 2006. The system average interruption frequency index (SAIFI) was 5.8 in FY2009/10 compared with 0.4 in FY2006/7; the system average interruption duration index (SAIDI) was 20.7 compared with 5.5; and the average system availability index (ASAI) was 97% against 99%.

4.2.5 For sales to Namibia result, sales are projected at 166GWh in 2011 and 274GWh in 2012, compared with 219GWh projected at Appraisal.

4.2.6 Intermediate Results: the remaining intermediate results pursued were to improve the financial

**Figure 1: Actual and Projected Capacity and Power Transfer**



position of ZESCO and electricity consumers. These were measured at the distribution level and in terms of power trade. Regarding the former, at Appraisal electricity consumption was projected to increase by 2.4%/ann. ZESCO's records of consumption do not reach back prior to project commissioning. However, statistics since FY2007/8 indicate that consumption in Western Zambia has actually declined by about 5%/ann. As regards the impact of electricity on consumers' basket of energy costs, compared with typical prices of alternative energy sources such as wood, fuel and LPG, the price of electricity is estimated to have increased by about 50% more than those sources – not because of the project itself, but rather because of the electricity tariff corrections ZESCO has been carrying out in the background.

4.2.7 In terms of power trade results, it is estimated that the net revenue contribution of the project would be approximately USD 5.8 million in 2010 and USD 6.9 million in 2011, compared with about USD 3.1 million projected at Appraisal. The increase in foreign exchange earnings is projected at USD 6.0 million and USD 13.8 million respectively, compared with USD 4.7 million at Appraisal.

4.2.8 For both the short and intermediate terms, compared with the Appraisal, the project has therefore exceeded the anticipated power transfer and sales results, although it is falling short of achieving the distribution-level results.

4.2.9 Long term results: the ZESCO-NamPower operational interaction points to increased regional cooperation, but the limited amount of power transferred implies that the regional integration results are limited so far. The present-day load in Namibia is in the order of 550MW, expected to step up to about 800MW in the near future because of new mining developments. 50MW from ZESCO would therefore constitute between 6% and 9% of the Namibia load, and 150MW would make up 19%

to 27%. That would constitute the maximum contribution to Namibian load in terms of the Namibia Energy Policy which requires at least 75% of load to be generated domestically.

4.2.10 Although Zambian GDP has grown throughout the decade, the previous conclusions on short-term and intermediate results imply that the project could only have made a very modest contribution to improved economic growth for Zambia. As to whether the long-term results as expected will realise, this will depend on (a) the strengthening of the 66kV line from Sesheke northwards (not planned presently), (b) REA rural electrification plans in Western Zambia (as per the REMP<sup>2</sup>), (c) ZESCO Distribution rolling out connections, (d) the planned agricultural block around Kaoma being developed and (e) the completion of the Namibia intra-connector (expected by mid-2010). Therefore, the localised results of the project in Western Zambia are likely to remain fairly modest, while the benefits related to regional power transfer should manifest shortly.

## 4.3 Efficiency

4.3.1 Cost Effectiveness indicators: the actual project cost (UA 15.27 million) significantly overran the cost at Appraisal (UA 11.98 million). This overrun is largely attributable to the initial under-appreciation of soil conditions and flooding during construction. Compared with similar investments in the Southern African region, the costs for the project are on the low side given the assets commissioned (UA 15.27 million versus an expected cost of UA 22.8 million).

4.3.2 Financial Rate of Return: the FIRR was recalculated based on USD in nominal values, assuming an inflation rate of 3% in USD. The calculations

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<sup>2</sup> The REMP was formally approved in 2010. It provides, amongst others, for electricity investments in the Kaoma farming block and distribution projects in the Sesheke District. Although ZESCO intends strengthening the 66kV OHL from Sesheke onwards, its implementation is not aligned with the rollout of the rural electrification projects, which are close to being commissioned.

were done by selectively updating and substituting elements of the FIRR calculation at Appraisal and project completion. These were: (a) applying the actual capacity sold to NamPower up to mid-2010 and thereafter reducing it to 50MW firm, (b) increasing the load factor in Western Zambia slightly to 60% (to reflect the recent demand/consumption ratio), (c) including ZESA-NamPower wheeling of 50MW in 2012 and 100MW thereafter, (d) increasing O&M expenditure to 1.65%/ann. of the capital investment, (e) updating the NamPower sales tariff as per the PPSA, (f) reducing the bulk energy purchase cost slightly (to USDc 2.27/kWh), (g) assuming a sales price to Western Zambia (USDc 2.50/kWh) and (h) assuming a wheeling charge to ZESA/NamPower (USDc 0.45/kWh). The tariffs assumptions were all relative to the tariff ZESCO charges CEC (as declared by CEC). The calculation of the FIRR is shown in Erreur ! Source du renvoi introuvable..

4.3.3 The recalculated FIRR amounts to 22.7% against 12% at Appraisal. Even though the investment is nearly one third more than at Appraisal, the power transferred is for most of the project life more than five times what was projected at Appraisal. Even though the transfer to Namibia is now 50MW less, the net power transferred is projected to be about 50MW more than assessed at the time of the PCR based on the ZESA-NamPower wheeling arrangement concluded since then. A further benefit is derived from a small reduction in bulk purchase costs (2.27c/kWh vs 2.50c/kWh at Appraisal and 2.27c/kWh vs 3.00c/kWh in the PCR). Although the FIRR is significantly higher than at Appraisal, this is not because ZESCO executed its project plan well, but rather because of the fortunate outcome of events, specifically the wheeling transaction entered into with NamPower.

4.3.4 A sensitivity analysis shows that the FIRR is particularly susceptible to changes in the PPSA details (energy and tariff) as well as the bulk purchase

tariff. The project is projected to already break even (FIRR = 0%) in 2012.

4.3.5 Economic Rate of Return: the EIRR has been recalculated based on the economic impact derived from the direct financial benefit of the project to each stakeholder. The three economic beneficiaries (for the EIRR) are Zambia, Western Zambia and Namibia. Zambia benefits from direct net revenues (earned by ZESCO) that it can then apply to boost the general economy. Namibia benefits from savings in electricity expenditure compared with the alternative supply option. Namibia relies on cheap coal-based imports from South Africa but the imports from Zambia have a strategic value in that the diversity/security of supply is increased. Western Zambia benefits from increased reliability of supply and reduced cost of energy compared with the alternative supply.

4.3.6 The direct effects for Zambia are as per the FIRR assessment, excluding the part of the investment that was made by parties other than GRZ or ZESCO (because that did not drain a resource from Zambia). For Namibia and Western Zambia, the direct benefits are calculated based on the probability of improved security of supply/reliability, and the cost of the alternative supply option. To determine the indirect effects, the multiplier effect of a saving in the beneficiaries' hands on the rest of the economy needs to be determined. Although an expenditure multiplier for the general economy is not readily available for either Zambia or Namibia, typical multipliers in Sub-Saharan Africa range between 1.6 and 1.8. The multiplier assumed for the EIRR is 1.7. The EIRR at Appraisal was 15.1% and in the review it is estimated at 28.1%. The calculations of the EIRR are also shown in Erreur ! Source du renvoi introuvable..

4.3.7 Overall, the project efficiency is rated unsatisfactory. Although the project has provided strong financial contribution to ZESCO, the time and cost overruns have hampered the efficiency of the line.



**Table 2: Estimated Financial & Economic Returns at Appraised, Completion and Review**

Rate of Return	Appraisal	PCR	PPER
FIRR	12.0%	24.4%	22.7%
EIRR	15.1%	25.3%	28.1%

## 4.4 Institutional Development Impact

The project did not have specific institutional development objectives. Although the financing of the project was a pioneering effort in the design and implementation of interconnectors in Zambia, the project did not contribute to the sector policy planning and it did not build capacity nor provide training to ZESCO. On the positive side, indirect benefits include “learning curve” experience as ZESCO Transmission and its Environmental and Social Affairs Unit have managed to retain skills and expertise for use in other projects. The ECZ has been able to apply experience gained on other trans-boundary transmission line projects (e.g. DRC-Zambia) and the ERB entrenched its autonomous status through its role in approving the PPSA.

## 4.5 Sustainability

4.5.1 Overall, the project benefits are rated sustainable but risks reside in the areas of institutional and social sustainability.

4.5.2 The context within which the project was developed and implemented is a predictable policy environment. GRZ’s position on the electricity sub-sector is documented in the Energy Policy (2008) and Electricity Act (2003). GRZ has furthermore laid down the development path for the electricity sector: the commercialisation of the sector (increased autonomy to and financial self-reliance of ZESCO, allowing private suppliers, independent regulatory oversight by ERB and handling of social objectives via REA) within an integrated resource planning environment managed by GRZ (through MEWD).

