



Power Transmission Interconnector

Kabwe (Zambia) to
Iringa (Tanzania)

Project
Information
Memorandum

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PREPARED FOR:
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UNDER THE FRAMEWORK OF:
PROGRAMME FOR INFRASTRUCTURE DEVELOPMENT IN AFRICA (PIDA)





Table of Contents

1	Project Description	2
1.1	Context & Objectives	2
1.2	Project Description & Location	3
1.3	Project History, Stage & Cycle	4
1.4	Key Parties	6
	1.4.1 Project Sponsor	6
	1.4.2 Implementation Authority	6
	1.4.3 Executing Agent	6
	1.4.4 Other Key Parties	7
1.5	Delivery & Business Models	7
	1.5.1 Private Sector Opportunities	8
1.6	Revenue Model	8
1.7	Political Support	9
2	Technical Features	10
2.1	Power Capacity	10
2.2	Design Status	10
3	Sector	11
3.1	Scope of Sector in Zambia & Tanzania	11
3.2	Market Size, Demand & Projections	11
4	Project Cost & Funding	13
4.1	Project Costs	13
4.2	Economic Analysis	14
	4.2.1 Funding	16
4.3	Domestic Resource Mobilization Opportunity	17
5	Environmental, Socio-economic Impact and Sustainability Model	19
5.1	Job Creation	19
6	Governance & Risks	21
6.1	Governance Structure	21
6.2	Project Risks	21
7	Milestones & Timelines	24
7.1	Project Preparation Milestones	24
7.2	Implementation Timeline	24
	Bibliography	26
	Interviews	26
	Version Control	26



1. PROJECT DESCRIPTION

1.1 CONTEXT AND OBJECTIVES

The Governments of Zambia, Tanzania and Kenya agreed to interconnect their power systems by constructing a high voltage Alternating Current (AC) transmission line, traversing the three countries¹ covering a total distance of 2,300km². The project will ultimately link the Eastern African Power Pool (EAPP) with the Southern African Power Pool (SAPP). This greater Zambia-Tanzania-Kenya Power Interconnector project will be developed through a 400kV double circuit power transmission line in Kenya and Tanzania while the segment in Zambia will be constructed as two single 330kV circuits. The voltage transformation will be at the proposed Nakonde 400kV / 330kV substation in Zambia located approximately 14km from the Tanzania-Zambia border.

On 14th December 2014, a Tripartite Inter-Governmental Memorandum of Understanding (TIGMOU) was signed by the three countries in which the three countries agreed to develop the project³. It was agreed that each country will develop the segment of the project within its boundaries. The Nile Basin Initiative (NBI) through its investment arm, the Nile Equatorial Lakes Subsidiary Action Program (NELSAP), embarked on the creation of a regional power market amongst its Riparian States in the '90s. NELSAP's near-term objective is the development of regional power infrastructure in its member states. This project has been prepared under the leadership of NELSAP-Coordination Unit, with funding from the Government of Norway and European Union through KfW. The NELSAP Coordination Unit long-term objective is the creation of a regional electricity market that can play a key role in ensuring that the hydropower resources of the Nile Basin are developed and managed in an integrated and sustainable manner with special focus to regional interconnections.

1 through the following route: Kabwe – Pensulo – Kasama – Nakonde – BORDER (Zambia/Tanzania) – Tunduma – Mbeya – Iringa – Singinda – Arusha – Namanga BORDER (Tanzania/Kenya) – Isinya.

2 The Project presented in this PIM represents 1,322km of this greater ZTK project length.

3 The 2014 TIGMOU superseded the TIGMOU signed in September 2003.



1.2 PROJECT DESCRIPTION & LOCATION

The Project comprises a power transmission interconnector between Kabwe in Zambia and Iringa in Tanzania, including 1,322 km of new transmission lines, of which 414 km will be in Tanzania and 908 km in Zambia, as well as the development of nine substations, being four new substations and five substation modifications. The main elements of the Project are illustrated in Figure 1 and quantified in Table 1. The Project will complete the larger ZTK Interconnection Project noted above, and the main objectives of the project are to:

- Enhance electricity trade and improve security of electricity supply;
- Foster socio-economic development and promote regional integration;
- Create an information and communications technology (ICT) connection by including the Optical Fibre Ground Wire (OPGW) on the transmission lines;
- Create a transmission backbone to support rural electrification; and
- Stimulate investment in generation in the two sub-regions of the EAPP and SAPP arising from the larger market of the interconnected systems.

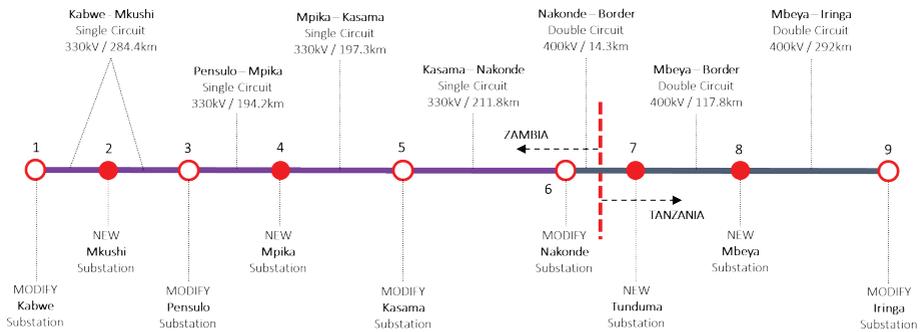


Figure 1: Main elements of the power transmission interconnector.

