



## KERALA STATE ELECTRICITY BOARD LIMITED

(Incorporated under the Companies Act, 1956) CIN:U40100KL2011SGC027424  
Tariff & regulatory Affairs Cell  
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No. KSEBL/TRAC/G/ Tariff Revision/2022-23 /62

28.04.2023

02.05.2023

To:

The Secretary,  
Kerala State Electricity Regulatory Commission  
KPFC Bhavan  
CV Raman Pillai Road,  
Vellayambalam, Thiruvananthapuram-10

Sir,

Sub: Additional submission to the 'Tariff revision proposals for the period from 2023-24 to 2026-27' in the matter of allowing green tariff to consumers of KSEB Ltd -reg.

- Ref: 1. Tariff Revision proposals for the control period 2023-24 to 2026-27 submitted before the Hon'ble Commission on 10.02.2022.  
2. KSERC Letter No. 427/ Con(T) /2023 /KSERC /300 dated 13.04.2023

Kind attention invited to the reference cited above. Hon'ble Commission vide letter referred above had directed to submit necessary proposal for green energy tariff with proper justification. Hence, an additional submission incorporating the proposal for green tariff is submitted herewith for kind consideration and approval of the Hon'ble Commission, along with tariff revision proposal already submitted before the Hon'ble Commission.

Yours faithfully,

Chief Engineer  
Commercial & Tariff

28/04  
1/24  
Q.

Acc: Additional submission

BEFORE THE HON'BLE KERALA STATE ELECTRICITY REGULATORY COMMISSION

In the Matter of : Additional submission to the 'Tariff revision proposals for the Control period from 2023-24 to 2026-27' in the matter of allowing green tariff to consumers of KSEB Ltd.

Petitioner : Kerala State Electricity Board Limited,  
Vudhyuthi Bhavanam,  
Pattom, Thiruvananthapuram.


AFFIDAVIT VERIFYING THE APPLICATION

I, Jayaraj. V., son of N. Vasudevan aged 52 years, residing at Lakshmi Mandiram, Jagathy, Thycadu. P.O., Thiruvananthapuram do solemnly affirm and state as follows:

I am the Chief Engineer (Commercial & Tariff) of Kerala State Electricity Board Limited, Vidyuthi Bhavanam, Pattom, Thiruvananthapuram, the representative of the petitioner in the above matter and I am duly authorized by KSEB Ltd. to make this affidavit on its behalf. I solemnly affirm at Thiruvananthapuram on this the 28<sup>th</sup> April 2023 that

- (i) Contents of the above petition are true to my information, knowledge and belief. I believe that no part of it is false and no material has been concealed there from.
- (ii) That the statements made in paragraphs of the accompanying application now shown to me are true to my knowledge and are derived from the official records made available to me and are based on information and advice received which I believe to be true and correct.

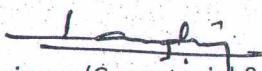
Deponent

  
Chief Engineer (Commercial & Tariff)  
Kerala State Electricity Board Limited,  
Vidyuthi Bhavanam, Pattom  
Thiruvananthapuram – 695 004.

**VERIFICATION**

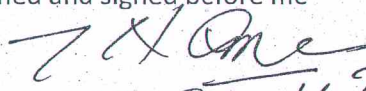
I, Jayaraj. V., son of N. Vasudevan aged 52 years, residing at Lakshmi Mandiram, Jagathy, Thycadu.P.O., Thiruvananthapuram and the above named deponent, solemnly affirm at Thiruvananthapuram on this the 28<sup>th</sup> April 2023 that the contents of the petition are true to my information, knowledge and belief, that no part of it is false and that no material has been concealed there from.

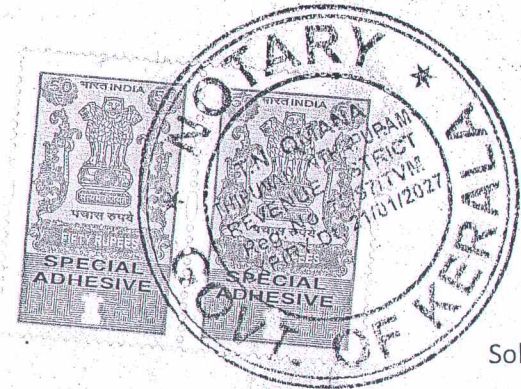
Deponent

  
Chief Engineer (Commercial & Tariff)  
Kerala State Electricity Board Limited,  
Vidyuthi Bhavanam, Pattom  
Thiruvananthapuram – 695 004.

Solemnly affirmed and signed before me

Advocate and Notary

  
28/4/2023  
T.N. OMANA  
Advocate & Notary  
Thiruvananthapuram Revenue District  
Kerala State South India



80/10/607/2023  
at 28/4/2023  
M. P. Anand  
B. S. S. S. S.



