Terms of Reference (TOR)

Batoka Gorge Hydro Electric Scheme (BGHES)
Power Market Study

19 January 2026

Contents

1. Project Background

The Zambezi River Authority ("ZRA" or the "**Client**") is a bilateral organization owned by the Governments of the Republic of Zambia and Republic of Zimbabwe, (collectively referred to as the "**Governments**" or "**Contracting States**"), and mandated to *obtain, for the economic industrial and social development of the two countries, the greatest possible benefit from the natural advantages offered by the waters for the Zambezi River and to improve and intensify the utilisation of the waters for the production of energy and for any other purpose beneficial to the two countries*. The proposed Batoka Gorge Hydro-Electric Scheme (BGHES) ("the **Project**") is a significant hydroelectric power generation initiative situated on the Zambezi River, shared between Zambia and Zimbabwe. The Project is located approximately 47km downstream of Victoria Falls at the coordinates - latitude: 17° 55' 38.55" S and longitude: 26° 6' 28.38" E.

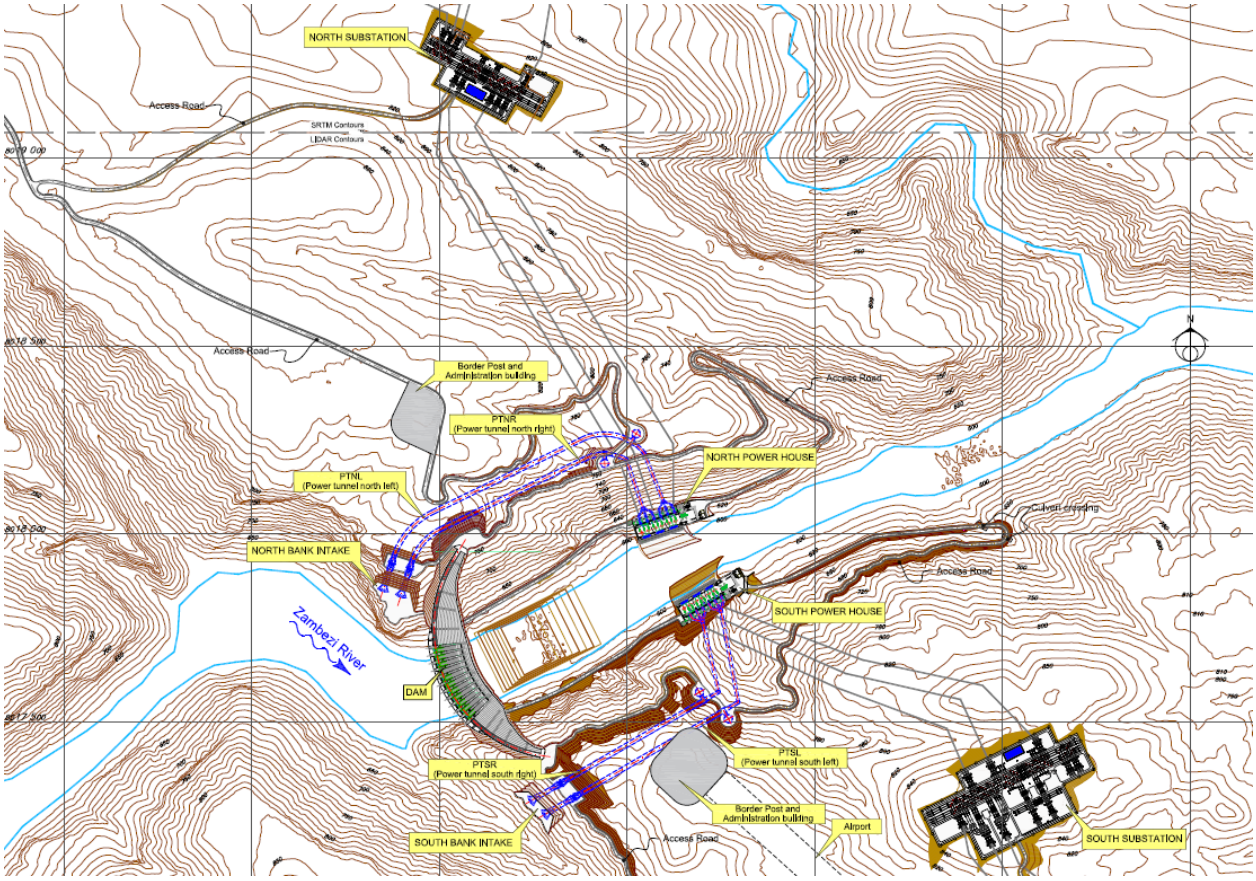

Figure 1: Batoka Gorge Hydro-Electric Scheme General Layout

The Project aims at harnessing the hydroelectric potential of the Zambezi River, to address the energy needs of the Contracting States and to explore potential exports to the rest of the Southern African Power Pool (SAPP), and the Eastern African Power Pool (EAPP) electricity markets. The proposed Project consists of a Dam, two surface power houses (one each on the Zambian and Zimbabwean bank respectively), associated infrastructure, two switching stations (one on the Zambian and Zimbabwean bank respectively), and associated transmission lines. The associated transmission lines will

connect the Batoka hydro power plant(s) to the Zambian and Zimbabwe national transmission grids. The Project is expected to include the establishment of two staff townships; one situated on the north bank (Zambia) and the other on the south bank (Zimbabwe) of the Zambezi River. The townships will be complete with social amenities such as health facilities, schools etc.

2.Objectives of the study

A number of studies have been conducted on the Project, however ZRA wishes to evaluate the viability of the Project from a market perspective considering the latest domestic and regional demand, supply and network developments and whose end product should be a Power Market Study (the "Assignment"), hence the need for a consultant ('the **Consultant**") to undertake this Assignment. The primary objective of the Power Market Study is to evaluate the Project's potential contribution to Zambia, Zimbabwe, and the regional electricity markets, specifically the Southern African Power Pool (SAPP) and the Eastern Africa Power Pool (EAPP). The study will among other aspects focus on balancing projected electricity demand with competitive generation and transmission pricing models.

