STANDARDIZED TARIFF METHODOLOGY (STM)

FOR THE SALE OF ELECTRICITY TO THE MAIN GRID

IN TANZANIA

UNDER

STANDARDIZED SMALL POWER PURCHASE AGREEMENTS

November 2008 Version with correction to separate mini-grid STM

This is one of three documents that define the Small Power Purchase Scheme in Tanzania for the Main Grid.

1. Standardised Small Power Purchase Agreement (SPPA) for the Main Grid [already approved by EWURA]
2. Standardised Tariff Calculation Methodology (STM) for the Main Grid [this document]
3. Detailed Tariff Calculations under the SPPA for the Main Grid for year 2009 [accompanying document]

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1 DEFINITION OF A SMALL POWER PLANT (SPP)

SPPs are embedded in the distribution system and would require interconnection to the existing network with relatively short, medium-voltage transmission lines, and would not unduly affect the service quality to customers on the distribution lines. Considering the sizes of renewable energy-based power plants awaiting development, and the configuration and voltage levels of the Tanzanian electricity network, a SPP is defined as a power plant using a renewable energy source or waste heat, or cogeneration of heat and electricity, with an export capacity up to ten (10) MW.

2 PRINCIPLES OF TARIFF SETTING

Tariffs for the purchase of electricity from SPPs to the Tanzania Electricity Supply Company (TANESCO) main grid should not cause excessive costs to the Buyer above the costs of other options. Therefore, the tariffs are established on the principle of avoided costs.

The tariff is calculated on the basis of Long-run Marginal Cost (LRMC) of the main grid and adjusted to reflect short-term uncertainties and avoided losses.

3 TARIFFS FOR SPPs ON THE MAIN GRID

3.1 Responsibility and Timing of Tariff Calculations

Tariffs will be calculated and annually revised by the Small Power Development Working Group (SPDWG). Tariffs for the subsequent year will be calculated in the month of September every year, and submitted for regulatory review by 30th September. Tariffs for the subsequent year will be published on or before 30th November every year.

The tariffs are based on the avoided cost of the main grid at the medium voltage level, suitably adjusted to reflect short-term market conditions. Tariffs are re-calculated and published every year. All SPPs operating on the main-grid will be paid at this tariff, subject to the floor price and the price cap described in this document.

3.2 Calculation of LRMC for the Main grid

The *Long-run Marginal Cost (LRMC)* is the basis for the calculation of the avoided cost. LRMC is the cost of providing an additional kWh of energy and the corresponding kW of capacity from the generating system in the long-run.

The SPDWG will calculate the LRMC using the following method:

A. Calculation of LRMC at the Generation Level

Step 1: The base-case long-term generation expansion plan to cover at least twenty years ahead is optimized. This plan is the most likely scenario out of all the different scenarios that may be modelled, and this should be the long-term generation expansion plan that is recommended for implementation and accepted by TANESCO. It should be a least-cost plan. In keeping with TANESCO practice, this plan will be based on economic costs. The net present value of all costs of this base-case expansion plan is NPV_1.

In preparing the expansion plans the following will be adhered to:

(a) The ACRES™ model already available with TANESCO will be used. Alternatively the WASP[1] model may be used.
(b) Investments on new candidate generating plants will be updated to the most recent figures available, based on the latest feasibility studies.
(c) Transmission investments required to interconnect each candidate generating plant will be included in the costs of each such plant presented to the planning model.
(d) Commitments to existing Independent Power Producers (IPPs) will be reflected in the fixed and variable costs of such power plants. Commitments to Emergency Power Plants (EPPs) will be reflected similarly.
(e) Non-fuel operating and maintenance costs of other existing power plants will be updated to the most recent figures.
(f) Fuel prices for existing gas, oil and coal-fired power plants will be based on the existing contract prices. In the absence of contract fuel prices for new gas and coal-fired power plants, they will be equal to the highest price paid for the same fuel in existing power plants.
(g) The studies will be conducted in constant USD prices.

Step 2: A demand increment is given to the load forecast, to a level adequate to disturb the investment plan. This disturbance may be in terms of certain power plants being advanced and/or new power plants from the candidate list of power plants being picked-up for implementation. This plan should also be optimised, and be a least-cost plan. In the case of

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[1] Wien Automatic System Planning Model, IAEA, Vienna. Current version is WASP IV. This model is already installed in the Ministry of Energy and Minerals.

Tanzania, the demand may have to be increased by about 50 MW, to enable some planned power plants to be advanced. Advancing demand growth by one year may provide the adequate marginality to the system. The net present value of all costs of this expansion plan for increased demand is NPV_2.