This PIM only includes the costing and economic analysis for the power transmission line sections costed and analysed in the Final Feasibility Study and Conceptual Design by AECOM (dated 5th October 2017), and termed in this PIM the “Feasibility Study”. Therefore, costing for the following sections has been omitted: Pensulo – Kabwe (284.4km), Kasama-



Table 1: Main component measurements for the power transmission interconnector

TRANSMISSION LINES	COUNTRY	DISTANCE (KM)	NEW SUBSTATION	MODIFY SUBSTATION
Iringa-Mbeya	Tanzania	292.0	-	IRINGA
Mbeya-Tunduma	Tanzania	117.8	MBEYA	-
Tunduma-Zambian Border	Tanzania	4.4	TUNDUMA	-
Sub-Total TANZANIA	Tanzania	414.2	2	1
Zambian Border-Nakonde	Zambia	14.3	-	-
Nakonde-Kasama	Zambia	211.8	-	NAKONDE
Kasama-Mpika	Zambia	6.0	-	-
Kasama-Mpika	Zambia	197.3	-	KASAMA
Mpika-Pensulo	Zambia	194.2	MPIKA	-
Pensulo-Mkushi	Zambia	284.4	-	PENSULO
Mkushi-Kabwe	Zambia		MKUSHI ⁴	KABWE
Sub-Total ZAMBIA	Zambia	908.0	2	4
GRAND TOTAL	Zambia-Tanzania	1,322.2	4	5

Mpika (old line modification, only 6km), Zambian Border-Nakonde (14.3km) and Mbeya-Iringa (292km)⁵, as well as costing for Kabwe, Mkushi and Iringa substations.

1.3 PROJECT HISTORY, STAGE & CYCLE

The interconnector was originally conceived by Zambia and Tanzania in the 1960s; as a bilateral project. Kenya joined forces with Zambia and Tanzania in 2001; leading to the signing of memoranda of understanding in 2003 and 2014. The Project’s key milestones are illustrated in chronological order in Figure 2 below, which culminated in the completion of a Feasibility Study.

⁴ The Mkushi substation in Zambia is not essential for the Project, but was requested by ZESCO.

⁵ The Mbeya – Iringa section was costed in a 2012 Feasibility Study by AECOM-SOGREAH (23rd November 2012), which is noted in the project costing subsection of this PIM, but is not included in the economic analyses that are presented.

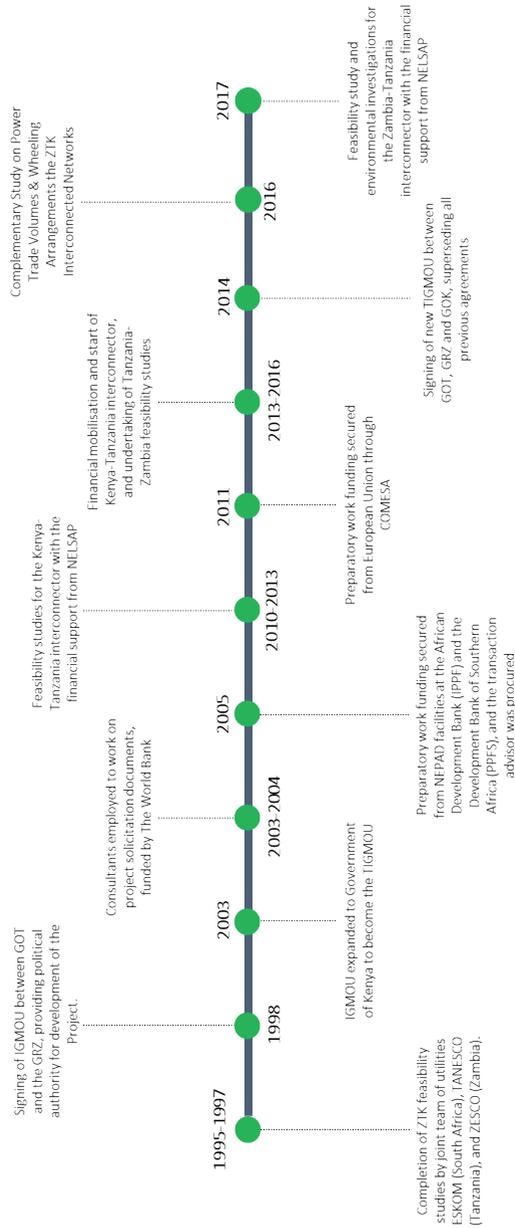


Figure 2: Key Project milestones.



According to PIDA's Priority Action Plan (PAP), the Project's status is '**S3A – Feasibility Study Completed / Project Structuring**'. It is the intention of the governments to achieve financial close for the Project by end-2018. To this end, market soundings with potential lenders have commenced with the view to facilitate increased appetite, the short listing of potential lenders and obtaining indicative term sheets for funding.

1.4 KEY PARTIES

1.4.1 PROJECT SPONSOR

The Project Sponsors are the Governments of Zambia (GOZ) and Tanzania (GOT). The Government of Zambia, acting through the Office for Promoting Private Power Investment (OPPPI), in the Ministry of Energy has been given the responsibility by the Government of Kenya and the Government of Tanzania to undertake the coordination of this Project.

1.4.2 IMPLEMENTATION AUTHORITY

The two principal stakeholders are the two respective power utilities as noted below:



ZESCO, Zambia's state-owned power utility, will be responsible for the implementation of the 400kV double circuit transmission line from Nakonde to the Tanzanian border, and the 300kV single-circuit line from Kabwe to Pensulo, and up to Nakonde, as well as 2 new substation and 4 substation modifications.



