

# **APPENDIX 2B**

**DETAILED TARIFF CALCULATIONS FOR YEAR 2011**  
**FOR THE SALE OF ELECTRICITY TO THE MINI-GRIDS**  
**IN TANZANIA**  
**UNDER**  
**STANDARDIZED SMALL POWER PURCHASE AGREEMENTS**  
**IN TANZANIA**

**APRIL 2011**

This is one of the five documents that guide the Small Power Purchase Scheme in Tanzania for Mini-grids.

1. Standardised Small Power Purchase Agreement (SPPA) for Mini-grids,
2. Standardised Tariff Calculation Methodology (STM) for Mini-grids,
3. Detailed Tariff Calculations under the SPPA for year 2011 [this document],
4. Electricity (Small Power Development) Rules, and
5. Electricity (Small Power Development) Guidelines.

**DETAILED TARIFF CALCULATIONS FOR YEAR 2011**

**FOR THE SALE OF ELECTRICITY TO THE MINI-GRIDS**

**IN TANZANIA**

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Mathematical symbols have the same meaning as defined in the accompanying document titled “Standardised Tariff Methodology”.

**1. Calculation of LRMC for the Main Grid**

**Special Note:**

TANESCO has issued the “Power System Master Plan Study, August 2009”, which contains an updated calculation of Long-run Marginal Costs, using a different approach, which is acceptable. Therefore, steps 1, 2 and 3 given in the approved Standardised Tariff Methodology were not conducted in this calculation. Instead, the LRMC calculated in the August 2009 Master Plan Study was used.

<b>Small Power Purchase Tariff Calculation for the Mini-Grid for year 2011</b>			
<b>A: Calculation of LRMC at the Generation Level</b>	<b>Unit</b>	<b>Value</b>	<b>Basis/Source</b>
Generation Investment	UScts/kWh	4.59	Economic
Energy at Generation	UScts/kWh	3.31	Economic
<b>Total Generation Busbar</b>	UScts/kWh	<b>7.90</b>	PSMP-2009
<b>B: Converting LRMC from Economic to Financial Costs</b>			
Average Taxes for Generation Investments	Estimste	30%	Excl VAT if any
Average Taxes on Fuel	Estimste	19%	Excl VAT if any
<b>LRMC</b>			
Generation Investments	UScts/kWh	5.97	Fin /Calculated
Energy at Generation	UScts/kWh	3.93	Fin /Calculated
<b>Total Generation Busbar</b>	UScts/kWh	9.90	Fin /Calculated
Financial LRMC at Generation Level	UScts/kWh	9.90	
Average selling price of USD from Sept '09 to Aug '10	TZS/USD	1,352.92	
<b>Generation LRMC</b>	TZS/kWh	<b>133.98</b>	

Please see Annex 1 for the daily average spot selling rate for USD for one year until end Aug 2009, from which the average selling rate until end August above was calculated.

Therefore,  $CA_G = 133.98$  TZS/kWh

## 2. Adjustment to Reflect Avoided Transmission Losses

<b>C: Adjustment for Avoided Transmission Losses</b>			
LRMC at generation level		TZS/kWh	133.98
Energy loss on the HV Transmission Network		% of net generation	5.2%
Adjusted Avoided Cost at MV Distribution Level		TZS/kWh	130.88

## 3. Calculation of Average Incremental Costs in Mini-grids

<b>D. Incremental Capacity Cost of Mini-grids</b>			
			<u>Source</u>
-			
Cost of a new diesel engine generator (typically 1 MW)	300	USD/kW	Estimate
			See TZS-
Average selling price of USD for 2009 until end Aug	1,353.92	TZS/USD	USD rates
Cost of a new diesel engine generator (typically 1 MW)	406,176.05	TZS/kW	Calculated
Economic life of a diesel engine-generator	5.2	years	
Annual maintenance cost as a share of investment	4.0%	per year	Estimate
			As in
Real discount rate	10%	per year	Masterplan
Annual capacity factor	50%		Estimate
PV factor	3.79		Calculated
Annuity factor	0.26		Calculated
Annualised capital cost	107,148.22	TZS/kW	Calculated
Annual maintenance cost	16,247.04	TZS/kW	Calculated
Annual capacity cost	123,395.26	TZS/kW	Calculated
Energy delivered from 1 kW of capacity	4380	kWh	Calculated
Incremental capacity cost	28.17	TZS/kWh	Calculated
<b>E. Incremental Fuel, Lubrication and Maintenance Costs of Mini-grids</b>			
-			-
Fuel consumption rate for full-load operation	0.275	litre/kWh	Estimate
Adjustment factor to account for part load operation	10.0%		Estimate
Estimated fuel consumption rate	0.30	litre/kWh	Calculated
Lubricating oil and variable maintenance costs	10.0%	of fuel costs	Estimate
One-year average price of fuel	1,807.31	TZS/litre	EWURA
Incremental Variable Cost	601.38	TZS/kWh	Calculated
Incremental Capacity and Variable Cost of Mini-grids	629.55	TZS/kWh	Calculated

#### **4. Tariff for SPPs Connected to Mini-grids**

The tariff for SPPs connected to mini-grids shall be the average of

- (a) Adjusted avoided cost of supply  $CA'_G$ , and
- (b) Total Incremental Cost of mini-grids  $CI_G$

$$\text{Tariff for SPPs connected to mini-grids } T_{SPP} = \frac{1}{2}[CA'_G + CI_G]$$

#### **F. Tariff for SPPs Connected to Mini-grids**

Incremental Capacity and Variable Cost of Mini-grids ( $CI_G$ )	629.55	TZS/kWh	Calculated
LRMC at MV Distribution level of main grid ( $CA'_G$ )	130.88	TZS/kWh	Calculated in C above
Average of grid LRMC and mini-grid incremental costs	380.22	TZS/kWh	
Standardized Mini-grid SPP Tariff for the year 2010	<b>380.22</b>	<b>TZS/kWh</b>	

#### **5. Floor Price and the Price Cap**

The Floor Price for all SPPAs executed in year 2011 shall be the above tariffs. If the above tariffs are less than the floor prices stated in any SPPA, the floor price stated in such SPPA shall be paid.

