

**DETAILED TARIFF CALCULATIONS FOR YEAR 2009**  
**FOR THE SALE OF ELECTRICITY TO THE MINI-GRIDS**  
**IN TANZANIA**  
**UNDER**  
**STANDARDIZED SMALL POWER PURCHASE AGREEMENTS**  
**IN TANZANIA**

**24 NOVEMBER 2008**

**APPROVED BY THE SMALL POWER DEVELOPMENT WORKING GROUP ON 26 FEB 2009**

This is one of three 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)
3. Detailed Tariff Calculations under the SPPA for year 2009 [\[this document\]](#)

# DETAILED TARIFF CALCULATIONS FOR YEAR **2009**

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

### IN TANZANIA

#### UNDER

#### STANDARDIZED SMALL POWER PURCHASE AGREEMENTS

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 Masterplan Study, March 2008”, 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 repeated in this study. Instead, the LRMC calculated in the March 2008 Masterplan Study was used.

<b><u>A. Calculation of LRMC at the Generation Level</u></b>			
			<u>Basis</u>
LRMC	Generation investments	2.96 UScts/kWh	Economic
	Energy at generation	2.14 UScts/kWh	Economic/financial
	Total generation busbar	5.10 UScts/kWh	Economic
	Source: Power System Masterplan 2008, Final draft March 2008		
<b><u>B. Converting LRMC from Economic Costs to Financial Costs</u></b>			
	Average taxes for generation investments	30.0% Estimate	Excludes VAT if any
	Average taxes on fuel	0% Estimate	Excludes VAT if any
LRMC	Generation investments	3.85 UScts/kWh	Financial
	Energy at generation	2.14 UScts/kWh	Financial
	Total generation busbar	5.99 UScts/kWh	Financial
	Financial LRMC at generation level	5.99 UScts/kWh	
	Average selling price of USD for 2008 until end Aug	1193.55 TZS/USD	See TZS-USD rates
	Generation LRMC	71.47 TZS/kWh	

Please see Annex 1 for the daily average spot selling rate for USD for one year until end Aug 2008, from which the average selling rate until end August above was calculated.

Therefore,  $CA_G = 71.47 \text{ TZS/kWh}$

## 2. Adjustment to Reflect Avoided Transmission Losses

<b>C. Adjustment for Avoided Transmission Losses</b>	
LRMC at generation level	71.47 TZS/kWh
Energy loss in the HV transmission network	4.0% of net generation
LRMC at MV Distribution level of main grid	74.45 TZS/kWh

## 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)	250 USD/kW	Estimate
Average selling price of USD for 2008 until end Aug	1193.55 TZS/USD	See TZS-USD rates
Cost of a new diesel engine generator (typically 1 MW)	298,387.3 TZS/kW	Calculated
Economic life of a diesel engine-generator	5 years	
Annual maintenance cost as a share of investment	4.0% per year	Estimate
Real discount rate	10% per year	As in Masterplan
Annual capacity factor	50%	Estimate
PV factor	3.79	Calculated
Annuity factor	0.26	Calculated
Annualised capital cost	78,714 TZS/kW	Calculated
Annual maintenance cost	11,935 TZS/kW	Calculated
Annual capacity cost	90,649 TZS/kW	Calculated
Energy delivered from 1 kW of capacity	4380 kWh	Calculated
Incremental capacity cost	20.70 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	1,726.60 TZS/litre	EWURA
Incremental Variable Cost	574.52 TZS/kWh	Calculated
Incremental Capacity and Variable Cost of Mini-grids	595.22 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  $CI_G$

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

<b><u>F. Tariff for SPPs Connected to Mini-grids</u></b>		
Incremental Capacity and Variable Cost of Mini-grids	595.2 TZS/kWh	Calculated
LRMC at MV Distribution level of main grid	74.45 TZS/kWh	Calculated above
Average of grid LRMC and mini-grid incremental costs	334.8 TZS/kWh	
Strandardised Mini-grid SPP Tariff for the year	334.83 TZS/kWh	

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

The Floor Price for all SPPAs executed in year 2009 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 6.41% (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 2009) remaining valid as of 1<sup>st</sup> January 2009 shall be further increased by 6.41%.

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											100.0
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	113.0	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	121.0	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	128.0	130.0	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	139.0	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		
	8.62%	8.89%	9.04%	9.70%	9.14%	9.28%	9.49%	9.80%	11.62%	11.78%		
Average of 60 months ending August 2008						<b>6.41%</b>						

## **7. Annual Tariff Announcement**

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

Standardised Mini-grid SPP Tariff for the year                      **334.83**    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                      **6.41%**

The above tariffs are standardised and non-negotiable. More information including guidelines to the process of application and development of small power projects, the standardised SPPA, the tariff calculation methodology and the tariff calculations, can be obtained from:

xxxxxxxxxx

xxxxxxxxxx

xxxxxxxxxx

This additional information is also available on [www.xxxx.xxx](http://www.xxxx.xxx)

## Annex 1: Selling Rate for USD for one year until end August 2008

Currency Exchange Rates in Tanzania used to calculate SPP Tariffs for 2009

Basis: Published Exchange Rates for one year ending 31st August

Source: Bank of Tanzania Website [www. Bot-tz.org](http://www.bot-tz.org)

<http://www.bot-tz.org/FinancialMarkets/ExchangeRates/>

Note 1: Exchange rates are not published for weekends and holidays

Note 2: The Selling Rate of USD (TZS required to purchase 100 USD) as stated by Bank of Tanzania.