TANESCO, Tanzania's state-owned power utility, will be implementing the 400kV double-circuit transmission line in Tanzania from the Zambian Border to Mbeya and on to Iringa as well as two new substations at Tunduma and Mbeya, and a substation modification at Iringa.

1.4.3 EXECUTING AGENT

OPPPI has been acting as the Executing Agent, as mandated by the Governments of Kenya, Zambia and Tanzania, and will play a critical role in implementing the Project, whereby



they will be responsible to setup and manage a Joint Project Implementation Unit (JPIU) to provide for close coordination of all works in both countries to ensure simultaneous commissioning. The structure of the JPIU is illustrated in Figure 3.

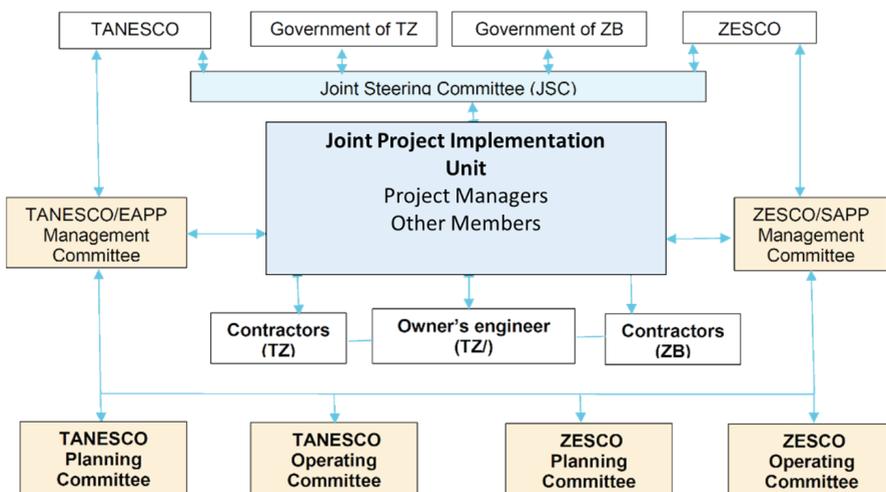


Figure 3: Structure of proposed Joint Project Implementation Unit.

1.4.4 OTHER KEY PARTIES

The Project spans three RECs (Regional Economic Communities), namely COMESA (Common Market for Eastern and Southern Africa), EAC (East African Community), and SADC (Southern African Development Community), and enjoys the support of each of these representative committees.

1.5 DELIVERY & BUSINESS MODELS

A decision was taken by Tanzania and Zambia that TANESCO and ZESCO will procure and fund the sections of the interconnector that lie in their respective countries, which includes both the transmission lines and substations. This financial sharing structure is based on Public Financing, which was used on most of the NELSAP's interconnector projects because the public sector typically has the capacity to raise funds at a rate that is lower than the one available on the market to the private sector. The model assumes that TANESCO and



ZESCO will each procure Engineering Procurement Construction (EPC) Contractors for the sections within their geographical boundaries and it is expected that the contracts will be awarded on International Competitive Basis (ICB). It is envisaged that TANESCO and ZESCO will be responsible for the payment of the design and construction costs of their respective EPC contracts on a progress payments basis.

1.5.1 PRIVATE SECTOR OPPORTUNITIES

Under the Public Financing model, the primary opportunity to the private sector relates to the physical implementation of the Project as TANESCO and ZANESCO will contract with private sector EPC Contractors to construct the Project. The utilities may elect to procure a single EPC Contractor to minimize implementation delays and synchronise integration of the interconnector⁶. The EPC Contractors will also assume the construction, installation, integration and performance risks, as they are responsible for both the design and construction/installation of the Project. Another private sector opportunity is to lease the excess optical fibres (“dark fibres”) to the private sector. Whilst some fibres are needed for the normal operation of the transmission line (for transmitting measures, status, commands and protection signals), unused fibres could be leased to telecommunication companies. The completion of the ZTK Interconnector will allow Zambian telecommunication companies to link into the East African submarine cable which will increase the capacity and the reliability of Zambia’s telecommunication network.

1.6 REVENUE MODEL

Once commissioned, TANESCO and ZESCO intend to enter into Power Purchase Agreements (PPAs) and Wheeling Agreements with various regional players in the Eastern Africa Power Pool (EAPP) and SAPP. The PPAs will be signed bi-directionally between: (1) ZESCO and TANESCO, and (2) ZESCO/TANESCO and utilities in the SAPP and EAPP as illustrated in Figure 4 and will be USD denominated. According to the 2017 Feasibility Study, the wheeling tariff will be USD denominated and will be set at a level that will allow ZESCO and TANESCO to cover the cost of the Project’s operation⁷ whilst being attractive to other utilities in the region.

⁶ Neither utility has indicated whether they will procure a single EPC contractor jointly, or procure multiple contractors.

⁷ Wheeling charges modelled only appear to cover operational costs.

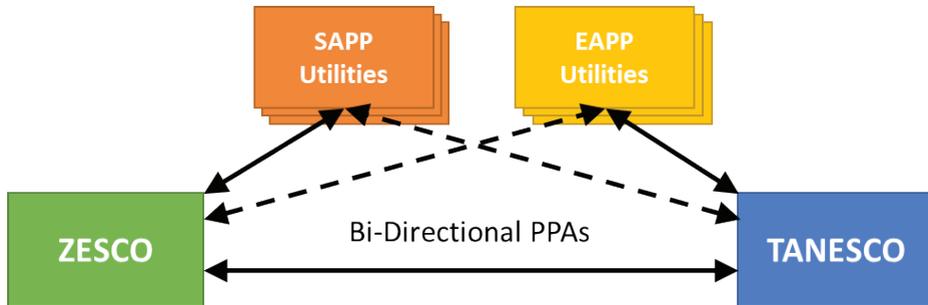


Figure 4: Bi-directional PPAs enabled by implementing the Project.