The status of these policy initiatives is that (a) ZESCO is moving in the direction of self-sufficiency albeit slower than required by the ERB and with evidence that the shareholder (GRZ) retains an active interest in the company as evidenced by the recent large-scale replacement of Board and senior manager positions, (b) CEC is well established and there are at least one other supplier (NWEC) and a number of new generation initiatives under the OPPPI, (c) the ERB is making credible findings such as its transparent and thorough assessments of requests for tariff increases, and has been firm with ZESCO in the form of implementing, monitoring and publicising a performance management regime (the KPIs) and has been responsible for an ordered PPSA framework and (d) REA is well-resourced and focused (including through the REMP). Policy directions which would support the sustainability of the project would include moving in the direction of financially ring fencing ZESCO Transmission, as well ring fencing the project from a financial and MIS perspective.

4.5.3 Social Sustainability: project support by the local communities in Western Zambia is generally weak. Various stakeholders (Barotse Royal Establishment, Office of the President, Consumer Watch Group, Chamber of Commerce and Industry) noted that the power reliability was still low and there was still frequent load shedding, and that the project has had limited benefits for local communities.

4.5.4 The ZESCO customer liaison/satisfaction system was reported as poor. The stakeholders differed on the progress that was being made with rural electrification in Western Zambia. Documentary

evidence of consultation with Katima Mulilo stakeholders was provided, and the Katima Mulilo Town Council reported that they experienced increased reliability of power with consistent voltage and that it has become a stimulus for new development proposals.

4.5.5 There are institutional capacity weaknesses that are likely to affect project performance. In terms of record keeping and operational performance, data on the performance of the 66kV line, or of distribution/supply initiatives or of distribution performance in Western Zambia is not readily available. In addition, key operational statistics are not logged (network incidents on the line, occurrences at Victoria Falls power station) and the incident management system is not actively used by ZESCO Transmission. Asset management is hampered by the fact that financial accounts are not ring fenced.

4.5.6 Top management turnover has been quite high in the recent years. The list of directors shows that in FY 2008/09 six of the seven non-ex-officio directors retired (excluding only the Managing Director)<sup>3</sup>. The MD's contract was not renewed under the new Board, and since then at least two MDs have been appointed and dismissed. Various senior managers have also not had their contracts renewed. However indications are that most of the key line management positions have remained untouched (Planning, Finance, etc.), including most senior Transmission staff.

4.5.7 The line availability is fairly high. Planned outages take up about seven days per year. Unplanned outages were seven days in the first year (up to the end of FY2006/7), one day in FY2007/8, and none thereafter. At Livingstone, the Victoria Falls Substation performs adequately, although the age of the transformer and the likely duration of outages if it fails are of concern. At Sesheke, initial voltage issues related to the small power load were overcome

through the installation of a variable reactor. However, from Sesheke northwards, power quality is still hampered by the performance of the long 66kV line. At Katima Mulilo, NamPower has experienced improved reliability in the power supply, with most incidents limited to minor faults such as lightning and protection coordination issues. Although the physical inspection of the assets indicates that they are being maintained and run well, it is strongly recommended that ZESCO improve its systems and processes to enable the interconnector's benefits to be exploited fully, such as active monitoring of the network to influence and guide planning processes.

4.5.8 In the absence of ring-fenced financial accounts at the asset level, the direct operations and maintenance (O&M) cost of the transmission line and associated substations has been assessed based on a pro rata allocation from the annual transmission budget. This assessment shows that the annual expenditure amounts to about USD 350 000, or approximately 1.65% of the initial investment. International norms are O&M on transmission to be in the order of 2%. Indications are therefore that the line is being operated and maintained cost-effectively.

4.5.9 In respect of the technical adequacy, there are several design shortcomings which could impact negatively on the sustainability and availability of the supply. The design issues primarily encompass (a) lack of redundancy on key transformer installations, (b) lack of premium protection schemes in installations of this nature and importance and (c) undesirable equipment arrangement, particularly on the 220kV portion of the substations.

4.5.10 Lastly, very little thought has been given to the increase in demand and this issue is compounded by the fact that there is limited active monitoring of the technical system performance which could be a

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<sup>3</sup> ZESCO's 2008/9 Annual Financial Statements (AFS)

useful instrument in cases where future planning is lacking.

4.5.11 The financial sustainability of the project is largely related to the transmission tariffs and in this particular case, the approval of the PPSA and respective tariff was a key factor in project implementation. The ERB had initially refused to approve the PPSA for the 220 KV line. The rationale was to ensure that the tariff was cost-reflective<sup>4</sup> while at the same time that it did not subsidise the Namibian electricity consumer. A key constraint to the process was the institutional disparity between the Namibian and Zambian institutional structures – while the ERB has the mandate to approve PPSAs, in Namibia the Minister of Mines and Energy owns this mandate rather than the Electricity Control Board (ECB). That situation was overcome and transmission tariffs agreed are in line with the Cost of Service Study benchmarks. The FIRR assessment shows that once the NamPower supply agreement becomes fully operational, the project financial returns should be strong, providing an acceptable return on the initial investment.

4.5.12 As regards ZESCO's financial performance, key financial indicators are generally trending upwards and ZESCO's revenues have started to reflect the ERB's tariff correction plan. Expenditure growth has remained below the national inflation band, including staff expenditures for the most part. The ratio of expenditure to income has accordingly been drifting downwards, resulting in increased cash from operations (average growth of 31%/ann.). Investments (capital expenditure) have increased, reflecting PRP-related activity. This has been financed partly from increased operating revenues, some recapitalisation and net loans. The company's net cash position has been unstable, but ended on a historic high point in 2008/9.

4.5.13 Additional financial ratios as presented below show that in the capital structure net loans have

outpaced recapitalisation and retained earnings, so that the debt/equity ratio has moved upwards. The cash-backed interest cover ratio remained strong and static for the first three years, and then vaulted on the back of increased net revenues. The debt service cover which had not been sufficient to service short-term obligations recovered to a healthier but still anaemic level in 2008/9. The working capital analysis shows that debtor (trade receivables) days improved over the period, although falling behind the targets set by the ERB. Year-end cash levels remain low, but by the end of 2008/9 were covering more than one month's cash operating expenditure. The company's solvency position remains precarious with current assets continually falling short of covering current liabilities. In terms of profitability, earnings before non-cash items increased steadily before stepping up in 2008/9. Considering the non-cash items, retained earnings after tax remained steady over the period except for 2006/7. Return on capital employed fell significantly short of what would be expected of a commercial enterprise.

4.5.14 A comparative analysis between staff productivity at ZESCO with fairly similar, vertically-integrated utilities in Southern Africa, reveals that the company has many employees relative to installed capacity, produces much more energy per employee (most likely related to the large mining base in Zambia) and is towards the lower end when comparing customers per employee. Details are provided in Erreur ! Source du renvoi introuvable..

4.5.15 Lastly, ZESCO has performed unsatisfactorily against the ERB's Key Performance Indicators (KPIs). By the first quarter of 2009, of the ten quantified KPIs, five indicators had the absolute performance improved and in only two cases had targets been

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<sup>4</sup> As per the costs shown in the 2007, Cost of Service Study from ERB. The purpose of the study was mainly to develop the utility's revenue requirements and set appropriate tariff levels that enable the utility to improve service and meet demand growth over time.

**Table 3: Capital Structure, Working Capital and Profitability (returns on investment)**

	Unit	2005/6	2006/7	2007/8	2008/9
<b>Capital Structure</b>					
Debt:Equity	%	57%	71%	72%	78%
Interest Cover	ratio	4.3	4.9	5.1	17.5
Debt Service Cover	ratio	0.4	0.6	0.6	1.4
<b>Working Capital</b>					
Debtors Days	days	168	176	147	136
Cash Days	days	21	-8	-13	35
Current Ratio	ratio	1.1	1.0	0.8	0.9
<b>Profitability</b>					
Net Profit after Tax	%	6%	-18%	4%	3%
ROCE incl. Grants	%	1.0%	-2.9%	0.7%	0.6%
ROCE excl. Grants	%	1.0%	-3.1%	0.8%	0.7%

Extracted from the published Annual Audited Results up to 2008/9.

met. ZESCO's performance against the ERB KPIs is shown in 0.

4.5.16 ZESCO has some financial exposure to rural electrification. Although REA funds extensions to grid lines in rural areas and these are then transferred to ZESCO at no cost, these assets then become ZESCO's to manage, maintain and rehabilitate. Apart from some institutional customers (schools, hospitals), these rural extensions would provide electricity to fairly poor communities where consumption and payment rates are low – thus placing a financial burden on ZESCO.

