

**KERALA STATE ELECTRICITY REGULATORY COMMISSION
THIRUVANANTHAPURAM**

PRESENT: Shri. K.J.Mathew, Chairman
Shri. C. Abdulla, Member
Shri. M.P.Aiyappan, Member

Petition No. CT/SOLAR JNNSM/KSERC/2010

August 4, 2010

IN THE MATTER OF

“Jawaharlal Nehru National Solar Mission” – Tariff for grid connected Solar
Plants – Tariff Order for Grid Connected Solar PV Power Plants (Above 3 MW), Solar
Thermal Plants and Roof Top (PV) and other small solar Power Plants of capacity from
1 MW upto 3 MW

ORDER

1. The Government of India has approved a new policy on development of solar energy in the country by launching of the Jawaharlal Nehru National Solar Mission. This Mission is one of the eight key National Missions which comprise India’s National Action Plan on Climate Change. It has a twin objective – to contribute to India’s long term energy security as well as its ecological security. The Solar Mission recommends the implementation in 3 stages leading up to an installed capacity of 20,000 MW by the end of the 13 th Five Year Plan in 2022. It is envisaged that as a result of rapid scale up as well as technological developments, the price of solar power will attain parity with grid power at the end of the Mission, enabling accelerated and large-scale expansion thereafter. The Mission will adopt a 3-phase approach, spanning the remaining period of the 11th Plan and first year of the 12th Plan (up to 2012-13) as Phase 1, the remaining 4 years of the 12th Plan (2013-17) as Phase 2 and the 13th Plan (2017-22) as Phase 3.

As per the above Policy, the solar power purchase obligation for States may start with 0.25% in the phase I may go up to 3% by 2022. This can be complemented with a solar specific Renewable Energy Certificate (REC) mechanism to allow utilities and solar power generation companies to buy and sell certificates to meet their solar power purchase obligations. Under Jawaharlal Nehru National Solar Mission (JNNSM) guidelines for selection of new Grid Connected Solar Projects under Phase I the minimum project capacity shall be 5 MW and 20MW in case of Solar Photo Voltaic Projects and Solar Thermal Project respectively. The maximum capacity for each project of Solar Photo Voltaic technology would be 25 MW and 100 MW for Solar thermal technology. The evacuation under this scheme will be 33 kV and above. For each MW installed capacity of solar power for which a PPA is signed by NRVN, the Ministry of Power (MoP) shall allocate to NRVN an equivalent amount of MW (upto a maximum of 1000 MW) capacity from the unallocated quota of NTPC coal based stations and NRVN will supply this “bundled” power to the Distribution Utilities.

2. The mission also encourages rooftop solar PV and other small solar power plants, connected to LT/11 KV grid, to replace conventional power and diesel based generators. The distribution utility will pay the tariff determined by the State Electricity Regulatory Commission for the metered electricity generated from such applications . Under the Solar Mission, a normative Generation Based Incentive will be payable to the utility and would be derived as the difference between the solar tariff determined by the Central Electricity Regulatory Commission for the concerned solar generation technology less an assumed base price of Rs. 5.50/kWh with 3% annual escalation. Funds will be disbursed through Indian Renewable Energy Development Agency (IREDA), a PSU under MNRE. The distribution utilities will be entitled to account such electricity generated and consumed within their license areas for fulfillment of RPOs.
3. The Ministry of new and renewable energy (MNRE) , Government of India with a view to encourage solar power generation announced the Generation based incentive programme for Grid Interactive Solar photo Voltaic (PV) Power Generation and Grid Interactive Solar Thermal Power Generation projects during January 2008. KSERC

published the Kerala State Electricity Regulatory Commission (Power Procurement from Solar Plants by Distribution Licensees) Regulations, 2008, providing terms and conditions and the procedure for determination of tariff of Solar PV power plants. The levelised tariff including incentive receivable at 12% discount rate was Rs 15.18/Unit. In order to avail the generation based incentive the projects should have been completed on or before 31-12-2009.

4. In pursuance of the Regulation, the Commission, by this order, based on the financial principles and technology specific parameters as per CERC order dated 26-02-2010 ,determines the tariff for FY 2010-11 and FY 2011-12 in the case of solar photovoltaic power projects and for FY 2010-11, FY 2011- 12 and FY 2012-13 for solar thermal power projects subject to the condition that power purchase agreement (PPA) for such Solar PV and Solar thermal power projects shall be signed before 31.3.2011 and the entire capacity shall be commissioned on or before 31.3.2012 in the case of solar PV projects and on or before 31.3.2013 in the case of thermal projects
5. The Commission has published draft notification on the Tariff Applicable to Solar PV Power Projects including Roof Top and other small projects and Solar thermal Power Projects on 8-07-2010 In response to the above notification comments from the following stakeholders were received.

- (a) Malankara Plantations Limited, Kottayam.
- (b) Binani Zinc Limited, Binanipuram.
- (c) Kerala State Electricity Board.

Public hearing was held 21-07-2010. Representatives of the above stakeholders and KSE Board attended the hearing and offered their comments/suggestions on the norms specified in the draft order.

Commission upon hearing all the parties having carefully considered the issues involved orders as follows.

The tariff determined by the Commission in this Order shall be applicable to the following projects located within Kerala State and selling electricity to the distribution licensees within Kerala State only.

- (a) Solar PV Power plants (Above 3 MW) for which purchase agreements are signed by 31-03-2011 and projects are commissioned by 31-03-2012.
- (b) Solar Thermal Plants for which power purchase agreements are signed by 31-03-2011 and projects commissioned by 31-03-2013.
- (c) Roof Top and other small Solar Power Plants of capacity from 1 MW up to 3 MW connected to the Distribution Network (below 33 kV) for which power purchase agreements are signed by 31-03-2011 and projects are commissioned by 31-03-2012.