1.7 POLITICAL SUPPORT

Political support for the Project is evidenced by the initial Tripartite Inter-Governmental Memorandum of Understanding (TIGMOU) that was signed in 2003 as well as the new TIGMOU that was signed in 2014. Whilst the assets within each country will be owned and financed by that respective country and the operation and maintenance will also be the responsibility of the respective countries, the three key benefits are likely to arise which will be shared, including:

- Wheeling and/or capacity charges, and revenue generated from leasing of “dark fibres”;
- Power reserve sharing; and
- Increased rural electrification and poverty reduction.



2. TECHNICAL FEATURES

2.1 POWER CAPACITY

The maximum power transfer from Tanzania to Zambia is limited by the smaller, single-circuit 330kV lines at an instantaneous power demand of 530MW⁸. According to the Feasibility Study, the interconnector will enable an estimated maximum power transfer from Tanzania to Zambia of 530MW and a maximum power transfer from Zambia to Tanzania of 386MW⁹, in 2020. Furthermore, it is estimated that in 2025 the maximum power transfer from Tanzania to Zambia will be 530MW (the transmission limit) and a maximum power transfer from Zambia to Tanzania will be 458MW.

2.2 DESIGN STATUS

A Conceptual Design¹⁰ was completed by AECOM in October 2017 to a Class 3 level as determined by the Association for the Advancement of Cost Engineering (ACE). Furthermore, dynamic stability studies were carried out on interconnected EAPP and SAPP network systems for the study years of 2020 and 2025, starting with year 2025, to better understand the impact of implementing the proposed interconnector on the two power pools. Year 2025 revealed better dynamic performance than year 2020 since some new generation facilities will have been commissioned that will facilitate further power system tuning. Importantly, the Feasibility Study highlights the need for extensive and comprehensive power system studies to properly tune all existing power systems.

8 Power transfer of 530MW is close to the thermal limit of the existing 330kV transmission line, which is 575MVA at 65° C

9 The modelled maximum power transfer from Zambia to Tanzania of 386MW was not limited by the interconnection itself but by the generation available in Zambia in 2020.

10 In terms of critical line routes, line descriptions are based on geographical maps at a 1:50 000 and 1:250 000 scale, along with recent high-resolution satellite images at a 50-cm resolution.



3. SECTOR

3.1 SCOPE OF SECTOR IN ZAMBIA & TANZANIA

The countries of the region are grouped in two super power pools that cover geographically almost two thirds of Africa. However only a subset of these two pools is presently or in the process of being synchronously interconnected. Tanzania's Power System Master Plan (PSMP 2012) and Zambia's Power System Master Plan (PSDMP 2010) were used to evaluate the gap between the Project's demand requirements and the countries' expected demand, in the 2017 Feasibility Study.

3.2 MARKET SIZE, DEMAND & PROJECTIONS

The interconnected EAPP and SAPP network was analysed at peak load condition for 2020 and 2025 in the 2017 Feasibility Study. The analysis was required to define the short-term operating performance of the EAPP and SAPP interconnected network systems and to define any out-of-limits conditions for the existing and the planned interconnected EAPP and SAPP power systems.



Zambia's installed power generation capacity is 2,396MW consisting of 94% hydro, 3% thermal power and 2% HFO, with IPPs currently contributing only 9% to total power generation. Electricity demand currently stands at 1,987MW. Zambia's population was projected to grow from 12.2 million in 2007 to 33.6 million in 2040 at an annual rate of 3.1%. The country's GDP is forecast to grow at 6.5% over that same period. Electrification rate for new customers is forecast to average 4.1% annually between 2010 and 2040, resulting in total annual sales growth of 3.1%.



Tanzania's population has been projected to grow from 43 million in 2010 to 87 million in 2035 (i.e. at 2.7% per annum) and the country's GDP is forecast to grow at 6.5% over the same period, which is equal to Zambia's projected GDP growth rate. Total electricity sales are forecast to grow at a rate of 8.6% per annum between 2010 and 2040. Tanzania's installed power generation capacity is 1,385MW consisting of 52% Hydro, 42% Natural Gas and 6% diesel power plants. The country's maximum demand is 935MW which is being met by TANESCO, and four IPPs. Tanzania's current electricity access rate is only 12%, but electricity consumption is increasing rapidly due to increasing industrialisation, growing population and improved distribution.



4. PROJECT COST & FUNDING

4.1 PROJECT COSTS

The Feasibility Study states a total capital cost of US\$ 314.8 million in October 2017 terms, for the sections that amount to 725.7km of transmission lines, of which US\$ 172.6 million (55%) will be borne by ZESCO and US\$ 142.2 million (45%) by TANESCO (see Table 2). However, as noted in the Project description, there are an additional 597km of power transmission lines and the development of three substations that also require funding, but were not a part of the Feasibility Study. The additional sections lie between Kabwe and Pensulo in Zambia, Nakonde and the border, and Mbeya to Iringa, and the three substations that are not costed are at Kabwe, Mkushi and Iringa.

Table 2: Capital cost breakdown for the Project

ITEMS	TOTAL (USD'000)	TANZANIA (USD'000)	ZAMBIA (USD'000)
LINES	167 593 000	52 442 000	115 151 000
SUBSTATIONS	118 081 000	71 796 000	46 285 000
SUB-TOTAL	285 674 000	124 238 000	161 436 000
ENVIRONMENTAL AND SOCIAL COSTS	29 124 000	17 952 000	11 172 000
TOTAL (FEASIBILITY STUDY)	314 798 000	142 190 000	172 608 000
MBEYA – IRINGA (2012 TERMS) ¹¹	110 000 000	110 000 000	-
GRAND TOTAL ¹²	424 798 000	152 190 000	-

The capital costs include engineering¹³, procurement, installation, site supervision and management costs as well as a 12% contingency, but excludes financing costs, duties and taxes.