3.Scope of work

The scope of work for the market study is expected to comprise the following key elements:

i. Confirm and review the demand forecast for Zambia, Zimbabwe (both energy and power) up to 2055;
ii. Confirm and review demand for electricity within the SAPP and EAPP electricity markets up to 2055;
iii. Assessment of generation capabilities of Zambia, Zimbabwe, and future expansion plans up to 2055;
iv. Assessment of existing transmission infrastructure, identifying grid constraints, and necessary upgrades in Zambia and Zimbabwe;
v. Regional Power Market Analysis focusing on identification of market opportunities for export to the regional market (SAPP DAM, long term Bilateral), for example within the SAPP and EAPP in view of the anticipated completion of cross-border and national energy projects such as the 789MW Luapula Hydropower Plant project (DRC-Zambia), the 872MW Baynes Hydropower Plant project (Angola-Namibia), the 1500MW Mphanda Nkuwa Hydropower Plant project (Mozambique), the ZIZABONA interconnector, Zambia-Tanzania-Kenya (ZTK) interconnector, Malawi-Zambia Interconnector, the Angola-Namibia interconnector, the Baynes Hydropower Plant Transmission Lines (Angola-Namibia), Inga-Soyo Interconnector (DRC-Angola), Mozambique-Zambia Interconnector, Angola-Zambia Interconnector, Kalumbila-Kolwezi and

Kolwezi-Solwezi (DRC-Zambia) Interconnectors, and other energy infrastructure projects;

vi. Forecast annual power despatch profiles from BGHES, considering water allocation to other stakeholders in the Zambezi basin, including the downstream power stations;

vii. Identification of relevant commercial structures, including off-taker and wheeling agreements indicative offtake profiles, and cost reflective transmission tariffs; and

viii. Net economic and financial costs and benefits to the project countries Zambia, and Zimbabwe, project utilities ZESCO and ZESA/ZETDC, and to the region (Southern and Eastern Africa region).

a. Demand assessment

The aim of the electricity demand forecast is to determine the present and future electricity requirements in terms of peak demand (maximum, MW) and energy (volume, GWh) consumption of the productive end-users to assess overall projections of demand balance requirements in Zambia and Zimbabwe.