4.5.17 Most of the project revenues are couched in foreign currency terms and these are protected via contract; and the expenditures that are not in forex would be protected by a depreciating exchange rate.

4.5.18 ZESCO's financial performance demonstrates its exposure to macro-economic trends and shocks, including economic growth, inflation and the exchange rate. On growth, domestic economic growth is likely to be a contributing factor to an eventual electricity generation supply shortfall. On

inflation, Zambia typically experienced double digit levels, in the region of 15%/ann. in the last five years. This puts a strain on the required tariff increases, and leads to the depreciation of the currency. On the exchange rate, including or excluding exchange rate gains/losses would have affected ZESCO's profit level by up to USD 50 million over the last four years.

4.5.19 As far as willingness to pay is concerned, electricity is perceived to be very expensive in Western Zambia. Qualitative data from the socio-economic assessment suggests the cost of electricity is out of proportion with the perceived quality of service rendered by ZESCO. Customers attribute their unwillingness to pay the current electricity tariffs largely to the perception of poor quality of service they receive (perceptions from Barotse Royal Establishment).

4.5.20 The project does not carry large exposure to other exogenous factors such as regional political stability or regional electricity prices. In a country largely dependent on hydro power, there will unavoidably be exposure to drought, but the effects of seasonal rainfall fluctuations would be predictable

and managed accordingly. Changes in commodity prices (copper) will affect domestic demand which (depending on the severity) may impact on ZESCO's ability to provide the contracted capacity. A lower copper price would also increase the pressure on electricity as earner of foreign exchange for Zambia, which could expose the project to a different politico-commercial context.

4.5.21 Environmental sustainability objectives are achieved where direct access to reliable energy supplied by the project occurs, i.e. Katima Mulilo and Sesheke. The "clean" (i.e. zero carbon hydro-power) source of the energy supplied by the line more than offsets the limited visual influence within the Victoria Falls World Heritage Site and Mosi-oa-Tunya National Park (3-4 pylon structures are visible along the ridgeline along the Falls-Livingstone scenic route within the World Heritage Site, and their impact is mitigated by the visual impact of the previously installed cell phone repeater towers in the same area). The hydropower is generated from an in-stream off-take from the Zambezi, with no storage or impoundment, and without significantly altering the natural flow and course of the river.

4.5.22 There is no specific evidence of the implementation of policy instruments, as well as intergovernmental department coordination that would realise the benefits of the project. The absence of policy and sector coordination significantly dilutes the potential for achieving environmental sustainability targets such as biomass fuel reduction, pollution abatement, carbon offset, deforestation, amongst others.

## 4.6 Other Development Impacts

4.6.1 Other development impacts are limited. The physical impact of the project on the environment and surrounding communities was adequately mitigated in the design and implementation of the project. There are no significant physical impacts which can be directly attributed to the project infrastructure.

4.6.2 The project allows the supply of "clean" (hydro) power to Western Zambia and Eastern Caprivi region of Namibia in the place of high carbon content charcoal and diesel-based generation.

4.6.3 No communities were resettled away from their family or traditional land. The extent of the resettlement entailed moving individual family units, where necessary, out of the power line servitude (due to the health and safety risks), onto adjacent land. Communities were therefore not displaced, and were in most cases more than adequately compensated monetarily.

4.6.4 Increased access to modern, accessible and affordable energy generally benefits women. The relatively weak delivery of the project power at local level means that such gender benefits are probably quite modest.

## 4.7 Aggregate Performance Rating

4.7.1 The detailed ratings are shown in Appendix 1 and summarised in the Basic Project Data section at the front of this report. Overall, the project performance is unsatisfactory. The complexion of the project changed substantially during project implementation. The initial transmission project became an interconnector operation with a primary objective of exporting power to the Caprivi Region as well as to the whole of Namibia. The increased focus on the power trade with Namibia reduced the attention devoted to strengthening the electricity network in the Western Region of Zambia.

4.7.2 There are shortcomings related to quality at entry that specifically detract from the project achieving a higher performance. The project efficiency is rated unsatisfactory due to significant cost and time overruns. Sustainability is mainly affected by the expressed lack of social support as well as institutional capacity deficiencies. Other development

impacts which can reasonably be anticipated have yet to be realised due to project delays and the fact that the project was not properly aligned with the Rural Electrification Agency (REA) and ZESCO Distribution programmes.

4.7.3 The project is operating soundly with fairly high availability and fairly modest O&M expenditure. However, the main limitations are the lack of redundancy of key transformer installations and the low reliability of the line particularly in Western Zambia.

## 4.8 Borrower and Executing Agency Performance

4.8.1 As noted previously, quality of preparation was not based on a robust demand forecast, it failed to incorporate necessary downstream actions by several important role players and it seems that there was a lack of appreciation of where the project would fit into the medium-term plan for regional transmission expansion planning. These shortcomings reflect on the Borrower as well as the project lenders.

4.8.2 The Borrower and the EA were the cause of substantial project delays. GRZ (MFNP) delayed about two years in concluding the on-lending agreement to ZESCO. ZESCO made calculation errors in the design (foundations and routing). ZESCO and NamPower agreed to change the project scope mid-stream. Scope changes during design exposed ZESCO to financial liabilities (tower foundation designs). Quality of implementation also suffered from the fact that the PPSA was not maintained current relative to the changing project complexion. The exposure to the Zambian supply/demand context (especially the impact of the PRP and its delay) was not managed.

4.8.3 Compliance with loan covenants was delayed by 24 months. Up to now two “Other Conditions” have not been complied with. There is no formal project monitoring and evaluation approach in place.

4.8.4 The overall performance of the Borrower and Executing Agency is “Unsatisfactory”, as they rate unsatisfactory on three of the five performance components.

## 4.9 Bank Group and Co-Financier Performance

4.9.1 The Bank performance is rated as *unsatisfactory*. The shortcomings of the Borrower and Executing Agency regarding project preparation and appraisal were at the same time shortcomings of the Bank.

4.9.2 The project was classified as a Category II project as per the AfDB Group Policy on the Environment, February 2004 (updated). Based upon this categorisation and the ECZ requirements, the project was approved on a Project Brief. Significant detail was missed in the project approval due to the fact that a detailed site and route assessment was not conducted as part of the Project Brief and approval. Unexpectedly sandy soil conditions as well as graves and heritage aspects were uncovered during project implementation, which caused significant time delays. The project subsequently incurred additional costs related to these findings.

4.9.3 The quality of project implementation is also less than satisfactory. The Bank signed off on the design changes shortly before the Zambia power surplus dissipated, it did not coordinate actions with the World Bank under whose PRP supply was significantly curtailed, it did not reinforce the need for an updated PPSA, and it failed to identify ZESCO Distribution and NamPower’s performance as shortcomings in realising the project objectives. It also failed to recognize the need for alignment between the REMP and this project in order to derive some of the local socio-economic impacts. The REMP has since initiated distribution-level investments in Western Zambia, but the transmission line beyond Sesheke still remains to be strengthened.

4.9.4 The Bank supervision was weak and is reflected in the supervision reports which provided very limited information on the status of the project. Major issues (Namibia intra-connector, Zambia supply shortage, etc.) went undetected. The PCR makes findings on the local development and social impact of the project that are not supported by the evaluation mission. Specifically, the PCR finds that the project “improved the reliability of electricity services in the border towns in Namibia and the Western Region in Zambia”, and that “the usual benefits of electricity to rural communities have been enhanced in the project areas, boosting economic activities and increasing incomes”. Although there appear to be more electricity connections than before the project, the reliability of supply has decreased and the relative price of electricity increased. The actual consumption of electricity has also recently reportedly decreased.

4.9.5 The DBSA acted as co-financier. Contrary to the PCR’s assertion, there are indications that DBSA’s loan amount reduction was due to the depreciation of the Rand against the US dollar. The DBSA’s policy is that modifications in the course of a project are for the project sponsor’s account. This principle was also applied to additional costs related especially to the under-design of the foundations and additional line length required due to the change of line routing.

4.9.6 The DBSA is well aware of the financial weaknesses of ZESCO, especially the company’s commercial indicators (including debtor management). The DBSA subsequently attempted to overcome some of these weaknesses by lending to ZESCO to implement a comprehensive Management Information System (MIS) (“integrated resource planning” tool) and providing some capacity-building support.

## 4.10 Factors affecting Implementation Performance and Outcome

4.10.1 The major factors that affected achievement of the project implementation performance, outcomes and objectives/outputs were as recorded below. It should be noted that some of these are likely to fall away in the near future, leading to the improvement of the project financial performance.