¹¹ The Mbeya – Iringa section was costed in a 2012 Feasibility Study by AECOM-SOGREAH (23rd November 2012).

¹² This total is inclusive of the Mbeya – Iringa section, but excludes the Kabwe – Pensulo and Nakonde – BORDER sections.

¹³ It is assumed that the governments will secure EPC contracts, meaning the responsibility of detailed design lies with the EPC contractor(s).



4.2 ECONOMIC ANALYSIS

A cost benefit analysis was performed as part of the Feasibility Study that calculated the net present value (NPV) and real internal rate of return (IRR) of the net costs and benefits of the Project under two scenarios. As noted above, this economic analysis excludes costs and benefits for the sections of Pensulo – Kabwe (284.4 km), Kasama-Mpika (old line modification, only 6km), Zambian Border-Nakonde (14.3 km) and Mbeya-Iringa (292 km), as well as costing for Kabwe, Mkushi and Iringa substations. Costs and benefits were forecast for a 25-year operational period and a 3-year construction period. The total forecast real benefits and costs are summarized below for Scenario 1 together with their discounted equivalent values. The surpluses and deficits forecast by Zambia’s PSDMP 2010 (Base Load) forms the basis of scenario 1, whilst scenario 2 used surpluses and deficits developed by AECOM under a delayed power plants scenario. The outputs of the financial analysis are presented in Table 3.

The annual real costs and benefits forecast under scenario 1 are illustrated in Figure 5 and it is estimated that pay back can be achieved as early as 2023 when cumulative benefits will exceed cumulative costs. Wheeling benefits or charges have been assumed in the forecasting to cover almost 99% of operational costs and that the import and export benefits will fund the capital expenditure of the Project.

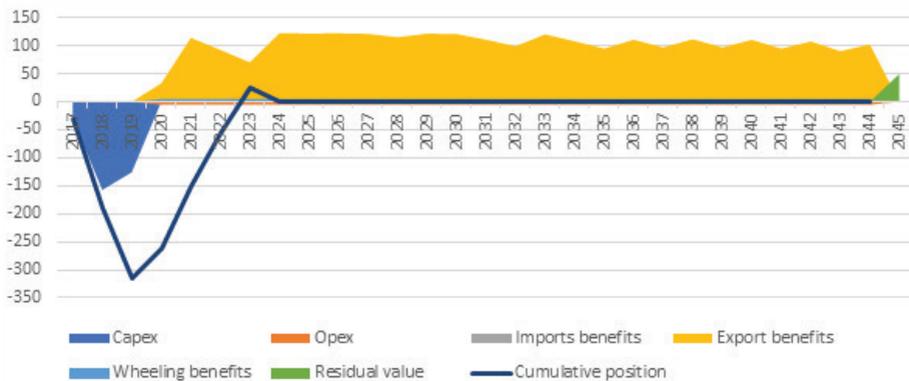


Figure 5: The annual real costs and benefits forecast under scenario 1.



Table 3: Financial analysis outputs.

US\$ MILLION	REAL TOTALS	DISCOUNTED REAL TOTALS (@10%)	ASSUMPTION USED IN 2017 FEASIBILITY STUDY
Import Benefits	168.9	41.4	Zambia's forecast deficits were monetized by importing combined cycle generated electricity from Tanzania that replaces emergency generation in Zambia estimated at 0,20 USD/kWh.
Export Benefits	2,608.9	720.9	Zambia's forecast surpluses were monetized by assuming that excess KWh will be exported to Tanzania, replacing combined cycle generation estimated at 0,051 USD/kWh ¹⁴ .
Wheeling Benefits	125.0	35.8	\$50/KWh/year or \$5.0 million per annum over 25 years.
Total Benefits	2,902.8	798.1	-
Capex	(314.8)	(265.7)	Total construction costs and associated social costs
Opex	(142.8)	(40.9)	\$5.71 million per annum over 25 years.
Residual Value	250.3	18.3	Balancing figure
Net Benefit (Scenario 1)	2,695.4	509.8	NPV of \$510m was calculated using a real discount rate of 10%
Real IRR (Scenario 1)	25.9%		

The Feasibility Study also quantified IRRs and NPVs at a country level by allocating costs and benefits to Tanzania and Zambia. These metrics are summarized in Table 4 together with the outputs from four scenarios, namely:

- A 30% increase in capital expenditure (capex);
- A 10% decrease in capex;

¹⁴ The variable cost of hydro power is estimated to be zero.



- An additional benefit scenario that includes dark fibre lease revenues at \$50 per month per kilometre; and
- An additional benefit scenario that includes dark fibre lease revenues at \$100 per month per kilometre.

Table 4: Sensitivity analysis outputs for financial metrics.