The Consultant will be expected to utilise an appropriate demand forecasting methodology with a combination of both historical and forward-looking analysis techniques to develop demand forecasts from 2026-2055, for Low, Medium and High demand growth scenarios. The forecasts should be calibrated by using the latest sales data available from ZESCO and ZESA, taking into consideration the power rationing which was lately implemented in Zambia and Zimbabwe due to power supply deficits.

The Zambia and Zimbabwe electricity forecasts shall be developed separately. The Consultant shall be expected to consider key drivers of demand, including:

1. Anticipated economic growth rates;
2. Projected electricity intensity (i.e. ratio of electricity energy demand growth relative to GDP growth) and associated view on the projected system load factor;
3. The impact of ‘step loads’ (e.g. large industrial energy intensive developments or power export arrangements) on the projected economic forecast;
4. Electricity access and new connections for residential customers;
5. Changes in intensity for residential electricity consumption;
6. Expected technical and non-technical losses in the domestic market;
7. The demographic growth in Zambia and Zimbabwe to correlate with the economic growth, and thus, the medium- and long-term demand for electricity (so far, the two countries’ demand spans across different sectors, with domestic and mining being substantial users); and
8. The potential of future bulk electricity consumers that can influence potential step changes from the historic peak annual demand, load curve and load duration curve.

In addition, the Consultant is expected to construct an hourly representative load forecast for each of the scenarios for the main supply areas in Zambia and Zimbabwe. The detailed

hourly area forecast shall serve a key driver in the scheduling and dispatch of existing and new generation sources to minimize the overall cost of electricity production.

The above approach will enable the hourly dispatch of all the existing and planned supply options. This will provide both countries, the electric utilities, developers and investors with a deeper insight into the production requirements of the BGHES over its operating life. It will also be used to determine the optimum expected dispatch and allocation of energies from the BGHES from the perspective of the ZESCO and the ZESA.

b. Supply assessment

This section of the market analysis will deal with the current and future supply arrangements in Zambia and Zimbabwe. The Consultant shall work with ZRA, ZESCO and ZESA and other stakeholders to identify the various options as well as details such as costs, production capabilities, technical parameters and operating constraints over the expected operating life.

The main points to be considered are evacuation of generated power from existing power plants as well as with the BGHES, both from the perspectives of Zambian and Zimbabwean grids. It is expected that the model used will incorporate several technical and economic constraints for each plant in the power systems, including (but not limited to):

1. Gross and net installed capacity (MW);
2. Commissioning date;
3. Overnight cost/ CAPEX profile;
4. Fuel cost;
5. O&M cost;
6. Discount rate;
7. Domestic and regional tariff;
8. Forecast wheeling cost;
9. Must run obligations lying under the economic and technical requirements agreed for each of the existing generation project (such us Take or Pay obligations);
10. The SAPP spot market prices and supply opportunities;
11. Project life; and
12. Production constraints (e.g. minimum up and down-times, ramp rates, fuel supply agreements, PPA conditions, hydrology, hydro production profiles, storage characteristics, etc.).

ZRA, ZESCO and ZESA will provide the Consultant with the relevant existing studies reports to determine the operating protocol for the BGHES, based on its current design characteristics.

The Consultant shall be expected to develop specific profiles for discretionary renewable energy plant options, based on geographic locations in Zambia and Zimbabwe.

c. Network assessment

For each country, the study must assess existing transmission line capacity network as well as the transmission capacity investment (either new or rehabilitation, or both) required for integrating BGHES into their local grids successfully. As a part of the Zambian and Zimbabwean system, this analysis is key to confirming evacuation of the BGHES power to meet domestic demand.

To the extent that the grid is seen to limit optimal use of the generation resources, such constraints will be identified and should be accounted for in the simulations of the generation system, including whether planned expansion of the system may alleviate such problems – alternatively if modification of such expansion projects may be required.

To assess possible constraints on the operation of existing and new power plants in Zambia and Zimbabwe, the study should identify current network configuration, bottlenecks on the existing system and how future expansion plans – both on the generation and transmission side – may impact on such bottlenecks. The model used by the Consultant is expected to reflect the existing network configuration, future planned networks, as well as any transmission constraints between the various regions in Zambia and Zimbabwe. Furthermore, the study should discuss realistic penetration levels for intermittent renewable generation.