4.10.2 Factors outside the control of the Borrower or EA: these factors included (a) the impact of the increased domestic demand, but especially the PRP, on the domestic supply surplus (although it could be argued that this should have been managed better), (b) flooding in the project area, (c) lack of finance when cost overruns occurred (although these relate mostly to judgment errors by the Executing Agency), (d) changes in material costs due to delays (although these could mostly be accommodated in the project contingencies), (e) non-completion of the Namibia intra-connector and (f) non-performance by ZESCO Distribution and REA (although it is not that they did not comply with a firm commitment).

4.10.3 Factors subject to Government control: This entailed delays in loan effectiveness related (mostly) to the non-execution of the on-lending agreement.

4.10.4 Factors subject to the EA: these factors included (a) non-participation of development beneficiaries, (b) design errors (line length, line cost) and decision errors at design stage (not carrying out soil investigations, not doing detailed line route survey), (c) not updating the PPSA and taking steps to secure the offtake NamPower committed to, (d) non-ringfencing of the project so that its financial performance could be monitored and managed effectively and (e) non-implementation of an M&E system to track the achievement of development outcomes.

# 5. Conclusions, Lessons and Recommendations

## 5.1 Overall Conclusion

5.1.1 Overall, the project performance is unsatisfactory. The unsatisfactory ratings stem from four main areas where the project was conceived or managed poorly. The first three areas are (a) the absence of necessary components in the electricity supply chain to achieve the intended results at the local distribution level, (b) the apparently casual manner that the change in project scope was managed and (c) making the interconnector project subject to conditions which could not reasonably be addressed through this project. Fourthly, although the Borrower/EA and the Bank individually erred in specific ways, they were jointly responsible for these major shortcomings. Apart from these four themes, there were also some other shortcomings that affect the evaluation rating of the project. Notwithstanding the issues identified here, however, indications are that the project will provide a good financial and economic return to ZESCO and Zambia.

## 5.2 Lessons

5.2.1 Transmission projects can only achieve targets beyond short-term objectives of power transfer if they are backed up by the next links in the delivery chain (further transmission or distribution system).

5.2.2 Transmission interconnector projects are complex. They involve many stakeholders, and are exposed to the electricity markets and exogenous factors of two or more countries so that their environment is particularly dynamic.

5.2.3 The assessment of downstream demand and the contractual arrangement to secure that demand are crucial. In a scenario where key conditions change, commercial protection and offtake agreements that

are advantageous for all parties must be negotiated and put in place.

5.2.4 Availability of monitoring data and statistics on the performance of the transmission line helps improve Zesco efficiency and effective operational performance.

5.2.5 Understanding the interplay between the project and policy dialogue and sector reform (including policies on tariffs and cost-recovery) is essential to project sustainability. Also, the realism of the timeframe for the fulfilment of loan conditions has a direct impact on project implementation;

5.2.6 The elevation of this type of project to a category I would have ensured that an exhaustive EIA was conducted, identifying detailed and specific environmental and social aspects which would then have been adequately mitigated through a project and issues-specific Environmental and Social Management Plan (ESMP).

## 5.3 Recommendations

### Recommendations to the Bank and the Borrower

5.3.1 Transmission projects should be designed with identified supporting programmes for which responsibilities are clearly assigned. Transmission projects should be “stress tested” to establish whether the building blocks are in place to ensure that the longer-term objectives are realised. Also, the appraisal of similar projects should be more demanding in terms of the assessment of risks and assumptions, revision of preliminary designs at feasibility stage as well as the inclusion of adequate mitigation measures. It is recommended that the



Bank thoroughly scrutinize feasibility studies and put increased focus on preparatory missions before appraisal.

5.3.2 The environment within which the project is carried out should be continuously monitored to determine whether crucial assumptions still apply. Where applicable the Bank and the Borrower should be willing to learn from mistakes made during formulation and in the course of the implementation and take responsibility to mitigate them. There should be regional oversight and guidance, and possibly also credit-enhancing tools (to offset risk that becomes unbearable for one party in the interconnector arrangements). This function can perhaps reside with SAPP.

5.3.3 Future transmission projects as well as interconnector projects that involve local supply should also plan to provide for the distribution of reliable and affordable electricity at the local level in order to enhance socio-economic impact.

#### **Recommendations to the Bank**

5.3.4 Given the importance and complexity of the PPSA concerning technical, commercial and legal issues, the Bank in future similar operations should consider the possibility of providing assistance to its regional member countries in drafting and negotiating PPSAs that are advantageous for all parties involved, based on a thorough risk assessment. Mechanisms for updating the risk assessment should be agreed by the Parties. The Bank's supervision should put greater emphasis on the financial and contractual arrangements in place.

5.3.5 Although in-country requirements may only require a PB, the Bank will safeguard its reputation by taking a more precautionary approach, and similarly align itself with international best practice on safeguard policy.

5.3.6 Loan covenants and undertakings for similar operations should be further enhanced and coupled with complementary assistance such as Economic and Sector Work (ESW). It is also recommended that the Bank explore compulsory measures in order to enforce loan conditions that are key to project sustainability;

5.3.7 Although the substations are managed and maintained in a satisfactory manner, future Bank's operations may explore the reinforcement of institutional capacity in terms of tracking system and record keeping of operational data.

## **5.4 Dissemination**

5.4.1 A workshop will be conducted in order to discuss evaluation findings, lessons learned and recommendations on power interconnector operations.

5.4.2 After the workshop, the PPER will be finalized and sent to CODE and the final evaluation report published and disseminated by OPEV within the Bank and to RMCs. The report will be posted on the OPEV website.

# Appendix 1: Evaluation Criteria – Retrospective

No.	Component Indicators	Score (1 to 4)	Remarks
<b>1.</b>	<b>Relevance and quality at entry assessment</b>	<b>2</b>	Relevance of objectives is generally confirmed, however good quality at entry is unsatisfactory with key shortcomings related to assumptions and risks. Also, project planning should have been more integrated
i)	Consistency with country overall development strategy	3	The project is in line with the objectives of the Government for the country and energy sector. The project objectives are consistent with the principles of Zambia's Vision 2030 and Fifth National Development Plan (FNDP) in which the main focus of the energy sector is to increase the current level of access to electricity, and in the long term to ensure that Zambia has reliable, economically sustainable and environmentally sound energy supply. The project remains relevant to the Joint Assistance Strategy for Zambia 2007-2010 (JASZ) which supports creating an enabling environment for electricity and reaping the positive effects of increasing access to electricity. In the energy sector, the Bank's Country Support Strategy (CSP) 2007-2010 pursues a multinational goal, i.e. the development of regional power interconnectivity projects that have already been identified by NEPAD, SADC, COMESA and SAPP.
ii)	Consistency with Bank Assistance Strategy	3	
iii)	Macro-economic Policy	N/A	
iv)	Sector Policy	3	GRZ has laid down the development path for the electricity sector: the commercialisation of the sector (increased autonomy to and financial self-reliance of ZESCO, allowing private suppliers, independent regulatory oversight by ERB and handling of social objectives via REA) within an integrated resource planning environment managed by GRZ (MEWD). The major policy objectives are migration towards cost-reflective tariffs, commercialisation, autonomy of ZESCO from GRZ, private sector participation in the power sector and independent regulation. In order to enhance ZESCO's efficiency, the Energy Regulatory Board adopted in 2007 a multiyear incentive tariff framework (MYTF) that is based on the use of self-enforcing incentives in the form of Key Performance Indicators (KPIs). The purpose of the KPIs is to motivate ZESCO to improve profitability and delivery of quality service to its customers. ZESCO's performance against the KPIs has been below expectations as explained in the following sections of the report.
v)	Public Policy Reform	N/A	
vi)	Poverty reduction	2	At entry, socio-economic development and poverty reduction were the overriding project objectives. The project design failed to include activities that would tie improved transmission to improved quality of supply at distribution (i.e. consumer) level
vii)	Social and Gender equality	2	Improved consumer quality of supply has a major potential impact on improving the living conditions of women (reduced time for fuel collection, potential to study, etc.). In the same way that poverty benefits were not unlocked, this potential was not addressed because of failure to design distribution into the project
viii)	Environmental Concerns	2	The geo-physical environment was not properly appreciated at entry (line routing, soil conditions, perennial flooding of dambos). The environmental categorisation could also arguably have been higher
ix)	Human Resources Development	2	Although the PIU was established, there is only anecdotal evidence of the corporate memory developed being implanted in ZESCO. The PIU also made some crucial errors (e.g. line length and costing estimates) which bring into question how well it was resourced and supported