MODELING SCENARIO		TOTAL		TANZANIA		ZAMBIA	
		NPV	IRR	NPV	IRR	NPV	IRR
Scenario 1	Zambia PSDMP 2010	509.8	25.9%	256.5	27.5%	253.3	24.6%
Scenario 2	AECOM	619.0	31.1%	311.1	33.2%	307.9	29.3%
Capex (%)	+30%	429.8	21.1%	221.7	22.6%	208.1	19.9%
Sensitivities	-10%	536.5	28.0%	268.1	29.6%	29.6%	26.7%
Additional Benefit Sensitivities - Dark Fiber¹⁵ (\$/Mth/Km)	50 \$	611.6	28.0%	273.6	28.2%	337.9	27.8%
	100 \$	713.3	29.9%	290.8	29.0%	422.5	30.7%

The Project’s IRRs do not appear to be very sensitive to increases in capital expenditure as illustrate by the fact that the Project’s IRR reduces by only 4.8% to 21.1% from 25.9% under a 30% overspend scenario. This is due to the significant benefits modelled (\$2.6 billion over 25 years) compared to the Project’s capital expenditure of only \$314 million. Attracting ICT companies to lease excess capacity from the Project can further improve the IRRs and NPVs of the Project as illustrated by the additional benefit scenarios.

4.2.1 FUNDING

Under the proposed structure, Zambia and Tanzania intend to raise long term concessionary loans and grants from multilateral financing institutions in the first instance which will be supplemented by commercial loans if a funding gap exists. These loans will be passed onto the two utilities, TANESCO and ZESCO, by their respective Governments. Both Zambia and Tanzania have committed to provide the necessary guarantees and counterpart funding.

¹⁵ The completion of the ZTK Interconnector will allow the linking of Zambia through Tanzania to East African submarine cables.



4.3 DOMESTIC RESOURCE MOBILIZATION OPPORTUNITY

An opportunity may exist to finance the Project via project bonds once the Project has been commissioned and to use concessionary loans only during the construction period and commissioning phase. This would allow concessionary lenders to recycle their loans earlier, i.e. after 4 years when the Project is commissioned, instead of 20 or 25 years. Project bonds may also offer an opportunity to raise funding in local currencies that are also inflation linked which may be attractive to Zambian and Tanzanian institutional investors.

Transmission lines are well-understood by international institutional investors and are deemed to be relatively low-risk assets provided that availability payments are structured to maximise the credit quality of the bonds. While most project bond issuances come from North America and Europe, several project bonds have been issued to finance transmission lines in South America. Approximately US\$1.1 billion of investment grade project bonds have been issued in Brazil, Chile and Peru based on public concession frameworks and availability payments mechanisms. Some of these bonds were issued in local currency and successfully marketed to the local institutional investors.

A study undertaken by Fieldstone in 2012 concluded that the Project would not be affordable to Zambia and Tanzania if it were procured using a PPP model where the private sector developed the project through a build – operate – transfer model which led to the decision to procure the Project using a Public Financing model.

To structure an investment grade project bond, a special purpose vehicle (SPV) is used to ringfence cashflows and to pass construction, operation and maintenance risk to credible private sector parties. This is normally done as part of a PPP arrangement where the private sector structures the SPV and a PPP agreement provides cashflow certainty. However, such an SPV could potentially be established by the public sector (i.e. TANESCO and ZESCO) to allow the Project to issue project bonds. Under this scenario, TANESCO and ZESCO would need to contract with the SPV to commit availability payments over a period that is greater than the bonds' tenor. Investors in the bond are also likely to require government guarantees to further enhance the credit quality of the bond(s).

Such a utility led project bond issue will require significant investment in transaction advisory fees to structure an SPV that will be able to issue bonds successfully to the market. It may also require a more integrated approach in terms of contracting EPC contractors and O&M



contractors to mitigate investors' risks than is currently envisaged. A legal structure would also need to be developed that sets out the rights and obligations of the different utilities and may need to be done under a neutral legal system, such as English law.

A structuring modelling exercise would be required to quantify the availability payments that ZANESCO and TANESCO would need to pay the SPV(s) under different bond term scenarios. This modelling exercise would also need to investigate different currency scenarios to conclude on the optimal split between local currency and USD bonds.

11 Source: 375 GEN R SP 001 C – Vol IV – Res. Operation & En. Prod. Studies Report, March 2016.



5. ENVIRONMENTAL, SOCIO-ECONOMIC IMPACT AND SUSTAINABILITY MODEL

An environmental & social impact assessment plan and a resettlement action plan were finalised by WSP in 2017, which identifies key environmental and social impacts and their corresponding mitigation measures during the preconstruction, construction and operation phases.

In Zambia, the project routing is generally in areas that are sparsely populated, with few sensitive sites and mostly accessible with formal roads. Most of the impacts have been assessed as either of low significance or insignificant in magnitude. Impacts are also identified as being both positive and negative, and the only impact of potentially high significance is the positive effect of increased power supply within the communities that will be fed by the line. Similarly, in Tanzania, the negative impacts of the planned project are relatively modest. This is attributed to the fact that most of the line will run through low-density populated woodland with only scattered cultivation. There are game and forest reserves in the area but efforts have been made in the route selection to avoid crossing these reserves. Some minor negative impacts are envisaged for existing land use and resettling of households, and for wildlife and nature conservation in the areas where the line crosses or runs close to protected areas. The creation of a significant number of jobs in the construction phase and some jobs on a permanent basis for line maintenance will be positive for the local communities.

In both Zambia and Tanzania, significant positive social impacts will arise from increased employment both during construction and more sustainably during line operation and maintenance. The local communities in close proximity to the line and associated substations are likely to benefit from these employment opportunities.

5.1 JOB CREATION

It is expected that some jobs will be available during construction of the transmission line for the local population, mainly as casual workers. However, these employment opportunities are expected to be temporary and benefit the community in the short-term only. This would result in a minimal positive impact on employment, since few local people are likely to be



employed. Also, a survey conducted shows the distribution of artisanal skills across the villages crossed by the wayleave for the power transmission lines. The composition shows mechanics (78.9%), welders (52.6%), heavy machinery operators (36.8%) and experienced pylon assembler (15.8%), workers that could be employed during the Project. To maximize the project's positive impacts on the creation of jobs, the following mitigation measures will be implemented:

- Apply human resources policies favouring local labour;
- Implement training programs to build local capacity; and
- Disclose information on newly created business opportunities.