Note that ZESCO and ZESA shall be responsible for the losses on the transmission and distribution system, and such losses will therefore have a bearing on ZESCO and ZESA‘s financial position (and therefore the ability to pay for power purchases). As part of the analysis an assessment should be made of historic losses on the transmission and distribution system over the last 5-10 years. Both technical and non-technical losses and programs addressing loss reduction will be reviewed and commented on. The study shall seek to comment on projects that clearly have a positive impact on loss reduction. Losses forecast should be incorporated into the analysis.

d. Regional analysis

An essential outcome of this analysis shall be the role of BGHES in Zambia and Zimbabwe as well as a potential supply position in the region. Therefore, the analysis shall commence by addressing local demand, with subsequent expansion to a regional level to assess the potential for energy exports from BGHES. It is therefore expected that the Consultant shall develop a similar detailed demand and supply balance analysis for selected potential regional offtakers as has been conducted for Zambia and Zimbabwe.

The Consultant must explore and incorporate the potential demand from the SAPP market, ZTK interconnection, Malawi – Zambia Interconnector and other planned regional interconnectors like Zambia – DR Congo (Solwezi-Kolwezi) and Mozambique-Zambia. This shall include a detailed assessment of demand, supply and network characteristics

for these regional offtakers, as well as existing and planned interconnectors which may facilitate future trade of BGHES electricity.

The Consultant shall be expected to develop an assessment of potential volumes and pricing for supply from e.g. the SAPP Day Ahead Market (DAM) as a supply option for both countries, and from ZTK interconnection.

The regional analysis must consider the interconnectors transfer limits as well as BGHES's competitiveness amongst the competing supply options and each country's long run marginal and incremental system cost. Furthermore, the study shall seek to highlight limitations beyond the point of interconnection which may impact on the power trade limits. It is expected that the Consultant shall also determine the value of any BGHES electricity exported into the SAPP DAM and ZTK Interconnection. Such analyses shall be based not only on historic price analysis but should also include a forward view of prices for at least the next 10 years based on a detailed bottom-up assessment of the market generation costs in the region.

e. Demand and supply balance

The Consultant shall combine the results from the above analyses into a demand and supply balance outlook, to illustrate the need for and best use of the BGHES, in both domestic and regional markets. The modelling should define an optimum least-cost expansion plan taking all fixed and variable costs as well as constraints into consideration. Secondly, the Consultant should produce a least-cost production schedule that will minimise the variable cost of production under different scenarios for the different years. The Consultant is expected to utilise appropriate modelling software to conduct an hourly annual (8760hrs) analysis from 2026-2055, to test the value of the plant.

A least-cost expansion plan should be developed for Zambia and Zimbabwe where they do not exist. Secondly, if the model calls for BGHES as a least-cost supply option (or whether it is forced in), subject to the long term take or pay regime obligation from the existing potential competitors, the Consultant must determine how much of the plants' energy will be consumed in Zambia and Zimbabwe.

As a number of other projects are already committed, the modelling should consider any excess energy specifically due to BGHES, as well as the total system excess energy that can potentially be traded. If there is any excess energy from BGHES, the study must assess:

1. Who could buy the energy?
2. How much energy will they buy and in which hours and which seasons?
3. What will they pay for it?
4. What is current transmission line route and capacity between project site to the regional network for potential buyers?
5. What is the proposed power evacuation transmission route and the capacity required for trade?
6. What contract duration will they wish to comprise a firm capacity offtake?

The models used to forecast regional power flows, should incorporate not only the transfer capacities of the lines, but also the wheeling costs and losses expected on the lines. For example, if one wanted to sell power from BGHES to Namibia, Botswana, DR Congo, South Africa, the model should incorporate the following key features to accurately forecast the demand for power:

1. The excess energy profile for the supply;
2. The potential wheeling paths;
3. The cost of wheeling (US¢/kWh) as an individual cost for each line on the paths;
4. Expected losses for each line on the paths; and
5. Value of congestion for each location (due to price splitting when selling into the SAPP markets).