No.	Component Indicators	Score (1 to 4)	Remarks
x)	Institutional Development	N/A	
xi)	Private Sector Development	2	The FIRR indicates that the project has good commercial prospects, and the area of PSP should have been explored more. There is evidence that PSP was considered at one stage, but it is not clear why it was not developed further
xii)	Regional Economic Integration	2	At entry, the regional integration potential was understated, but this aspect was improved when the project was redesigned. Benefits from integration have been delayed due to some crucial mistaken assumptions on the timely completion of the Namibia intra-connector, and this aspect should have been attended to at entry
xiii)	Quality at entry (including demandingness, complexity, riskiness, etc.)	2	The project failed to effectively integrate requirements of a broad range of stakeholders. The major transmission stakeholder (NamPower) was consulted but there is no evidence that local stakeholders in Western Zambia (who at entry were the main designated beneficiaries of the project) were also consulted. In addition, the project at entry falls short in the following key respects: (a) it failed to acknowledge the looming Zambia supply shortage, (b) it was based on over-estimated demand growth, (c) it failed to commit NamPower to offtake at the planned supply level, (d) other initiatives in the power sector were overlooked and it was assumed that the required supporting transmission and distribution projects in Western Zambia would take place naturally, (e) there were shortcomings with the configuration of the project as optimal supply option (given the multiple roles of the project) as well as (f) specific environmental planning and management shortcomings.
xiv)	Other (Specify)		
<b>2.</b>	<b>Efficacy</b>	<b>3</b>	
i)	Policy Goals	3	Major policy goals were macro-economic growth via local development and increased foreign earnings. Neither of which has yet been achieved, although there are good prospects for the foreign earnings goal to realise.
ii)	Physical objectives (outputs)	3	Outputs were achieved. The physical outputs were constructed to a satisfactory standard although there are specific concerns regarding the choice of equipment, inadequate protection, and redundancy at substations. There was little resettlement required and therefore only limited compensation in the way leave for loss of a limited number of structures.
iii)	Financial Targets	3	Although the project is not yet earning revenues in relation to its investment, it will do so from mid-2010
iv)	Institutional Development Objectives	2	There were no explicit institutional development objectives associated with the project, although there was much institutional development potential. PIU at utility level was created, made some mistakes, but has contributed to corporate knowledge. The project should have given impetus to internal ringfencing in ZESCO and M&E (and associated MIS) is not capitalised on. Other agencies could have been tied into project more (REA, ECZ, possibly even CSO). PSP could have been pursued more vigorously
v)	Social Objectives and Targets	1	The project was marketed (especially in the 132kV configuration) with local development impacts in mind. These appear to have reduced in importance as the project took on an "interconnector" nature. Complementary actions to ensure development impacts were not planned and the development goals have therefore largely not been realised. There is also little prospect of the project achieving these goals in the near term
vi)	Environment Objectives	3	The project was not very sensitive environmentally, but some obvious environmental issues in construction were overlooked (soil and flooding). There is little environmental M&E post-construction.
vii)	Private Sector Development Objectives	2	The project had real PSP potential which was not thoroughly explored, i.e. in the potential ownership, funding and operation of the project
<b>3.</b>	<b>Efficiency</b>	<b>2</b>	

No.	Component Indicators	Score (1 to 4)	Remarks
i)	Economic Rate of return Appraisal Estimate: 12% PCR re-estimated at completion: 24% PPER re-estimated at completion: 21%	2	Only a very small economic premium (i.e. EIRR minus FIRR) is projected. In as far as it is expected, it will also be delayed compared with the original assessment.
ii)	Financial Rate of Return Appraisal Estimate: 15% PCR re-estimated at completion: 25% PPER re-estimated at completion: 21%	3	Although delayed, the project will make a strong financial contribution to ZESCO. The achievement of the higher than anticipated FIRR does not necessarily reflect an efficient project since an important part of project revenues were not specifically planned for.
iii)	Cost-Effectiveness Indicators	2	Project had 57 month delay, and a cost overrun of nearly one third. Construction costs are within regional norms. Line operating costs are in line with (and lower than) international norms
<b>4.</b>	<b>Institutional Development Impact</b>	<b>2</b>	Even though there were some modest impacts, the project did not have specific institutional development objectives.
i)	National Capacity	2	Although not fundamental to achieving project goals, the potential impact on public institutions has not materialised (in the case of the ECZ and REA). The ERB further developed its understanding of transmission interconnector issues
ii)	Executing Agency	2	The PIU was established and corporate knowledge and experience developed. Management accounting and M&E opportunities were not developed
<b>5.</b>	<b>Sustainability</b>	<b>3</b>	
i)	Technical Soundness (including O&M facilitation, availability of recurrent funding, spare parts, workshop facilities etc.)	3	Technical issues appear to be minimal, mostly related to design redundancies. A maintenance programme is in place. ZESCO and NamPower together are monitoring line performance. Technical soundness should be sustainable
ii)	Continued Borrower Commitment (including legal/regulatory framework)	4	Borrower has clear vision for ZESCO and for Zambia's role in regional power system, including the role of interconnectors such as this project. The status of policy initiatives is that (a) ZESCO is moving in the direction of self-sufficiency albeit slower than required by the ERB and with evidence that the shareholder (GRZ) retains an active interest in the company as evidenced by the recent large-scale replacement of Board and senior manager positions, (b) CEC is well established and there are at least one other supplier (NWEC) and a number of new generation initiatives under the OPPPI, (c) the ERB is making credible findings such as its transparent and thorough assessments of requests for tariff increases, and has been firm with ZESCO in the form of implementing, monitoring and publicising a performance management regime (the KPIs) and others and has been responsible for an ordered PPSA framework and (d) REA is well-resourced and focused (including through the REMP)
iii)	Socio-political Support (including beneficiary participation, vulnerable groups protection, political stability)	2	Anecdotal evidence of disgruntled local stakeholders. Local support needs to be addressed more systematically and in integrated fashion. However, in its 220kV configuration, local support is not key to the project being sustainable
iv)	Economic Sustainability	3	Economic risks are limited and largely contractually protected (PPSA). Anecdotal evidence shows that electricity is perceived to be very expensive in Western Zambia and willingness to pay is low due to the quality of the power supply.

No.	Component Indicators	Score (1 to 4)	Remarks
v)	Financial Sustainability	3	Project itself is expected to deliver good financial results. ZESCO's financial position is not robust, but it is stable, and there is (slow) improvement. Some concern that ZESCO's position could distract from project financial performance, e.g. with reference to performance against the ERB KPIs
vi)	Institutional Arrangements (organisational and management)	2	Project could be managed in a more ring-fenced manner. Skills allocated to the project appear to be good. There is pro-active maintenance planning. Performance measurement is reasonable (line availability), but records are not readily available. Power quality data is not kept
vii)	Environmental Sustainability	4	Although environmental management could be enhanced, there are no pressing environmental risks
viii)	Resilience to Exogenous Factors	3	Major issue is domestic supply capacity (related to availability, drought and domestic demand)
<b>6.</b>	<b>Other Development Impacts</b>	<b>2</b>	There are various development by-products not realised (including welfare and health benefits associated with improved electricity distribution)
<b>7.</b>	<b>Aggregate Performance Indicator</b>	<b>2</b>	Unsatisfactory. There are shortcomings related to quality at entry that specifically detract from the project achieving a higher performance. The efficiency of the project is unsatisfactory but the arrangement to wheel power for ZESA/NamPower has improved utilisation level of the line. Some costs are lower specifically the bulk purchase price of electricity. Sustainability is mainly affected by the expressed lack of social support as well as institutional capacity deficiencies

## Appendix 2: Borrower Performance

Component Indicators	Score (1 to 4)	Remarks
<b>1. Quality of Preparation:</b>	<b>3</b>	
Ownership, Beneficiaries participation	2	Better prepared at transmission level than distribution. Limited local participation
Government commitment	3	Strong commitment, but unclear why initial on-lending delay
Macroeconomic & Sector policies	3	Good fit, but PSP not explored
Institutional Arrangements (counterpart funding)	4	ZESCO stood in for its project share, and increased the share when it was required
Project Scope Changes	2	Project was dramatically redesigned mid-stream, and (retrospectively) possibly under-designed for its interconnection purpose
<b>2. Quality of Implementation:</b>	<b>2</b>	
Assignment of Key Staff	2	Staff assigned (PIU), but PIU could have been better structured and staffed (add legal, accounting)
Managerial Performance of Executing Agency	2	Inadequate given project lags, changes to the project, key integration components not managed
Use of Technical Assistance	2	TA not part of project, but design responsibility not clearly assigned (crucial design issues for which ZESCO took responsibility later had to be corrected by engineering consultant at additional cost). ZESCO should have employed guidance on design and planning process
Mid-Course Adjustments (from 132kV to 220kV)	2	Adjustment is justifiable, but changed project complexion. Namibia intra-connector and corresponding update to the PPSA not managed well
Adherence to time schedule & costs	2	Large time and cost overrun
<b>3. Compliance with Covenants</b>	<b>2</b>	Many were late
<b>4. Adequacy of Monitoring &amp; Evaluation and Reporting</b>	<b>2</b>	Adequate line performance monitoring. No formal M&E in place
<b>5. Satisfactory Operations (if applicable)</b>	<b>3</b>	5.1 Indications are that project is operating soundly (fairly high availability, fairly modest O&M expense). However the main limitations are the lack of redundancy of key transformer installations and the low reliability of the line particularly in Western Zambia.
<b>Overall Borrower Performance</b>	<b>2</b>	