Note 3: Exchange Rate per 100 USD is entered up to two decimal places, but not shown here.

Date	Spot Selling Rate (TZS/100 USD)	Date	Spot Selling Rate (TZS/100 USD)	Date	Spot Selling Rate (TZS/100 USD)
03-Sep-07	128,744	02-Jan-08	115,880	02-May-08	121,657
04-Sep-07	128,775	03-Jan-08	117,871	05-May-08	124,083
05-Sep-07	117,073	04-Jan-08	118,271	06-May-08	123,526
06-Sep-07	129,019	07-Jan-08	118,943	07-May-08	123,526
07-Sep-07	128,693	08-Jan-08	119,169	08-May-08	122,417
10-Sep-07	128,472	09-Jan-08	118,577	09-May-08	122,394
11-Sep-07	128,212	10-Jan-08	116,940	12-May-08	122,383
12-Sep-07	127,643	11-Jan-08	114,720	13-May-08	122,463
13-Sep-07	127,033	14-Jan-08	116,265	14-May-08	122,615
14-Sep-07	126,983	15-Jan-08	116,708	15-May-08	122,266
17-Sep-07	126,734	16-Jan-08	116,836	16-May-08	121,926
18-Sep-07	126,282	17-Jan-08	116,869	19-May-08	122,054
19-Sep-07	126,209	18-Jan-08	116,803	20-May-08	122,039
20-Sep-07	126,198	21-Jan-08	116,146	21-May-08	121,709
21-Sep-07	125,792	22-Jan-08	116,552	22-May-08	121,218
24-Sep-07	125,376	23-Jan-08	117,522	23-May-08	120,474
25-Sep-07	125,219	24-Jan-08	117,913	26-May-08	120,327
26-Sep-07	124,659	25-Jan-08	118,534	27-May-08	120,138
27-Sep-07	124,404	28-Jan-08	118,566	28-May-08	120,074
28-Sep-07	124,219	29-Jan-08	118,241	29-May-08	120,530
01-Oct-07	124,289	30-Jan-08	118,103	30-May-08	120,914
02-Oct-07	125,629	31-Jan-08	118,362	02-Jun-08	120,983
03-Oct-07	126,038	01-Feb-08	118,172	03-Jun-08	121,118
04-Oct-07	126,039	04-Feb-08	118,215	04-Jun-08	120,698
05-Oct-07	125,337	05-Feb-08	117,771	05-Jun-08	121,106
08-Oct-07	124,811	06-Feb-08	117,758	06-Jun-08	120,822
09-Oct-07	123,162	07-Feb-08	117,680	09-Jun-08	121,228
10-Oct-07	122,282	08-Feb-08	117,499	10-Jun-08	120,833
11-Oct-07	120,508	11-Feb-08	116,404	11-Jun-08	120,826
12-Oct-07	119,405	12-Feb-08	116,458	12-Jun-08	120,573