6. GOVERNANCE & RISKS

6.1 GOVERNANCE STRUCTURE

According to the 2017 Feasibility Study, the EPC Contractor(s) will be responsible to both state-owned utilities for the entire Project, however, the legal mechanism to achieve this is not explained. In terms of the project implementation phase, the 2017 Feasibility Study made the following recommendations:

- An Executing Agency and a Joint Project Implementation Unit should be established to fulfil the mandate of the Executing Agency;
- Both utilities shall be responsible for coordinating the development and operation of the interconnected power system facilities in order to obtain optimum reliability of service and efficiency upon their respective Power Pool and upon the interconnection facilities; and
- A Joint Operation Committee should be established well before the commission date to establish the operating procedures necessary for the optimal and safe operation of the interconnection. This committee should be permanent and meet regularly.

6.2 PROJECT RISKS

The major risks facing the Project were identified, analysed and categorised, according to the severity and likelihood of their impact in the 2017 Feasibility Study. The risk categorisation matrix (illustrated in Table 5) ranks risks from ‘low’ up to ‘critical’, depending on the magnitude of the consequence on the project and beneficiaries.

Table 5: Risk assessment matrix.

	1: Minor	2: Moderate	3: Serious	4: Very Serious
A: Likely	LOW	MEDIUM	HIGH	CRITICAL
B: Possible	LOW	MEDIUM	HIGH	CRITICAL
C: Unlikely	LOW	LOW	MEDIUM	HIGH

The initial status quo analysis (“A”) grouped risks into 5 sub-categories, namely (1) Project Preparation, (2) Construction, (3) Operation, (4) Financial, and (5) Operational Safety, Health, Environmental and Quality (OSHEQ). Thereafter, specific mitigation measures were determined, and applied, in theory, to each of the identified risks, and the risks were re-assessed using the same risk categorisation matrix to give a mitigated measure of risk (“B”). The figure below shows the number and rating of risks analysed for each of the 5 sub-categories, both for the Status Quo (“A”) and post-mitigation measures (“B”). Importantly, the graph illustrates that after the application of appropriate mitigation measures there are no ‘critical’ risks remaining and that the number of risks with a ‘high’ rating reduces from 55 to 18.

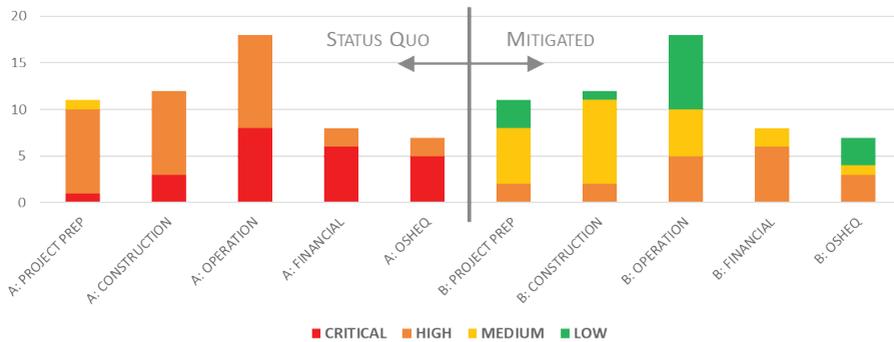


Figure 6: Categorisation of risks and subsequent mitigation potential for risks.

In order to mitigate the risks, as illustrated above, TANESCO and ZESCO have agreed to adopt a risk management policy which will:

- Set up appropriate organizational structures for the implementation and operation of the project (PIUs and Joint Planning and Coordination Committee), preferably at the very start of the project and before securing the financing for the project.
- Agree on a harmonized grid code and on the rules and procedures for the operation of the interconnection, preferably following the recommendations of the EAPP/EAC Interconnection Code.
- Apply sound project management practice during project preparation and construction phase to maintain the project within the budget and schedule, and to ensure the quality of the equipment and of construction and erection work.



- Implement a comprehensive risk management program to continuously monitor and address all categories of risk.
- Use risk allocation and risk sharing between the major stakeholders (governments, contractors, utilities, financing agencies).

Furthermore, TANESCO and ZESCO will put in place an insurance programme to protect the Project's assets in both countries against both commercial and non-commercial risks. The most prominent commercial risk is the unavailability of power production, as a result of:

- Low hydraulicity for hydro plants;
- Fuel shortages for thermal plants; and
- Production equipment outages.



7. TIMELINES & MILESTONES

7.1 PROJECT PREPARATION MILESTONES

The diagram in Figure 7 illustrates the project preparation milestones and target dates under a public finance model to achieve financial close.



Figure 7: Project preparation milestones.

7.2 IMPLEMENTATION TIMELINE

Figure 8 presents a consolidated timeline for the Project, showing a preliminary agreements and procurement period of 12 months and a construction period of 26 months. This timeline assumes that a public funding model will be put in place but does not appear to make allowance for the development of detailed designs.

In the event that the project owners decide to investigate a project bond funding model, a structuring exercise would need to be undertaken which would need to include:

- A detailed financial model that forecasts the actual cashflows of the Project rather than benefits and that solves for the availability payments that ZESCO and TANESCO will need to commit to the Project;
- Market soundings with institutional investors in Zambia, Tanzania and the broader region to understand investors' requirements in respect of bond tenors, coupons, CPI adjustment mechanisms and credit enhancements;



- A legal assessment of the contracts required given that the Project will span 2 legal jurisdictions; and
- Market soundings with development finance institutions to understand their appetite and requirements for providing funding during the construction period.