# Appendix 3: Bank Performance

Component Indicators	Score (1 to 4)	Remarks
<b>At Identification</b>	<b>3</b>	
Project consistency with government development strategy	3	Project was consistent with these strategies, except for low emphasis on PSP. Much involvement at transmission level, but little involvement at distribution level.
Project consistency with Bank strategy for country	3	Fairly standard project, slightly more complicated due to cross-border nature and discrete types of off-takers. Not sufficiently customised for sector complexities.
Involvement of government/beneficiaries	2	
Project Innovativeness	2	
<b>At Preparation of Project</b>	<b>2</b>	
Relevance of Bank support	3	Project prepared by ZESCO, but there are shortcomings which could have been improved with Bank support (e.g. project preparation support such as the – IPPF – for market assessment and transaction structuring).
Timely Bank support	2	Two years delay between identification and PAR, another seven months to loan award; but no information or evidence on requirement for specific (time-bound) Bank involvement.
<b>At Appraisal</b>	<b>3</b>	
Quality of technical, economic, financial, institutional, social, environmental analyses	2	It appears that these analyses were at pre-feasibility rather than detailed feasibility level. Many required modification during implementation. Geo-technical assessment was a specific shortcoming.
Relevance of Conditions and Covenants	2	Project-specific covenants mostly relevant; undertakings and other conditions relevant and in line with sector context. However the time line fulfil those conditions were unrealistic.
Adequacy of lending instrument	3	Standard instrument but it could have been complemented by TA.
Financial package adequacy	3	Adequate, cost under run 1.90% on DB component.
Quality of co-ordination with other donors/partners	3	Project formulation in line with initiatives of other development partner namely the World Bank's Power Rehabilitation Project (PRP). However the delay in the implementation of the PRP took out of operation a quarter under national generation capacity and at the time of project revision and design upgrade 220kV/200MW, ZESCO did not have surplus capacity to export as had originally been assumed.
Implementation & Supervision plans (including performance indicators, M&E requirements)	2	Standard supervision approach. Lack of development of M&E baseline and tracking system responding to project indicators.
<b>At Supervision</b>	<b>2</b>	
Adequacy of Bank staff (skills, time & continuity)	3	Regular missions. Skills mix could have more diversified as the Environmentalist attended appraisal mission only. There was continuity from technical and financial perspective.
Problem solving	3	
Responsiveness to changing conditions	2	Bank supported new configuration, but did not apply necessary checks (e.g. PPSA update). "Development" objectives changed to "commercial", but this was not flagged in the supervision reports. There is evidence of continuous dialogue to ensure the fulfilment of "Other Conditions" but those loan covenants remain unfulfilled until now.
Adequacy of Follow up on recommendations/decisions	2	
Realistic ratings at CPPR/APPR	2	Accurate assessment of implementation performance. Bank performance assessment focuses on Bank inputs – rather than on expected project outcomes.
Attention to likely social development impact	1	Although consistently reported on as satisfactory, no steps taken to ensure results.
Attention to sustainability issues	2	Bank apparently did not identify lack of complementary projects at distribution level.
<b>Overall Assessment of Bank Performance</b>	<b>2</b>	

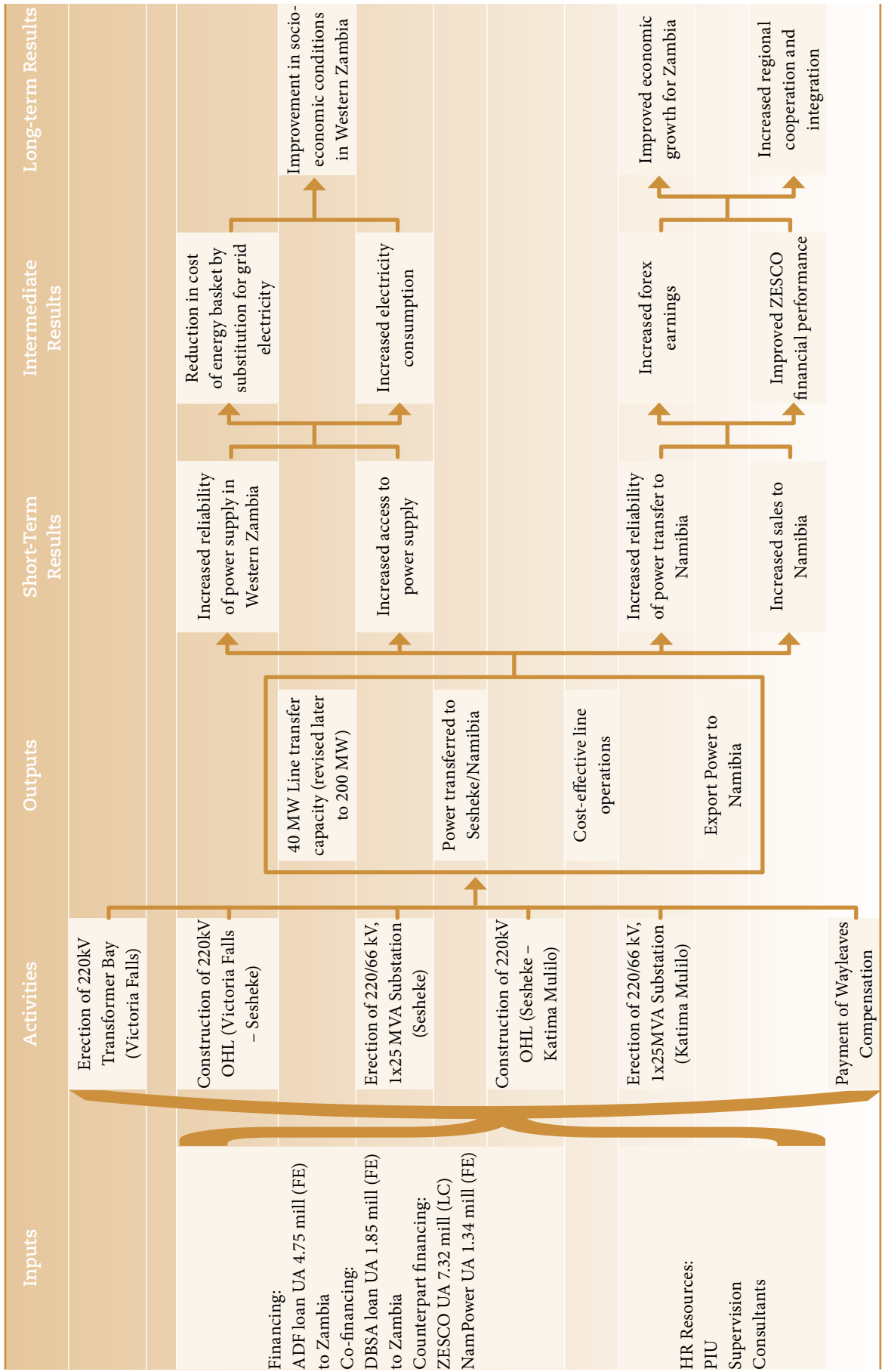
# Appendix 4: Factors Affecting Implementation Performance and Outcome

Factors affecting positively (+) or negatively (-) the implementation and achievements of major objectives

Factors	Substantial	Partial	Negligible	N/A	Remarks
<b>1. Not subject to Government Control</b>					
1.1 World Market prices			X		
1.2 Natural events		X			
1.3 Bank Performance			X		
1.4 Performance of contractors/consultants			X		
1.5 Civil war				X	
1.6 Others (Specify)					
<b>2. Subject to Government Control</b>					
2.1 Macro policies				X	
2.2 Sector policies				X	
2.3 Government commitment				X	
2.4 Appointment of key staff		X			
2.5 Counterpart funding		X			Lack of additional funding when required
2.6 Administrative capacity		X			
2.7 Others (Specify)	X				Non-execution of on-lending agreement
<b>3. Subject to Executing Agency Control</b>					
3.1 Management			X		
3.2 Staffing			X		
3.3 Use of technical assistance		X			
3.4 Monitoring & Evaluation	X				
3.5 Beneficiary Participation	X				
3.6 Others (Specify)					
<b>4- Factors Affecting Implementation</b>					
4.1 changes in project scope/scale/design	X				
4.2 Deficiency in estimating physical inputs, the base unit costs	X				
4.3 Inadequacy of price/physical contingencies		X			
4.4 Changes in exchange rates, in financial and institutional arrangements			X		
4.5 Unrealistic implementation schedule			X		
4.6 Quality of management including financial management			X		
4.7 Delays in selecting staff/consultants/contractors and in receiving counterpart funds	X				Engineering consultant
4.8 Inefficient procurement and disbursement procedures			X		
4.9 Others (Specify)					