Step 3: The present value of energy delivered in the base case plan developed in Step 1 is E_1. The present value of the energy delivered in the "demand increased plan" developed in Step 2 is E_2. Therefore, the long-run marginal cost will be,

$$LRMC = \frac{NPV_2 - NPV_1}{E_2 - E_1} \text{ USD/kWh}$$

LRMC calculated will be separated into the capacity component ($LRMC_c$) and the energy component ($LRMC_e$). The facility to do this is provided in the model, and the following are the guidelines to separate the costs:

$LRMC_c$ are the costs related to investments, less salvage value, plus the fixed operating maintenance costs and the costs of unserved energy.

$LRMC_e$ is the cost related to fuel and other non-fuel operating costs.

B. Converting LRMC from Economic Costs to Financial Costs

The LRMC so calculated has to be adjusted from economic costs to financial costs, as follows:

(a) The capacity component of the LRMC will be adjusted upwards to reflect the average taxes and duties imposed on TANESCO's capital equipment. These will include customs duty and other taxes and levies on investments, averaged-out to the investments of TANESCO, but would exclude recoverable taxes such as value added tax.

(b) The fuel-related component of LRMC will be adjusted upwards to reflect any taxes imposed on fuels, excluding recoverable sales taxes such as value added tax.

Composite average tax rate for capital investments $= T_c$
Composite tax rate for fuel (if any) $= T_e$

Financial LRMC at generation level $CA_G = LRMC_c \times (1+T_c) + LRMC_e \times (1+T_e)$ USD/kWh

The USD costs occurring in any calculation will be converted to TZS at the average selling rate of USD[2] published by the Bank of Tanzania (BOT) for all business days over one year

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[2] The selling rate means the amount of TZS required to buy a USD.

ending 31st August. This is because the calculations are done by the end of August. Exchange rate information is available in the official website of BOT http://www.bot-tz.org

3.3 Adjustment to Reflect Costs of the Existing System

The financial LRMC calculated reflects the optimal sequence of developing the generation facilities in the main grid. However, the actual costs in the immediate future may be different from LRMC, owing to special conditions in the system, such as the need for emergency power plants and imminent shortages of hydropower generation. Therefore, the tariff setting procedure will examine the average cost of thermal generation for the subsequent year. The source for this information will be TANESCO's five year financial forecast, in TZS terms.

C. Calculation of Costs of the Existing Generating System in the Forthcoming Year

C_{IPP} =   Forecast capacity charges of IPPs, including fixed O&M charges
C_{EPP} =   Forecast capacity charges of EPPs, including fixed O&M charges
$C_{TANESCO}$ =   Forecast capacity costs of TANESCO's own thermal power plants[3].
F =   Forecast fuel and variable expenses of all thermal power plants
E_T =   Forecast thermal energy dispatch

Average thermal generation costs $C_T = \dfrac{C_{IPP} + C_{EPP} + C_{TANESCO} + F}{E_T}$ TZS/kWh

Note: IPP means Independent Power Plant, EPP means Emergency Power Plant, O&M means Operation and Maintenance

All taxes such as customs duty and levies should be included. However, sales taxes such as value added tax should not be included.

D. Calculation of Avoided Costs

The calculated theoretical LRMC will be adjusted to estimate a realistic avoided cost, on the following basis. Caution will be exercised to ensure that the TZS/USD rates used to convert CA_G from USD to TZS, and the rate used in the TANESCO's five year financial forecast for the year under consideration, are the same. If not, the required adjustment would be made to C_T to align with the exchange rates of TZS/USD selling rate for all banking days for one year ending 31st August of the current year.

Adjusted avoided cost at generation level $CA'_G = \dfrac{CA_G + C_T}{2}$ TZS/kWh,

3.4 Adjustment to Reflect Avoided Transmission Losses

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[3] These may include capital and interest payments

SPPs are connected to the medium voltage network of TANESCO. Electricity produced by SPPs would be distributed through the medium and low voltage networks, thus saving high voltage transmission losses otherwise incurred by TANESCO to produce electricity at the main power plants and transfer to the medium voltage network. The avoided cost calculated will be adjusted upwards to reflect the avoided transmission losses.

E. Adjustment for Avoided Transmission Losses

Transmission losses (as a share of net generation)   = TLOSS

Standardised SPP Tariff (T_{SPP}) = $\dfrac{CA'_G}{(1-TLOSS)}$

F: Three Year Rolling Average

In order to smoothen out the annual variations, the applicable tariff shall be established as a moving average of the calculated tariff of the past three years, calculated using the Standardized Tariff Methodology.