Given the range of assumptions, the Consultant is expected to utilise a scenario-based approach to evaluate the potential outcomes for BGHES. The Consultant shall use SAPP and ZTK rules (and other methodologies as needed) to make informed recommendations pertaining to the regional wheeling arrangements and costs and clearly differentiate between firm and non-firm wheeling.

f. Power Utilities and commercial off-takers financial analysis

The Financial Performance section and the impact of BGHES on ZESCO and ZESA shall be dealt with in the financial analysis.

BGHES project will:

1. sell portion of its output to the Power Utilities (ZESCO and ZESA) via a long-term PPA; and
2. some portion to Commercial Offtakers (commercial or industrial customers, or both), under a mix of fixed capacity charge and variable energy charge. The Power Utilities will first use a portion of BGHES's energy to meet the domestic electricity demand while on-selling the remaining portion (residual) of electricity to the regional buyers.

To determine the value of the Project, the Consultant shall therefore assess:

1. The value of the Project in the Zambian and Zimbabwean markets; and
2. The value of the Project in the Region – this could be either via bilateral contracts with neighbouring electricity markets, or by selling power to the SAPP Day Ahead Market (DAM) as an alternative.

The financial performance analysis shall consider the bankability of the Project and at a minimum contain the following:

1. The value of the Project in the Zambian and Zimbabwean markets;
2. The portion of BGHES energy that will be sold to the Power Utilities;
3. A price path of electricity sales to ZESCO and ZESA;

4. Net cash flow analysis impact from the perspective of ZESCO and ZESA;
5. The portion of BGHES energy that will be sold to the domestic commercial off takers;
6. A price path for electricity sales to Commercial Off takers

7. The portion of BGHES energy that can potentially be on-sold / directly sold to the regional market;
8. A price path for regional electricity sales; and
9. Cost of purchases from the BGHES plants.

g. Modelling and Software

The Consultant shall utilize a state-of-the-art power market simulation platform. The primary software for this study shall be the **PLEXOS® Integrated Energy Model** or an equivalent tool with proven capability in large-scale, hydro-thermal system dispatch, expansion planning, and regional market modelling within the SAPP context.

The model must be capable of executing the detailed analyses required in this Scope of Work, including:

1. Simulating the integrated power systems of Zambia and Zimbabwe, including the BGHES, with hourly (8760) resolution over the entire study horizon (2026-2055);
2. Co-optimizing multiple simulation horizons (Long-Term, Medium-Term, and Short-Term) to accurately represent hydro scheduling, maintenance, and unit commitment, considering the hydrology of the Zambezi River and its impact on downstream power stations;
3. Incorporating all technical and economic constraints listed in the Supply Assessment, including those for the numerous regional interconnectors and competing generation projects (e.g., Mphanda Nkuwa, Baynes);
4. Representing transmission constraints and calculating wheeling costs and losses for regional export analysis as specified in the Network and Regional Analysis; and
5. Modelling the SAPP Day-Ahead Market and bilateral contract structures to determine the value of exports, based on a bottom-up assessment of regional generation costs.

4.Work plan and deliverables

a. Work plan

In this section the Consultant shall propose the main activities of the assignment, their content and duration, phasing and interrelations, milestones (including interim approvals by the Client), and delivery dates of the reports. The proposed work plan shall be

consistent with the technical approach and methodology, showing understanding of the TORs and ability to translate them into a feasible working plan. A list of the final documents, including reports, drawings, and tables to be delivered as final output, shall be included here.

A data room shall be established to provide the Consultant with access to all available documents, ensuring that all Project information is synchronized and cohesive. The Consultant shall identify a comprehensive list of required documents and records necessary for the successful execution of the Project. Data collection is expected to be finalised within eight (8) weeks.

b. Interface and Collaboration Requirements

The Consultant shall ensure effective coordination and collaboration with all other advisory teams engaged on the BGHES Project, including but not limited to:

1. **Engineering Feasibility Study (EFS) and ESIA Consultant (AFRY Switzerland Ltd)**
   The Consultant shall interface with AFRY to align market study assumptions with technical feasibility parameters, hydrology constraints, and environmental considerations. All relevant data and findings from AFRY shall be incorporated into the market modelling and analysis.

2. **Financial and Commercial Transaction Advisor (FCTA – Synergy Consulting)**
   The Consultant shall collaborate with the FCTA to ensure consistency between market projections, commercial structures, and financial models. Inputs such as tariff assumptions, wheeling charges, and off-taker arrangements shall be harmonized to support bankability assessments.