The Price Cap shall be calculated as follows: The five-year moving average of the change in Tanzania Consumer Price Index (CPI), for the adjustment of the price cap of SPPs is **8.78%**. (see the table below). The price cap stated in any SPPA signed in a previous year (already adjusted to account for any price cap adjustments announced in subsequent years prior to 2011) remaining valid as of 1<sup>st</sup> January 2011 shall be further increased by **8.78%**.

#### **6. Annual Tariff Announcement**

Press Announcement: Tariffs to Small Power Producers on Mini-grids in Tanzania 2011

Prices payable to Small Power Producers operating under the standardized Small Power Purchase Agreements (SPPAs) with TANESCO shall be as follows:

Standardized Mini-grid SPP Tariff for the year **380.22** TZS/kWh

For new SPPAs signed during the year,

- 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 on the basis of the five-year moving average of Tanzania Consumer Price Index.

For SPPAs that remain valid as of 1st January, the price cap shall be adjusted by **8.78%**.

## Annex 1: Selling Rate for USD for one year until end August 2010

Average exchange rate for one year ending 31 August 2010

Summary of average rate per Month	
	Spot Selling
August'10	1,448.37
July'10	1,394.91
June'10	1391.74
May'10	1,372.00
April'10	1,352.11
March'10	1,341.47
February'10	1,338.38
January '10	1,331.91
December'09	1,327.27
November'09	1,325.14
October'09	1,315.78
September'09	1,309.25
<b>Total</b>	<b>16,247.04</b>
<b>Average</b>	<b>1,353.92</b>
	<b>1,353.92</b>

## Annex 2: Tanzania CPI for the period 2003 to August 2010

CPI	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2001	Tanzania CPI was redefined to be 100.0 in Dec 2001											
2002	102.6	104.1	103.8	104.7	104.4	103.3	103.7	103.3	104.4	105.1	105.3	107.3
2003	107.3	108.9	109.4	109.9	110.4	109.3	108.7	109.4	109.3	111.2	111.5	113.3
	4.58%	4.61%	5.39%	4.97%	5.75%	5.81%	4.82%	5.91%	4.69%	5.80%	5.89%	5.59%
2004	114.5	113.3	114.0	114.7	114.4	113	112.9	114.4	115.4	117.8	118.1	118.5
	6.71%	4.04%	4.20%	4.37%	3.62%	3.39%	3.86%	4.57%	5.58%	5.94%	5.92%	4.59%
2005	118.9	118.6	118.6	119.5	120.6	120.6	119.9	121.2	121	122.6	123.4	125.5
	3.84%	4.68%	4.04%	4.18%	5.42%	6.73%	6.20%	5.94%	4.85%	4.07%	4.49%	5.91%
2006	126.8	127.9	128.9	130.1	132.3	131.3	127.6	127.8	128	130	131.1	133.9
	6.64%	7.84%	8.68%	8.87%	9.70%	8.87%	6.42%	5.45%	5.79%	6.04%	6.24%	6.69%
2007	135.7	137.2	138.2	138.1	138.9	139	139.1	137.8	138.6	139.2	140.7	142.5
	7.02%	7.27%	7.21%	6.15%	4.99%	5.86%	9.01%	7.82%	8.28%	7.08%	7.32%	6.42%
2008	147.4	149.4	150.7	151.5	151.6	151.9	152.3	151.3	154.7	155.6	158.0	161.7
	8.62%	8.89%	9.04%	9.70%	9.14%	9.28%	9.49%	9.80%	11.62%	11.78%	12.30%	13.47%
2009	166.4	169.3	170.3	169.7	168.8	168.1	168.9	169.6	173.4	175.3	177.7	181.5
	12.89%	13.32%	13.01%	12.01%	11.35%	10.66%	10.90%	12.10%	12.09%	12.66%	12.47%	12.24%
2010	184.5	185.6	185.7	185.6	182.2	180.2	179.5	180.8	181.2			
	10.88%	9.63%	9.04%	9.37%	7.94%	7.20%	6.28%	6.60%	4.50%			
	Average of 60 months ending August 2009						8.78%					

**Annex 3: Average Cap Prices for Diesel announced by EWURA**

	Bukoba	Kigoma	Musoma	Mwanza	Sumbawanga
Date	(Tshs/Lt)	(Tshs/Lt)	(Tshs/Lt)	(Tshs/Lt)	(Tshs/Lt)
2-Sep-09	1704	1719	1696	1665	1665
10-Oct-09	1665	1670	1646	1616	1615
25-Nov-09	1797	1814	1758	1727	1752
23-Dec-09	1784	1801	1744	1714	1739
2-Jan-10	1766	1783	1726	1696	1721
17-Feb-10	1775	1792	1735	1705	1730
17-Mar-10	1807	1824	1767	1737	1762
14-Apr-10	1852	1869	1812	1782	1807
26-May-10	1984	2001	1944	1913	1938
23-Jun-10	1876	1893	1836	1806	1831
21-Jul-10	1942	1959	1902	1871	1896
18-Aug-10	1947	1964	1907	1877	1902
9-Sep-10	1937	1954	1897	1867	1892
Average	1,834	1,849	1,798	1,767	1,788
Applicable Annual Average TZS/Ltr			1,807		

Note: The price derived is the average of the five most expensive regions for each month between September 2009 and August 2010.