15-Oct-07	116,898	13-Feb-08	116,471	13-Jun-08	119,761
16-Oct-07	116,094	14-Feb-08	116,504	16-Jun-08	119,057
17-Oct-07	117,610	15-Feb-08	116,567	17-Jun-08	118,345
18-Oct-07	115,844	18-Feb-08	116,501	18-Jun-08	118,070
19-Oct-07	114,243	19-Feb-08	116,376	19-Jun-08	119,509
22-Oct-07	113,436	20-Feb-08	116,702	20-Jun-08	120,072
23-Oct-07	113,628	21-Feb-08	117,039	23-Jun-08	119,344
24-Oct-07	114,461	22-Feb-08	117,384	24-Jun-08	119,121
25-Oct-07	114,838	25-Feb-08	117,817	25-Jun-08	118,521
26-Oct-07	115,498	26-Feb-08	118,158	26-Jun-08	118,519
29-Oct-07	116,849	27-Feb-08	118,478	27-Jun-08	118,535
30-Oct-07	117,029	28-Feb-08	118,593	30-Jun-08	119,271
31-Oct-07	117,867	29-Feb-08	118,497	01-Jul-08	118,800
01-Nov-07	117,165	03-Mar-08	117,486	02-Jul-08	118,800
02-Nov-07	117,681	04-Mar-08	117,581	03-Jul-08	118,876
05-Nov-07	116,374	05-Mar-08	117,800	04-Jul-08	119,273
06-Nov-07	115,975	06-Mar-08	117,777	08-Jul-08	119,358
07-Nov-07	115,118	07-Mar-08	117,837	09-Jul-08	119,320
08-Nov-07	114,454	10-Mar-08	117,847	10-Jul-08	118,518
09-Nov-07	113,625	11-Mar-08	117,819	11-Jul-08	117,975
12-Nov-07	114,128	12-Mar-08	118,033	14-Jul-08	117,670
13-Nov-07	114,427	13-Mar-08	118,362	15-Jul-08	117,563
14-Nov-07	114,221	14-Mar-08	118,362	16-Jul-08	116,530
15-Nov-07	114,817	17-Mar-08	119,561	17-Jul-08	117,102
16-Nov-07	114,938	18-Mar-08	119,749	18-Jul-08	117,489
19-Nov-07	114,974	19-Mar-08	120,039	21-Jul-08	117,890
20-Nov-07	115,090	25-Mar-08	120,361	22-Jul-08	117,891
21-Nov-07	114,934	26-Mar-08	121,590	23-Jul-08	118,025
22-Nov-07	115,077	27-Mar-08	123,649	24-Jul-08	117,763
23-Nov-07	115,233	28-Mar-08	125,265	25-Jul-08	117,530
26-Nov-07	116,434	31-Mar-08	124,919	28-Jul-08	117,497
27-Nov-07	117,783	01-Apr-08	123,220	29-Jul-08	117,499
28-Nov-07	118,003	02-Apr-08	121,557	30-Jul-08	118,133
29-Nov-07	118,574	03-Apr-08	120,257	31-Jul-08	117,572
30-Nov-07	118,242	04-Apr-08	119,112	01-Aug-08	117,205
03-Dec-07	118,272	08-Apr-08	119,506	04-Aug-08	116,889
04-Dec-07	118,748	09-Apr-08	121,534	05-Aug-08	116,949
05-Dec-07	119,195	10-Apr-08	121,534	06-Aug-08	117,010
06-Dec-07	119,251	11-Apr-08	121,705	07-Aug-08	116,597
07-Dec-07	119,322	14-Apr-08	122,515	11-Aug-08	116,896
10-Dec-07	119,197	15-Apr-08	123,103	12-Aug-08	116,597
11-Dec-07	119,173	16-Apr-08	124,334	13-Aug-08	117,069
12-Dec-07	118,355	17-Apr-08	124,928	14-Aug-08	117,102
13-Dec-07	117,993	18-Apr-08	124,620	15-Aug-08	117,178
14-Dec-07	117,591	21-Apr-08	124,548	18-Aug-08	117,345
17-Dec-07	116,971	22-Apr-08	125,139	19-Aug-08	117,411
18-Dec-07	116,475	23-Apr-08	125,080	20-Aug-08	117,357

19-Dec-07	115,608	24-Apr-08	125,286	21-Aug-08	117,354
21-Dec-07	114,733	25-Apr-08	124,439	22-Aug-08	117,399
24-Dec-07	114,484	28-Apr-08	122,288	25-Aug-08	117,433
27-Dec-07	113,578	29-Apr-08	121,326	26-Aug-08	117,956
28-Dec-07	113,648	30-Apr-08	121,316	27-Aug-08	118,192
31-Dec-07	114,341			28-Aug-08	117,716
				29-Aug-08	117,638

Average exchange rate for one year ending 31 August 2008	119,355 TZS/100 USD
	<b>1,193.5 TZS/USD</b>

## Annex 2- Prices of Diesel announced by EWURA

Year	Month	Period	Diesel Prices Announced by EWURA (TZS/litre)		Average	Location of highest fuel price
			Lowest Price Dar es Salaam	Highest Price See location stated		
2007	Sep	1-15				
		16-30				
	Oct	1-15				
		16-31	1,397.23	1,546.88	1,472.06	Mwanza
	Nov	1-15				
16-30		1,388.66	1,530.51	1,459.59	Mwanza	
Dec	1-15	1,528.30	1,676.95	1,602.63	Mwanza	
	16-31	1,538.96	1,687.61	1,613.29	Mwanza	
2008	Jan	1-15	1,518.86	1,667.51	1,593.19	Mwanza
		16-31				
	Feb	1-15				
		16-29	1,532.80	1,746.15	1,639.48	Kigoma
	Mar	1-15				
		16-31	1,648.47	1,830.75	1,739.61	Kigoma
	Apr	1-15				
		16-30	1,669.42	1,851.70	1,760.56	Kigoma
	May	1-15				
		16-31				
	Jun	1-15	1,846.93	2,086.93	1,966.93	Mara
		16-30				
	Jul	1-15				
		16-31				
	Aug	1-15	1,949.12	2,196.12	2,072.62	Kigoma
16-31		1,949.12	2,196.12	2,072.62		
Average for one year ending 31st August					<b>1726.60</b>	TZS/litre

Note: The price derived is the average of the cheapest and most expensive prices for each two-week interval ending 31<sup>st</sup> August 2008.