3. **Technical Advisory Services (SMEC)**
   The Consultant shall work closely with Technical Advisor to validate technical assumptions, utilise deliverables from AFRY and Synergy, and ensure that market modelling reflects the latest technical configurations and operational constraints.

4. **Legal Transaction Advisor (ALSF-appointed Counsel)**
   The Consultant shall provide necessary technical and market inputs to the Legal Advisor for drafting contractual frameworks, including PPAs, wheeling agreements, and regional trading arrangements.

5. **Collaboration Mechanisms**
   i. Participate in progress meetings with all advisors as scheduled by the Client.
   ii. Share relevant data, assumptions, and draft outputs through the Client's designated data room or recipients.

iii. Respond promptly to requests for clarification or additional information from other advisors.
iv. Ensure that all deliverables are consistent and complementary to the outputs of other advisory streams.

c. Deliverables

The deliverables, both hardcopies and softcopies, are expected to comprise written reports in MS Word or MS PowerPoint (as agreed between the Consultant and Client) as well as MS Excel spreadsheets with relevant modelling outputs. All documents shall be prepared in English.

The Consultant is expected to produce the following key deliverables, as described in item 3 – Scope of Work, within the outlined timeframe:

i. **Inception Report:** The Consultant shall submit six (6) sets of Inception Report within 7 weeks after Contract's signature. The purpose of the Inception Report is to reflect the final Project scope, deliverables, timeframes and budget arrangements following the conclusion of the contract negotiations and based on discussions during the Inception Meeting. The report shall be revised and finalized by the Consultant to include feedback from the Client.
ii. **Assumptions Report:** Six (6) sets of Assumption Report shall be submitted by the Consultant within 7 weeks after Contract's signature. The purpose of the assumptions report is to define the key assumptions to be used in the modelling – to be signed-off by the Client, before modelling commences.
iii. **Draft Market Study:** Six (6) sets of the Draft Market Study shall be submitted by the Consultant within seventeen (17) weeks after Contract's signature. An initial draft report detailing initial findings from the study allowing for further discussion and refinement of the analysis.
iv. **Final Market Study:** Six (6) sets of the Draft Market Study Report shall be submitted by the Consultant within twenty-five (25) weeks after Contract's signature. The final Market study Report shall incorporate any feedback and/or comments from the draft report, and all the key elements listed in the scope of work.
v. **Model Database and Documentation**: The Consultant shall deliver the complete and fully functional PLEXOS (or equivalent) project database used for the study. This includes all input files, data, assumptions, script files, and a comprehensive data dictionary. The model must be delivered in a state that allows the Client to run base cases and alternative scenarios for future planning purposes.
vi. **Training and Capacity Building Report:** A summary report detailing the training sessions conducted, the training materials provided, and an assessment of the knowledge transfer to ZRA, ZESCO, and ZESA staff shall be submitted.

vii. **Meetings and Workshops:** An Inception Meeting shall be conducted at the kick-off of the Assignment. The main purpose of this meeting shall be to confirm the objectives of the Assignment and to provide further input on the methodologies and modelling to be used in the analysis. The inception meeting shall also be used to confirm the workplan and dates for further meetings and deliverables along with the budget arrangements. The outcomes from the Inception Meeting shall be recorded in an Inception Report deliverable. The Draft Market Report shall also be presented and validated at a workshop meeting.

There shall be a workshop for the Assumptions Report submitted by the Consultant to ensure the validation of the key assumptions going into the modelling which shall be the basis of the Draft Market Report study. Further meetings and a minimum of three workshops shall be conducted as agreed upon during the project negotiations with the successful bidder. It is the obligation of the Consultant to coordinate with the Technical, Legal and Financial and Commercial Transaction Advisors and any other Consultant indicated by the Client.

The Client may have a Consultant providing strategic advice to the Governments of Zambia and Zimbabwe on the development of the Project. In this capacity, such Consultant will guide, supervise, and support the work of all Advisors and should be copied on all communications regards deliverables. Any such Consultant shall have equal access to all information, communication, data or reports. The Consultant shall also engage with the other institutions providing advisory services to the Client like AUDA-NEPAD. The Consultant shall provide inputs and outputs from their studies as may be required by the Advisors to complement their studies.