# Appendix 5: Intervention Logic

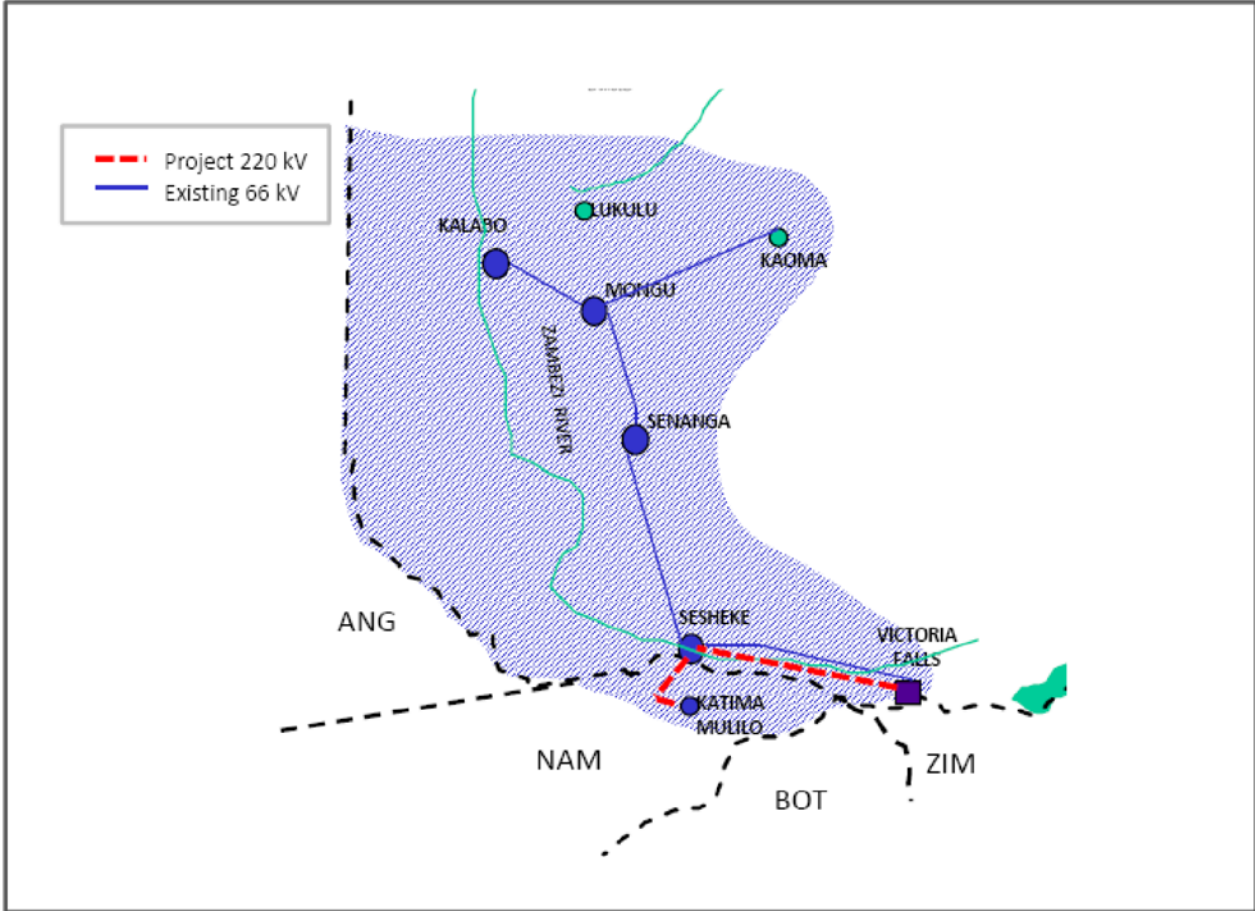


# Appendix 6: Compliance with Loan Conditions

Condition		Achievement
For Entry into Force	For First Disbursement	Other Conditions
Submission for the ADF's comments of the draft and final Tariff Study Report (submission by 31 December 2000)	Submission of the draft Tariff Study Report for the ADF's comments	The "1999 SwedPower Tariff Study" was mentioned in a Bank supervision summary (May 2004) and it is therefore concluded that the study had indeed been completed (and submitted) at that time
Submission to the ADF of the final tariff study report incorporating its comments		Submission of the final tariff study report (by 31 December 2000)
Submission for the ADF's approval by 31 December 2000 of an action plan for achieving LRMCM by 31 December 2008 (31 December 2000)		Submission of an action plan to achieve LRMCM by 31 December 2008 (by 31 December 2000)
		Submission of evidence of tariff increases according to the LRMCM action plan
Incorporating into the tender documents measures to mitigate negative environmental impacts	A written undertaking by ZESCO to incorporate appropriate environmental mitigations into the tender documents	The supervision summary of November 2001 reported that the Bank had been provided with the action plan for achieving LRMCM. The Multi-Year Tariff Framework (MYTF) process is intended to bring ZESCO to cost-reflectivity. Under the MYTF for 2008-2010, the ERB granted increases of 27% (2008), 16% (2009) and 11% (2010), subsequently (July 2009) increased to 35% for 2009/10 and 26% for 2010/11. The ERB indicated that ZESCO was approaching cost-reflectivity in the mining sector (tariff charged to CEC), but both the ERB and MEWD indicated that ZESCO had not yet achieved cost-based tariffs as per the Cost of Service Study (2007). The ERB's target is "cost reflectivity by 2012"
	Incorporation into the tender documents appropriate environmental mitigations	The procurement process received AfDB's "no objection" and it is therefore concluded that the documents were adequately worded
	Execution of an on-lending agreement	The on-lending agreement was concluded by about December 2001

Condition		Achievement
For Entry into Force	For First Disbursement	Other Conditions
	Submission by ZESCO of an action plan to reduce accounts receivable to 90 days by FY 2001/2	ZESCO reducing its accounts receivable to 90 days by FY 2001/2 (prior to 31 December 2000)
		The supervision summary of November 2001 reported that the action plan for reducing receivables had been submitted. However, in a letter of 14 August 2003, the Bank informs ZESCO that such an action plan had not yet been received and that ZESCO ran the risk of disbursements being suspended. ZESCO declared that in lieu of the receivables action plan, it submitted an action plan to implement a customer information system which would (amongst others) support the company's efforts to reduce receivables. By commissioning (2006), ZESCO had not yet achieved the accounts receivable target and was falling further behind the target. Since the ERB imposing its KPIs (refer section 4.5: Financial Sustainability), the receivables days progressed as follows: 130 days (Q1 2008), 108 days (Q2 2008), 128 days (Q3 2008), 148 days (Q4 2008) and 133 days (Q1 2009)
	Submission of a copy of the debt-swap agreement to settle GRZ's payment arrears to ZESCO	ZESCO reported that there was a GRZ-ZESCO debt-swap agreement, but that the relevant documentation had been archived
	Submission of a copy of the PPSA between ZESCO and NamPower	A PPSA for the 132kV configuration was signed in 1998. There is no evidence that the PPSA was updated for the 220kV/200MW configuration. A PPSA for 50MW was signed and came into effect in January 2010
	Submission of evidence of the establishment of the PIU	The PIU was established
	Submission of a written undertaking by ZESCO to negotiate the terms of compensation with affected persons prior to commencement of civil works	Submission of evidence prior to commencement of civil works that compensation had been paid by the project
		The supervision summary of May 2004 reported that even though the civil works had not yet started, ZESCO had paid compensation to those affected by the project

