

## **TERMS OF REFERENCE**

### **1. BACKGROUND**

An Electricity Cost-of-Service Study (ECOSS) is an important tool for electricity regulators and utilities to determine the cost of providing electric service to electricity customers to promote efficiency in the supply and consumption, and ensure financial viability of the power sector, while taking into account social and equity considerations in pricing of electricity to poor households. The study determines the lowest cost means of generating, transmitting, and distributing electricity to customers and to design and set appropriate tariffs for the different customer classes along the supply chain.

Following the completion of the ECOSS in December 2021 by the Energy Regulation Board (ERB) with the assistance from an international consulting firm, and with funding from the African Development Bank (AfDB), ERB has decided to prepare a guidebook to be used by its staff to facilitate the conduct of cost-of-service studies and periodic updates of consumer electricity tariffs. In view of uncertainties embedded in forecasts of future electricity demand, the rapidly changing environment of power generating technologies as a result of climate change mitigation and adaptation requirements based on country commitments to the international climate change agenda and the impacts of exogenous factors, such as government green growth policies and strategies and environmental quality improvement requirements, on power systems development to meet demand in the least-cost manner, periodic updates of electricity cost of service studies have become an urgent necessity to ensure that consumer tariffs continue to meet the three objectives as stated above of economic efficiency, utility viability, while taking into consideration social and equity concerns.

### **2. OBJECTIVES**

The objective of assignment is to provide a basis of improving and enhancing the skills and capability within the ERB for the conduct and periodic updates of ECOSS for ensuring continuous effective regulation of the Zambia electricity sector through the development of a Guidebook or a tool kit for the purpose. The Guidebook/Toolkit aims to provide a standard approach for conducting the study to ensure that the results are consistent, accurate, and transparent. It should provide sufficient clarity and be user-friendly to enable ease of application.

### **3. SCOPE OF THE ASSIGNMENT**

The Guidebook should provide the step-by-step approach, including the theoretical underpinnings, in carrying out the various modules necessary for a comprehensive execution of ECOSS in order to arrive at final consumer tariffs that meet economic efficiency, sector viability and equity goals, as well as a roll-out program of periodic tariff adjustments. The Guidebook should, therefore, provide the following:

#### **Module 1 – Comprehensive Diagnostic Sector Review**

To outline the required key elements in undertaking a comprehensive diagnostic review of the power sector for an understanding and clarity of the issues, including climate change dimensions, in the sector that impact the development of the sector and the electricity cost of service. as well as the performance of the power utilities and impacts on government budget, and relationship to electricity pricing.

#### **Module 2- List of Data Requirements**

Since the key elements of ECOSS are (i) projections of medium to long-term electricity demand; and (ii) the medium to long-term expansion of the supply infrastructure to meet the demand in the least-cost manner, a comprehensive list of data requirements covering historical consumption and the characteristics, the structure of the existing power supply system, their operations, feasible candidates and their properties for future expansion. The treatment and analyses should be outlined. An Annex dedicated for the purpose should be provided.

#### **Module 3- Medium to Long-term Electricity Demand Forecasts**

A critical review of the various well-known adopted methodologies for projecting future electricity demand for power(capacity) and energy, indicating the strengths and weakness, and one or two recommended approaches together with the available computer models. Statement and explanation of the mathematical formulation of the annual load duration curve. The detailed analysis required to ascertain the validity of the forecasts should be outlined.

#### **Module 4 – Least-cost Expansion of the Supply Infrastructure**

The objective is to find the economically optimal generation, transmission, and distribution expansion paths to meet the projected demand. The required data inputs and relevant analyses for each of the infrastructure segments, as well as the methodological approaches applicable to each segment of the supply infrastructure and leading to a recommended approach for each of the segments, generation,

transmission and distribution. The expected outputs, being the least-cost expansion programs should be elaborated for clarity and understanding.

### **Module 5 -Determination of Economic Cost of Supply**

From outcome of Module 4, provide the methodology for estimation of the: (a) Long-run Marginal Cost (LRMC) of generation, the average incremental cost (AIC) of transmission, and the AIC of distribution, with explanation for the rationale behind the LRMC and the AIC indicating clearly the step-by-step approach, including the iterative processes for the determination of the LRMC and the AICs; and (b) the short-run marginal cost of energy at generation, transmission and distribution. Definitions of concepts and theoretical underpinnings should be elaborated.

### **Module 6 – From Economic Costs to Cost-reflective Consumer Tariffs**

Outline the methodological approaches for the determination for each main class of consumer category, based on data to applicable consumer and system characteristics, the structure and level for each consumer category reflecting the economic cost of supply to that category. The principles and methods of cost allocation should be elaborated.

### **Module 7 – Life-line Tariff Mechanism**

Provide the rationale for life-line tariffs to enable affordability of electricity by the poor households to meet basic needs. The types of information, and their sources, as well as the methodological approach for determination of the life-line tariffs, as well as the mechanism of cross subsidy and impacts on utility revenues should be provided.