5. Software Licensing and Model Ownership

The Consultant's proposal must include a clear and costed option for providing the Zambezi River Authority with two (2) perpetual licenses for the PLEXOS Desktop Professional edition (or the equivalent software proposed) upon successful completion and acceptance of the Final Market Study. The proposal shall also include the cost of the first year of software maintenance and support. The ownership of the final model database and all associated input files developed during this Assignment shall reside solely with the Zambezi River Authority.

6. Reference to Zambia and Zimbabwe National Compact

In addition to the scope outlined under clause 3 of these ToRs, the Consultant shall consider the Zambia and Zimbabwe National Compact as a guiding framework to ensure that the Batoka Gorge Hydro Electric Scheme is strategically positioned to enhance electricity access in the region, in alignment with long-term development goals and Mission 300 objectives.

7. Qualifications

In this sub section, the Consultant shall propose the structure and composition of its team. The Consultant shall list the main disciplines of the assignment, the key expert responsible, and proposed technical and support staff.

a. Minimum qualifications

The Consultant shall comprise a team, managed by a single team leader. The members of the team shall have the skill and experience necessary to undertake the range of tasks set out in this Terms of Reference. Everyone on the team must be personally available to do the work as and when required. The team leader shall be held accountable for ensuring Assignment deliverables and for the professional conduct and integrity of the team. The Consultant must have prior experience in the completion of similar assignments within the past five years. The Consultant shall provide a list of such work and associated references.

The minimum skills and experience required for key staff will be:

i. <u>Team Leader</u>

- A Master's degree in Engineering, Business administration, Economics or similar related fields;
- At least ten (10) years of relevant experience in power system analysis and market design;
- A good knowledge of power system expansion planning as well as cross border trading arrangements;
- Experience as Team Leader or key project team member in at least two (2) power systems development projects implemented within the SADC region or in countries classified as developing by an internationally recognised authority (e.g., World Bank or United Nations); and
- Experience in Power market design and operations.

ii. <u>Power Market and Systems Analyst (Modelling Expert)</u>

- Master's degree in Powers Systems Engineering or related field;
- At least one financial model developed for hydro power stations;
- At least one hydro power project executed within SAPP member country or developing countries - Experience in regional power projects;
- At least ten (10) years of relevant experience conducting national and or regional electricity market studies;
- Experience in developing integrated resource plans, least economic power system plans and conducting the associated power systems studies;
- Experience with power market design and energy modeling using computer-based tools such as PLEXOS, PyPSA, GAMS or others;

- Experience with cross border power trading arrangements, including bilateral and competitive spot markets;
- Experience working in the Southern African Power Pool electricity markets and
- Demonstrated ability to conduct training and knowledge transfer on the PLEXOS platform is mandatory.

iii. <u>Economist / Financial Analyst</u>

- A Master's degree in Economics, Financial Economics, or Econometrics.
- A minimum of eight (8) years of relevant experience in infrastructure economics, utility finance, or project finance, with a specific focus on the power sector.
- Demonstrated experience in:
    - Developing tariff models and energy pricing structures for hydro power projects, including capacity and energy charge components;
    - Conducting financial cash flow analysis for power utilities to assess the impact of new power purchase agreements (PPAs) on their financial health;
    - Analysing country and corporate credit risk, particularly in a Sub-Saharan African context, for the purposes of project bankability assessments;
    - Evaluating the economics of regional power trading, including an understanding of market structures, bilateral contracts, and wheeling charges;
    - Proven ability to work integrally with technical modeling teams (e.g., PLEXOS modelers) to translate technical dispatch data into financial and economic outcomes; and
    - Experience in Africa, preferably the SADC region.

b. Consultant Experience

The Consultant must provide information [names of the assignments, names of clients, date of execution, value and summary description of the assignments] on at least three previous consulting assignments similar to the Assignment which is subject of this solicitation and for which your consulting firm/organization and the sub consultants for this Assignment were engaged either individually as distinct corporate entities or jointly as members of an association or consortium of corporate entities.

Such assignments should have been undertaken not more than 15 years ago.