3.5 Adjustment to Reflect Seasonality

Electricity produced by SPPs would be of a higher value to TANESCO during the dry season.

G. Adjustment to Reflect Seasonality

Definitions: The dry season is from August to November
                The wet season is from January to July, and December

Weighting Factors: Dry season: 120%
                      Wet season: 90%

Seasonally adjusted Standardised SPP Tariff: Dry season $TD_{SPP} = 1.2 \times TA_{SPP}$
                                                    Wet season $TW_{SPP} = 0.9 \times TA_{SPP}$

Tariff paid to all SPPs operating in the main grid during the year will be the above standardised tariff, subject to the floor price and the cap defined in the next section.

3.6 Floor Price and the Price Cap

The *floor price* is established at the signing of the SPPA to protect SPPs from possible reduction in the standardised tariff in future years, owing to external factors such as reduction in fuel prices and appreciation of the value of TZS against international currencies.

The *price cap* is established at the signing of the SPPA to protect TANESCO from possible increases in standardised tariffs in future years far in excess of initial tariffs, caused by external factors such as fuel price increases and depreciation of the TZS against international currencies.

Floor price for all SPPs signed during the year = Standardised Tariff announced for the year
The floor price will not be adjusted to account for inflation or any other factor.

Price cap for all SPPs signed during the year = 1.5 × Standardised SPP Tariff announced for the year.
The price cap will be adjusted based on the published Consumer Price Index (CPI) for Tanzania.

Floor price in year n, FT_n = TD_{SPP} for year 0
                                   TW_{SPP} for year 0
Note: Year 0 is the year of signing the SPPA

Price cap in year n, CT_n
$$= (1+CPIA_1) \times (1+CPIA_2) \times ....\times (1+CPIA_n) \times 1.5 \times [TD_{SPP} \text{ for year 0}]$$
$$= (1+CPIA_1) \times (1+CPIA_2) \times ....\times (1+CPIA_n) \times 1.5 \times [TW_{SPP} \text{ for year 0}]$$

where year 0 is the year of signing the SPPA. $CPIA_i$ in year i is the five-year moving average of the annual change of CPI, described by the following formula:

$$CPIA_i = 0.2 \times \sum_{r=i-5}^{i-1}\left(\frac{CPI_r}{CPI_{r-1}} -1\right)$$

where CPI_r is the consumer price index published by the National Bureau of Statistics, Tanzania (NBS) for year r. This information is available in the official website of NBS http://www.nbs.go.tz/

To be consistent with the time-frame used in the exchange rate calculations, the five year moving average too, will be based on a year ending 31st August of the current year.

For each SPPA signed, the Buyer will maintain a record of the floor price, and the CPI-adjusted price cap for every year for the term of the SPPA. Before making the first payment in the month of January in any year, the Buyer shall check whether the tariff of each SPPA has reached the floor price or the price cap, and make payments accordingly.

3.7 Decimal Accuracy

Quantity	Decimal accuracy
System costs in UScts/kWh	2
Tax rate (%)	1
Exchange rate in TZS/USD	1
System costs in TZS/kWh	1
Transmission loss in %	1
Generation forecast in GWh	1
System costs in million TZS	1
Quantities stated as a %	1
Change in Consumer Price Index stated in %	2
SPP tariff in TZS/kWh	2

3.7 Annual Tariff Announcement

The public announcement of the SPP tariffs for the main grid will be of the following form:

Prices payable in year xxxx to Small Power Producers operating under the standardised Small Power Purchase Agreements (SPPAs) with TANESCO will be as follows:

Dry season (August to November)   : TD_{SPP} per kWh
Wet season (January to July, and December)   : TW_{SPP} per kWh

The above tariffs will be subject to the limitations of the floor price and the price cap stated in the respective SPPAs.

For new SPPAs signed during the year xxxx, the floor price will be the tariffs stated above. The price cap will be 1.5 times the tariffs stated above, subject to adjustment for inflation reflecting the Tanzania Consumer Price Index.

The price cap applicable to all SPPAs signed in any previous year shall be increased by $CPIA_i$.

The above tariffs are non-negotiable. More information on the process of application and development of small power projects, the standardised SPPA and the calculation of tariffs for year xxxx can be obtained from:
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xxxxxxx
xxxxxxx

This additional information is also available on www.ewura.go.tz

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