**BEFORE THE HON'BLE KERALA STATE ELECTRICITY REGULATORY COMMISSION**

In the Matter of : Additional submission to the 'Tariff revision proposals for the Control period from 2023-24 to 2026-27' in the matter of allowing green tariff to consumers of KSEB Ltd.

Petitioner : Kerala State Electricity Board Limited,  
Vudhyuthi Bhavanam,  
Pattom, Thiruvananthapuram.

1. The Petitioner, KSEB Ltd. may humbly submit the following before the Hon'ble Commission for the kind consideration. KSEB Ltd. has filed an application for Tariff Revision proposals for the period from 2023-24 to 2026-27 before the Hon'ble Commission on 08.02.2023.
2. The Central Government has notified the Electricity (Promoting Renewable Energy Through Green Energy Open Access) Rules, 2022 on 6<sup>th</sup> January 2022 and the amendment rules, 2023 has been notified on 27.01.2023.
3. The salient features and benefits to common consumers from 'Green Energy Open Access' are as follows:
  - a. These rules are notified for promoting generation, purchase and consumption of green energy including the energy from Waste-to-Energy plants.
  - b. The Green Open Access is allowed to any consumer and the limit of Open Access Transaction has been reduced from 1 MW to 100 kW for green energy, to enable small consumers also to purchase renewable power through open access.
  - c. Consumers are entitled to demand supply of Green Power from DISCOMs. DISCOMs would be obligated to procure and supply green power to eligible consumers.
4. Power consumers in the Country are very conscious about the source of electricity supplied to them. A lot of consumers, especially in the Commercial & Industrial segments, are eager to switch over to Renewable Energy (RE) for a rapid transition to a zero-carbon economy. In Kerala also, consumers are expressing their interest to switch over to Renewable Energy and one among them is Tata Consultancy Service (TCS). Considering various issues/challenges in existing available options for procurement of

100% renewable energy for the interested consumers, KSEBL is considering to provide Green Tariff to the interested consumers to meet their 100% renewable energy commitment.

5. Hon'ble Commission, vide letter No. 427/ Con(T) /2023 /KSERC /300 dated 13.04.2023, has directed KSEB Ltd. to submit necessary proposal for green energy tariff with proper justification.
6. The proposed Green Tariff is a premium charge over existing retail tariff, duly approved by the Hon'ble Commission, which shall be reflective of the extra cost to be incurred by KSEB Ltd. on additional renewable energy procurement over its average power purchase cost and charges for compensating the licensee for intermittent nature of such energy.
7. Further, with a view to encourage the Entrepreneurs / consumers who wish to fulfil their green energy/ zero carbon emission commitments, the KSEB Ltd. is proposing Green Tariff which is framed in a premium form to ensure that the extra charges for procurement and supplying of renewable energy charged for the specific consumers, who opt for green tariff would not get loaded on rest of the consumers.
8. Components of Green tariff: For supplying exclusive round the clock green energy for the consumers, the licensee incurs additional cost – for additional RE procurement as well as to handle the intermittent nature of Renewable energy. There would be large variation during a day between RE generation and consumption on real time basis. Therefore, even if the quantum of RE generation and consumption is matching on monthly basis, there would be additional cost implication on KSEB Ltd. Such additional cost components are preliminary identified and categorized as under:

(a) Marginal Purchase Cost

(b) Banking/Storage Cost

(c) Backing Down Cost of Conventional Generator to absorb RE

(d) DSM Charges

(a) Marginal Purchase Cost:

Marginal cost indicates the incremental cost estimated to be incurred for arranging Green Energy. The marginal cost associated with arranging additional RE power towards meeting green energy requirement of the consumer needs to be factored in while determining the Green Energy Tariff. The Hon'ble Commission in the ARR order

for the period 2022-27 (OP No. 11/2022) has approved power purchase quantum and purchase cost for meeting both consumers demand in the state and RPO targets. As per ARR order for the period 2022-27, renewable energy purchase approved for the year 2023-24 is 1741.652 MU and the purchase cost approved is Rs. 524.22 Cr. Thus, the average cost of electricity purchase from renewable energy source is **Rs.3.00 per unit.**

Hon'ble Commission has approved renewable energy purchase mainly for meeting the RPO target of KSEB Ltd. and hence the approved renewable energy purchase quantum for the year 2023-24 is not sufficient to meet the green energy requirement of the consumer, who intend to be avail green tariff. This necessitates additional procurement of renewable energy. However, with this additional RE procurement, there may be situation of surplus energy in the system forcing KSEB Ltd. to surrender the already tied up conventional sources. In this process, there is a saving in variable cost of these stations which is also factored in arriving the marginal cost of purchase of renewable energy. The cost of additional green energy purchase is calculated by taking difference between tariff for green energy purchase and the weighted average variable cost of electricity from non-renewable energy source to pass through the savings in variable cost of non-renewable sources surrendered.