### **Module 8 – Assessment of Efficient Revenue Requirements of the Utility**

Outline the reasons for assessment of the revenue requirements of the utility, the type of analysis required, the role of key performance indicators, and the linkage to economic cost reflective consumer tariffs, and the comparison to the existing consumer tariffs.

### **Module 9 – Tariff Adjustment Roll-out**

The end game – development a comprehensive roll-out plan that outlines alternative strategies for the gradual migration from existing tariffs to the economic cost reflective tariffs, with the underlying principles, and the methodology for automatic cost pass-through.

## **Module 10 – Regulatory Clearing Account and Truing-up**

The tariffs are determined over a multi-year control period of usually five years. The module should provide guidelines and strategies for annual true-ups and reconciliation of the Regulatory Clearing Account. The Module should also set the parameters that would warrant the re-opening of a new tariff application before the expiry of the tariff control period.

### **4. DELIVERABLES**

The following are the deliverables:

#### **(a) Field Visit and Inception Report**

Two weeks after contract signature, the Consultant will be required to hold inception meetings with the with ERB, and other key stakeholders to collect information relevant for the preparation of the Guidebook. The Consultant shall issue an Inception Report to ERB within two weeks after the field visit.

#### **(b) Mid-term Progress Report**

At the end of three months from contract award, the Consultant shall issue a mid-term progress report that would provide the status of progress on the development of the Guidebook, advising on any issues that may have arisen, and implication, if any, on the timely completion of the development of the Guidebook.

#### **(c) Draft ECOSS Guidebook.**

The Consultant shall issue a draft final Guidebook, which shall be comprehensive in its coverage of the various modules, including Annexes of data, assumptions, methodologies and theoretical underpinnings as well as calculations for review and comments by ERB, and designated key stakeholders. A Virtual Meeting shall be held to discuss the comments of ERB.

#### **(d) Final ECOSS Guidebook.**

Two weeks after receipt by the Consultant of the comments of ERB, the Consultant shall issue the final Guidebook to bring the consultancy service to a close.

### **5. DURATION OF ASSIGNMENT AND LEVEL OF EFFORT**

The duration of the assignment is 6 months with a level of effort of 107 person-days.

## **6. CONTRACT TYPE**

The contract for the assignment will be a lump-sum (LS) type contract. The Lump-sum will comprise two parts as follows:

- (a) Professional fees of the Consultant
- (b) Reimbursable expenses

## **7. REMUNERATION**

Subject to the acceptance by the ERB of the various deliverables, payments to the Consultant will be linked to the deliverables as follows:

- (a) 20% of the total LS for the Inception Report
- (b) 20% of the total LS for the Mid-term Progress Report
- (c) 25% of the total LS for the Draft Final ECOSS Guidebook
- (d) 35% of total LS for the final version of the ECOSS Guidebook

## **8. ORGANIZATION AND MANAGEMENT OF THE SERVICE**

ERB shall set up a technical team comprising about three staff members headed by the Manager of Economic Regulation for the day-to-day management and supervision of the activities of the Consultant. The team will also play the facilitating role in assisting the consultant in information gathering during the field visit and will be the communication and focal point of the Consultant.

## **9. QUALIFICATIONS AND EXPERIENCE OF THE CONSULTANT**

- Hold at least a master's degree in Economics, Engineering, Finance or related field relevant to the assignment, and a bachelor's degree in an alternative technical discipline relevant to the energy sector.
- Demonstrated multi-disciplinary skills (Engineering-economics, Energy infrastructure & Finance).
- A minimum of 20 years of demonstrated professional experience in the energy sector and should have carried out a minimum of 5 energy sector diagnostic reviews in at least 5 different countries of which 2 in Sub-Saharan Africa.
- In-depth knowledge of the various power generation technologies, including renewable energy technologies, and their operational characteristics and roles in an integrated power generation system.

- Demonstrated in-depth knowledge of the various computer-based power system planning models, from demand forecasting through to determination of economic-cost-of-service, as well as experience in their practical application, power system modelling and the integration of climate change and environmental impacts dimensions.
- In-depth knowledge of power system planning, as demonstrated by having undertaken at least 5 power system expansion studies with at least 2 in developing countries.
- Should have designed and supervised the execution of at least one regional power pool medium to long-term pool-plan study of generation and transmission expansion.
- Should have carried out and/or designed and supervised the execution of at least 5 electricity cost-of-service studies, including the determination of economic cost of service, the design of economic-cost reflective consumer tariffs, and tariff setting, and roll-out plan, with at least 2 such studies in the last 5 years in 2 countries in Sub-Saharan Africa.
- In-depth knowledge of power system operations, and power utility work experience in a discipline relevant to the assignment.
- Strong analytical and communication skills.
- Excellent interpersonal relationship skills and ability to establish and sustain effective dialogue with high-level government key stakeholders.
- Excellent English speaking and writing skills.
- Good computer literacy with knowledge of Microsoft Windows, Adobe, Power Point, Excel and Graphics