# Appendix 7: Project Map



ANG – ANGOLA  
BOT – BOTSWANA  
NAM – NAMIBIA  
ZIM – ZIMBABWE

## Appendix 8: ZESCO Performance against ERB KPIS

	Indicator	Type	08 Q1	08 Q2	08 Q3	08 Q4	09 Q1
Customer Metering	Unmetered Customers	Target	116 158	105 598	95 039	84 479	73 919
		Actual	132 270	131 719	132 143	125 905	109 743
	Metering new Connections	Target	5 405	5 430	6 115	6 523	7 444
		Actual	551	674	766	686	1 319
	Connection Time (days)	Target	77	73	68	64	60
		Actual	81	82	82	79	82
Cash Management	Total Receivables	Target	43.07%	40.77%	38.47%	36.17%	33.87%
		Actual	38.11%	55.82%	61.29%	66.18%	
	Trade Receivables	Target	40.30%	38.24%	36.19%	34.14%	32.09%
		Actual	35.73%	29.48%	34.95%	40.56%	
	Debtor Days	Target	146.7	138.8	130.9	123.0	115.0
		Actual	130.4	107.6	127.6	148.0	133.0
Staff Productivity	Customer/Employee	Target	65	68	72	75	77
		Actual	64	67	74	81	82
Quality of Service	Unplanned Outages	Target	48	45	41	37	33
		Actual	48	11	15	43	31
System Losses	Transmission Loss %	Target	3.0	3.0	3.0	3.0	3.0
		Actual	11.7	2.7	-3.6	1.8	4.4
	Distribution Loss %	Target	18.58	18.17	17.75	17.33	16.91
		Actual	33.07	38.01	19.00	18.65	25.70

# Appendix 9: ZESCO Financial Performance

Key financial data 2005/6 – 2008/95 (excluding depreciation of assets, amortisation of grants and exchange rate-related gains/losses)

Ratio	Unit	2005/6	2006/7	2007/8	2008/9	Avg/ann.
Zambia CPI	%	18.3%	9.0%	10.7%	12.4%	
Staff Numbers	Staff	3 814	3 623	3 898	3 880	
<b>Income Statement</b>						
Cash Revenues growth	%		+14%	+7%	+40%	+19%
Cash Expenditure growth	%		+7%	+9%	+10%	+8%
Staff Cost growth	%		-2%	-3%	+25%	+6%
Cash Revenue : Cash Expenditure	%	94%	88%	89%	71%	
Profit before Non-cash Items	K'm	38 534	84 252	83 218	373 200	
Tax recovered/(charged)	K'm	76 812	(62 117)	(48 629)	70 946	
<b>Cashflow Statement</b>						
Cash from Operating Activities	K'm	206 444	123 681	307 728	463 679	
Cash from Ops. Activ. growth	%	-40%	+149%	+51%	+31%	
<b>Investment &amp; Financing</b>						
Capital Expenditure		360 912	350 200	463 935	525 352	
Equity injected					91 265	
Loans Incurred		458 229	135 021	237 654	132 253	
Loans Repaid		348 704	113 936	135 580	180 980	
Net Cash		43 466	(17 652)	(30 861)	91 338	

Extracted from the published Annual Audited Results up to 2008/9.

A comparative analysis between staff productivity at ZESCO with fairly similar, vertically-integrated utilities in Southern Africa

Comparator	Unit	ZESCO	ENE	ESCOM	EDM	TANESCO
		ZAM	ANG	MAL	MOZ	TAN
		2008/9	2006	2007	2007	2008
Total Installed Capacity	MW	1 700	843	300	***2 357	666
Hydro Capacity	MW	1 600	498	283	***1 193	561
Thermal Capacity	MW	100	345	17	1 164	105
Energy Billed	GWh	*7 737	1 841	1 166	1 429	3 365
Number of Connections	Conn.	*297 235	143 937	164 795	415 667	723 873
Employees	Staff	3 880	4 250	**2 262	3 228	5 527
MW/Employee	Ratio	2	5	8	1	8
MWh/Employee	Ratio	1 994	433	515	443	609
Connection/Employee	Ratio	77	34	73	129	131

Note: \* 2007

\*\* 2000

\*\*\* excl. Cahora Bassa

# Appendix 10: Mitigation and Compensation Program and its Implementation

Mitigation of construction, operational and maintenance works and impacts on the bio-physical and socio-economic environment is managed through an Environmental Management Plan. The ESMP was developed by ZESCO six years after the development and approval of the Environmental Project Brief (EPB). The recommendations and conclusions of the EPB were very broad and overarching and did not contain any substantial technical input for the development of an authoritative ESMP. Similarly, certain physical and social conditions could have changed during the six year timeframe to implementation.

The ESMP pertains exclusively to the construction and rehabilitation phase of the project. There is no direct correlation between the EPB and the content and framework of the ESMP, although this is stipulated in the opening paragraphs of the ESMP. The recommendations of the ESMP are technically sound and have substantially more depth than the provisions of the EPB, yet are still relatively generic in nature. The majority of the provisions could be applied on similar projects at different locations.

Aspects such as the grass species type required for rehabilitation should be specific to the project area. The line cuts through three forest reserves. Planning and construction detail is lacking and provisions are generic to any similar vegetation type or habitat. Similarly, the line crosses a section of the Mosi-oa-Tunya National Park and Victoria Falls World Heritage Site. Specific provisions for construction and operational activities within this culturally and bio-physically sensitive area are lacking in the ESMP.

It must be stressed however that the interconnector construction process has the most impact during the project lifecycle, and similarly, the impacts associated with the line are generally not significant. It was observed during the field verification that vegetation under the lines have recovered and require periodic maintenance. Larger trees have been removed as a safety aspect, but nowhere was it observed that vegetation clearing had created any significant problems, such as biodiversity loss or soil erosion.

ZESCO reported that the implementation of the ESMP was monitored and audited during the construction phase by the Environmental and Social Affairs Unit of ZESCO. However documentation of this does not exist. The field verification did not highlight any discrepancies such as clearly evident non-compliance issues.

The ESMP does not cover the operational or maintenance phase of the project. ZESCO reported that environmental monitoring is part of routine maintenance, but this process is similarly not documented.



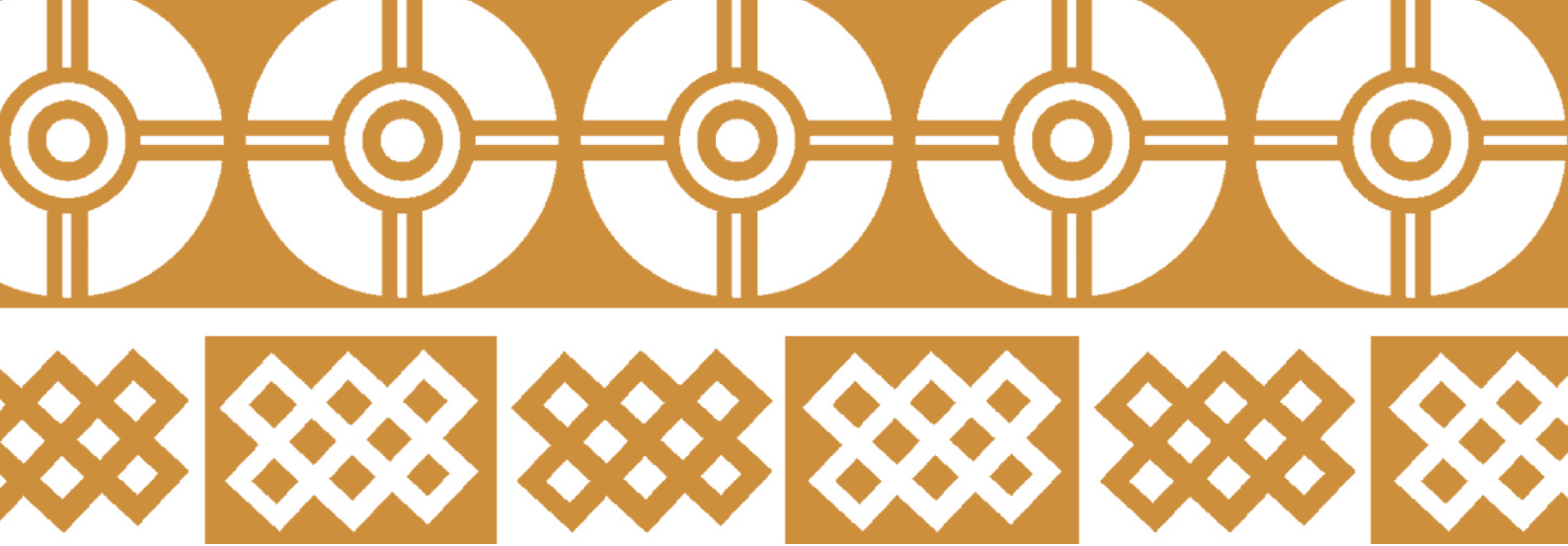




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# Zambia: Victoria Falls – Katima Mulilo 132kV Interconnection Project Project Performance Evaluation Report

**About the AfDB:** The overarching objective of the African Development Bank Group is to spur sustainable economic development and social progress in its regional member countries (RMCs), thus contributing to poverty reduction. The Bank Group achieves this objective by mobilizing and allocating resources for investment in RMCs; and providing policy advice and technical assistance to support development efforts.

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