In the analysis, sources having 'must run' status has not been considered among the sources approved by the Hon'ble Commission for the year 2023-24. The approved Variable cost for CGS and LTA stations for the year 2023-24 is as tabulated below. In the case of Unapproved DBFOO contracts, the Hon'ble Commission has not approved the variable cost separately. Hence the variable cost of Unapproved DBFOO contract is arrived by taking the weighted average variable cost of approved DBFOO contracts.

The average cost of power purchase from non-renewable sources (variable Charge) as per Hon'ble Commissions approval for the FY 2023-24 is **Rs. 2.19** per unit.



**KSERC approved Variable cost for CGS and LTA stations for the year 2023-24**

<b>Station/ Source</b>	<b>Energy availability at KSEB Ex. BUS ( MU)</b>	<b>Variable Charge (Rs/unit)</b>
RSTPS STAGE 1&II	1696.31	2.83
RSTPS STAGE 1II	425.93	2.66
TALCHER	2980.96	1.9
SIMHADRI	600.03	2.98
NLC II STAGE 1	422.33	2.75
NLC II STAGE 2	603.17	2.75
NLC EXP STAGE 1	464.13	2.5
NLC II EXP	511.51	2.65
VALLUR	350.72	3.26
NTPL	506.33	3.13
KUDGI	780.71	3.64
NNTPP	226.17	2.28
MAITHON BID 1	999.46	2.59
MAITHON BID 2	999.46	2.59
DVC MEJIA	681.31	2.99
DVC RTPS	336.12	3.2
JINDAL	1446.58	1.33
BALCO	723.29	1.18
Unapproved DBFOO	3363.29	1.28
MTOA	962.75	1.71
<b>Non-RE Per Unit Rate (variable Charge) as per KSERC approval – 2023-24</b>		<b>2.19</b>

Thus, the marginal purchase cost of Renewable energy for meeting green energy requirement of a consumer is Rs. 0.81/kwh. (3.00-2.19)

**(b) Banking/Storage Cost:**

Supplying RE power on round the clock basis always necessitates storage and banking of renewable power as RE power is season specific and, in a day, available for a limited duration only. If KSEBL is procuring additional power from solar plant, the power will be available to KSEBL only during the day when sunlight is available and considering the requirement of RE power for consumer as 100% of its entire consumption, KSEBL would have to arrange RE power for entire day. In such cases

the KSEBL would have to arrange storage facility for such infirm power. The banking quantity and charges depends on the consumption pattern.

The HT/EHT consumption data, including open access for the period 2022-23 is considered for analysing the consumption pattern is mentioned below;

HT/EHT Zone wise Consumption pattern (%) for the period 2022-23			
Month	Normal Zone (Z1)	Peak Zone (Z2)	Off Peak Zone (Z3)
April-22	56.22	15.67	28.05
May-22	56.48	15.49	27.97
June-22	56.11	15.69	28.13
July-22	56.42	15.56	27.96
August-22	55.99	15.7	28.25
September-22	55.95	15.79	28.18
October-22	55.82	15.79	28.32
November-22	56	15.72	28.22
December-22	56.36	15.57	28
January-23	55.93	15.66	28.33
February-23	46.25	20.8	32.93
March-23	55.7	15.88	28.35
Average	55.27%	16.11%	28.56%

As per the consumption pattern, Zone 1, Zone 2 and Zone 3 consumptions are 55.27 %, 16.11 % and 28.56% of total consumption respectively. Hence, If KSEBL is procuring additional power from solar plants for meeting the energy requirement of a consumer who opts green tariff, the consumer will consume only 55.27 % of total generation during the solar generation period. The solar energy generated and available during the day time needs to be stored to meet the consumers balance energy requirement at other times. Although there are technologies where the electricity can be stored in a small quantum however the technology for storing electricity on large-scale on commercial basis is still under development.



Hence, the cost of energy to be stored is calculated by taking the difference between the GDAM purchase rate during evening/night hours (as applicable) and the sale price during day time, on the assumption that the surplus electricity, unused by the consumer, during Zone 1 period, can be sold in the GDAM and an equivalent electricity can be bought from GDAM during other Zones at the respective prices to meet the consumer's demand for green energy. For this, the market clearing price of GDAM for the year 2022-23 is taken and tabulated below:

Clearing price of GDAM (S<sub>3</sub> Region)

Summary	Rate (Rs/kwh)
RTC	6.4877
Evening	8.27406
Day	5.31678
Night	6.03054
Morning	6.65732

Thus, the banking cost is calculated by estimating the additional renewable energy requirement as 100 MW with CUF at 21% (KSERC approved). The Per Unit Banking Charge is determined is Rs. 1.523 Rs/kwh as mentioned below:

Banking Charge Calculation		
RE estimated quantity	100.000	MW
CUF	21.000	%
Yearly Generation	183.960	MU
Z1 Consumption (Yearly)	101.673	MU
Z2 Consumption (Yearly)	29.636	MU
Z3 Consumption (Yearly)	52.534	MU
Banking Charge for Z2 consumption (Difference between GDAM price of evening and day time)	2.957	
Banking Charge for Z3 consumption (Difference between GDAM price of night and day time)	0.714	
<b>Per Unit Banking Charge</b>	<b>1.523</b>	<b>Rs/kwh</b>

(c) Backing Down Cost of Conventional Generator to absorb RE:

DISCOMs are expected to face various integration issues when they procure renewable energy. Renewables being given the must-run status, is scheduled despite leading to backing down of conventional generators and payment of higher fixed charges. Sometimes, DISCOMs are forced to sell power at cheaper rate to ensure must-run status.

Further, at the time when RE generation is higher than consumption, generation from the conventional sources needs to be backed down. The excess generation from tied up RE sources for supply under green tariff rate, will results KSEBL to pay backing down cost to already tied up conventional generators due to degradation of Heat Rate, auxiliary energy consumption, higher consumption of Secondary Fuel Oil etc. for running the plant at below the specified Plant Load Factor. The compensation charges by backing down the conventional generating plant due to additional purchase of renewable energy is determined based on the actual compensation charge paid by KSEBL during the FY 2021-22 due to degradation of Heat Rate, auxiliary Energy Consumption, secondary fuel oil is indicated below:

Compensatory Charges actually paid during FY 2021-22

Station	SIMHADRI	NTPL	Vallur	Total
<b>Compensatory Charges (Rs)</b>	70730097	85086607	23849654	179666358
<b>Energy Scheduled in units</b>	413744930.8	238898355.8	206941100.6	859584387

Thus, the compensation charge computed as Rs. 0.21 Rs/kwh.

(d) DSM Charges

The Variable renewable Energy generators are being weather dependent and hence with the increasing of variable renewable energy sources in the grid, balancing power is used to stabilize the active power balance of integrated power systems on short time scales from seconds to hours. In AC power systems, the demand–supply balance has to hold at every instant of time to ensure frequency stability at, usually around 50 Hz.

As per the “Report of the Forum of Regulators on “analysis of factors impacting retail tariff and measures to address them” the cost of balancing renewables

has been estimated to be in the range of Rs.1.10/unit by CEA. In addition, as per the report, the additional stranded capacity cost (incremental fixed charge) estimated on account of RE integration is in the range of Rs.1.02/ unit.

Due to the intermittent nature of the green energy and due to the variation in consumption pattern may results additional financial impact on DSM charges of KSEBL. Hence the variability and unpredictability of renewable generation contributes to deviations leading to payment of penalties for violation of operating limits, under the DSM Regulations.

Normally this impact shall be loaded to such consumers who avail green energy. However, in the present petition, KSEBL is not charging this cost as there is no intrastate deviation mechanism for accurately assessing the cost of deviation. But KSEBL is humbly requested before the Hon'ble Commission that, once intrastate DSM mechanism is introduced in the state, such charges shall be included for the determination of green tariff.

In terms of the above, the computation of green tariff is summarized as under:

Sl. No	Particulars	Cost (Rs/kwh)
a	Marginal Purchase Cost	0.81
b	Banking/Storage Cost	1.523
C	Backing Down Cost of Conventional Generator to absorb RE	0.21
d	<b>Total</b>	<b>2.543</b>

9. Thus, KSEBL is proposing a premium Green Tariff of Rs.2.543/kWh. The proposed Green Tariff is a premium charge over existing retail tariff and all other charges as approved in the KSERC tariff order shall be applicable to respective category of consumers. This green tariff shall be revised annually on a Petition by KSEBL.

Further, Green tariff being a new category, it is not possible to ascertain the number of consumers who may opt for this tariff category.


The consumers requiring green tariff may apply to KSEBL one year in advance with the requirement and duration of supply. The consumers opting for green tariff shall



avail it for a minimum of 1 year. Therefore, it is not possible to quantify the sales quantum under this category presently. However, KSEBL will capture and present the impact of this new tariff category during the truing up of FY 2023-24. In the view of the above, Hon'ble Commission may kindly approve a premium tariff of Rs. 2.543/kWh, over and above the retail supply tariffs of respective categories of consumers, who have opted for Green Power Tariff for the FY 2023-24.

Prayer

KSEB Ltd. humbly request before the Hon'ble Commission to consider the above proposal and to read along with the Tariff Revision Proposals submitted before the Hon'ble Commission, for the period from 2023-24 to 2026-27 on 08.02.2023.

  
Chief Engineer (Commercial & Tariff)  