The MNRE's draft guidelines for Rooftop PV and other small Solar Power Plants connected to distribution network (below 33 kV) under the Jawaharlal Nehru National Solar Mission specified that the Solar project schemes from States wherein Tariff tenure for duration of 25 years with tariff structure on levelised basis has been determined by SERCs shall alone be considered to be eligible to participate in this Programme.

6. Therefore, Commission orders the following Levelised Tariff based on the norms as per Annexure I by carrying out levelisation for 'useful life' duly considering the discount factor for time value of money. The discount factor considered for this purpose is equal to the weighted average cost of the capital on the basis of normative debt: equity.

**Summary of Solar Power Tariff for Projects qualified under Jawaharlal
Nehru National Solar Mission**

SI No	Particulars	Tariff (Rs/kWh)	Tariff if accelerated depreciation is availed (Rs/kWh)
1)	Solar PV Power plants (Above 3 MW) for which purchase agreements are signed by 31-03-2011 and projects are commissioned by 31-03-2012.	17.91	14.95
2)	Solar Thermal Plants for which power purchase agreements are signed by 31-03-2011 and projects commissioned by 31-03-2013.	15.31	12.85
3)	Roof Top (PV) and other small Solar Power Plants of capacity from 1 MW up to 3 MW connected to Distribution Network (below 33 kV) for which power purchase agreements are signed by 31-03-2011 and projects are commissioned by 31-03-2012.	17.91	14.95

The levelised tariff indicated in the above chart shall be inclusive of the Generation Based Incentive (GBI) calculated with a base rate (effective net cost to the Discom) of Rs.5.50 / kWh (or the modified base rate with escalation factor of 3% per annum) available under the scheme of Roof Top and Small Solar Power Projects and shall be subject to the terms and conditions stipulated in the scheme. The developers are to provide electricity to Licensees at these rates for a period of 25 years without any escalation.

Sd/-
M.P. Aiyappan
Member

Sd/-
C. Abdulla
Member

Sd/-
K.J.Mathew
Chairman

By Order of the Commission

Secretary

Annexure- I

Norms for Solar PV Plant and Solar Thermal Plant

1. Capital Cost

Capital cost is one of the most important parameters for solar power tariff determination. The cost of a solar power project is mainly dependent on the cost of PV modules / plant and machinery, technology adopted, location of the site and capacity. Therefore, Commission fixes a capital cost of Rs. 16.90 Crores / MW for solar photovoltaic power plants and Rs. 15.30 Crores / MW for solar thermal power project as per CERC norms for FY 10-11.

2. Capacity Utilization Factor (CUF)

CUF is the ratio of actual energy generated by the Solar PV / Thermal project over the year to the equivalent energy output at its rated capacity over the yearly period. CUF for Solar PV project depends on solar radiation and number of clear sunny days. Further, the CUF depends on site specific parameters like ambient conditions, conversion efficiencies of PV cell, etc The Central Electricity Regulatory Commission has considered average number of clear sunny days of around 300 and daily average global solar radiation to be around 5.8 kWh/Sq.mtr/day. Commission adopts a CUF of 19% for solar PV project and 23% for solar thermal project with auxiliary consumption factor 10% as per CERC norms

3. Debt - equity ratio

As per the guide lines specified in the tariff policy for financing of future capital cost of projects, a debt: equity ratio of 70:30 is adopted.

4. Term of the loan

CERC regulation has proposed loan tenure of 10 years and the same is adopted.

5. Interest rate on Loan

CERC has adopted Long Term Prime Lending Rate (LTPLR) of State Bank of India (SBI) prevalent during the previous year plus 150 basis points. Considering the above, Commission adopts an interest rate 13.39 %.

6. Interest on Working Capital

The Central Electricity Regulatory Commission has included the following components in working capital .

- (i) Operation and Maintenance expenses for one month;
- (ii) Maintenance spares @ 15% of the O&M expenses,
- (iii) Receivables equivalent to 2 months of energy charges for sale of electricity calculated on the normative CUF;

CERC fixed an interest rate equivalent to average State Bank of India short term PLR during the previous year plus 100 basis points. Considering the above, Commission proposed to adopt an interest rate of 12.89 % on working capital

7. Return on equity

The Commission proposes to adopt pre-tax RoE of 19% for the first 10 years and 24% from 11 th year onwards for all solar power projects.

8. Plant Life

Commission proposed to consider the plant life of 25 years for the solar power projects as per CERC Norms

9. Depreciation of plant and machinery

Depreciation rate 7% for first 10 years and 1.33% for the remaining years for solar projects.

10. Operation and Maintenance

Commission decides O&M costs as Rs 9.5148 Lakhs/MW/year with escalation factor 5.72% for Solar PV Power Projects and Rs 13.74 Lakhs/MW/year with escalation factor 5.72% for Solar Thermal Power Plant .

The cost plus levelised tariff for 25 years for Solar PV plants Including Roof Top and other small Solar Power Plants of capacity from 1 MW up to 3 MW is 17.91 Rs/Unit and the benefit of accelerated depreciation (if availed) works out to 2.96 Rs/Unit. The net applicable tariff shall be Rs 14.95 /Unit.

The Cost plus levelised tariff for Solar thermal Plants shall be 15.31 Rs/Unit and the benefit of accelerated depreciation (if availed) works out to Rs 2.46/Unit. The net applicable tariff shall be Rs 12.85/Unit