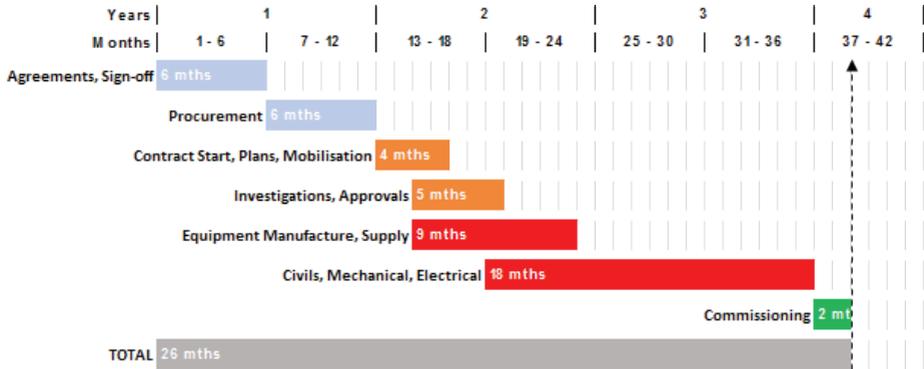


Figure 8: Proposed Project implementation timeline.



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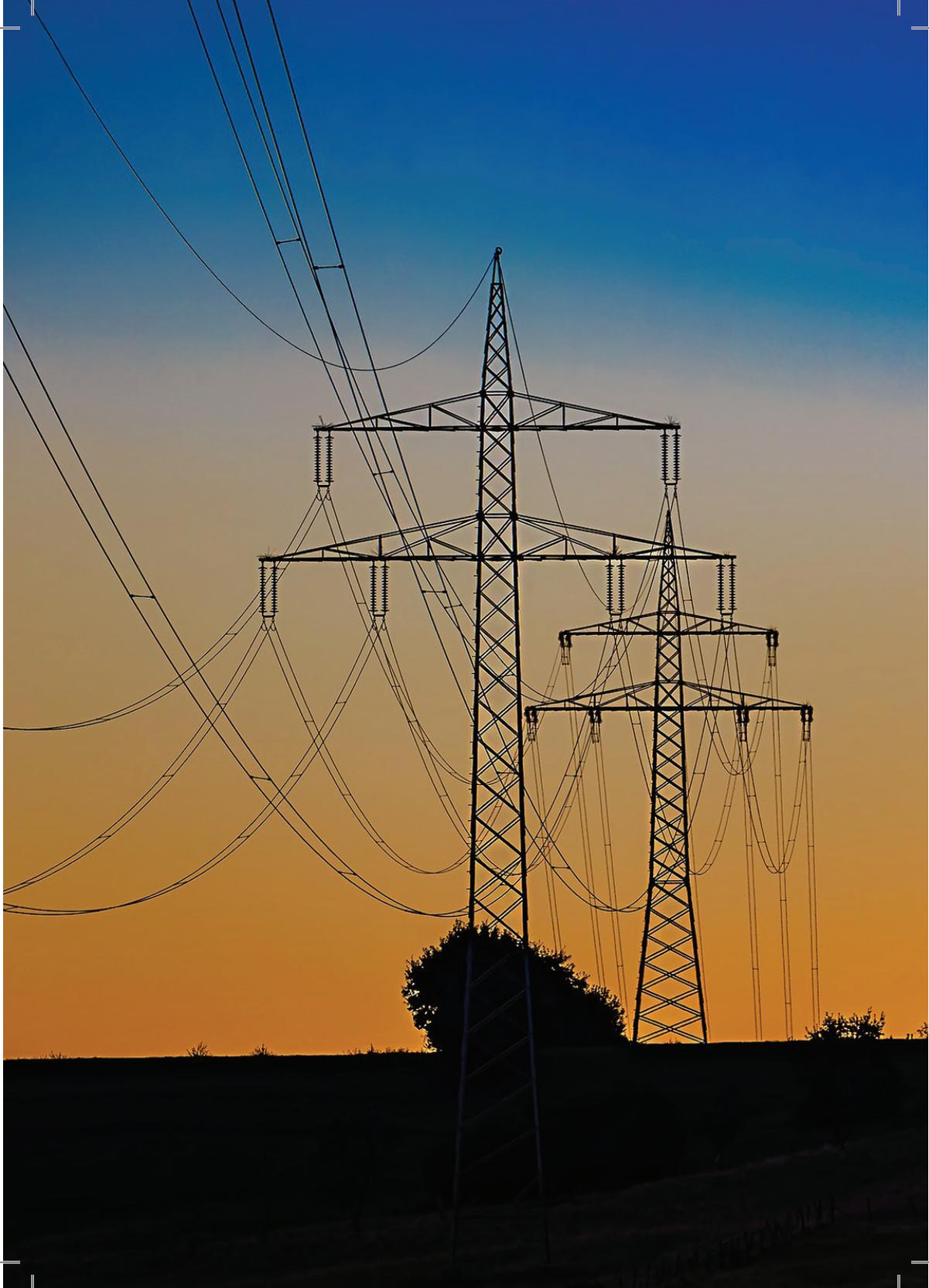
INTERVIEWS

Mr Clement Sasa, Financial Director, Office for Promoting Private Power Investment (OPPPI), Zambia.
 Interview conducted on Friday 13th October 2017.

VERSION CONTROL

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