

Jharkhand State Electricity Regulatory Commission



**Order
on
Determination of
Levellised Generation Tariff
for
1.2 MW Grid Connected Solar PV Project
of
Chotanagpur Green Energy Development Pvt. Ltd
(CGEDPL)**

Ranchi

July 2015

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List of Abbreviations

Abbreviation	Description
CERC	Central Electricity Regulatory Commission
CGEDPL	Chotanagpur Green Energy Development Private Limited
FY	Financial Year
GFA	Gross Fixed Assets
GoI	Government of India
JSERC	Jharkhand State Electricity Regulatory Commission
Kg	Kilogram
kWh	Kilowatt-hour
MUs	Million Units
MW	Megawatt
O&M	Operations and Maintenance
PLF	Plant Load Factor
PPA	Power Purchase Agreement
RES	Renewable Energy Sources
R&M	Repair and Maintenance
RoE	Return on Equity
Rs	Rupees
SBI	State Bank of India
SERC	State Electricity Regulatory Commission

BEFORE

**Jharkhand State Electricity Regulatory Commission,
Ranchi**

Case No.: 18 of 2014

In the matter of:

**Petition for determination of Levellised Generation Tariff for 1.2 MW
Grid Connected Solar PV Power Project at Sikidri, Ranchi**

And

In the matter:

Chotanagpur Green Energy Development Pvt. Ltd. (CGEDPL), 805, Amravati
Apartment, Lalpur Chowk, Ranchi

PRESENT

Hon'ble Mr. Justice Narendra Nath Tiwari - Chairperson

Hon'ble Mr. Sunil Verma - Member (F)

Dated: 08 July 2015

Order

In this Petition, Chotanagpur Green Energy Development Pvt. Ltd. (hereinafter referred to as 'CGEDPL') has prayed for determination of levellised generation tariff for 25 years for power generated from the proposed 1.2 MW Grid Connected Solar PV based power plant of CGEDPL at Sikidri, Ranchi for sale to Jharkhand Bijli Vitran Nigam Ltd. (JBVNL) in the State of Jharkhand.

A1: INTRODUCTION

Jharkhand State Electricity Regulatory Commission

- 1.1 The Jharkhand State Electricity Regulatory Commission (hereinafter referred to as the “JSERC” or “the Commission”) was established by the Government of Jharkhand under Section 17 of the Electricity Regulatory Commission Act, 1998 on August 22, 2002. The Commission became operational with effect from April 24, 2003. The Electricity Act, 2003 (hereinafter referred to as “the Act” or “EA, 2003”) came into force with effect from June 10, 2003; and the Commission is now deemed to have been constituted and functioning under the provisions of the Act.
- 1.2 The Government of Jharkhand vide its notification dated August 22, 2002 had defined the functions of JSERC as per Section 22 of the Electricity Regulatory Commission Act, 1998 to be the following, namely:-
- (a) to determine the tariff for electricity, wholesale, bulk, grid or retail, as the case may be, in the manner provided in section 29;
 - (b) to determine the tariff payable for the use of the transmission facilities in the manner provided in section 29;
 - (c) to regulate power purchase and procurement process of the transmission utilities and distribution utilities including the price at which the power shall be procured from the generating companies, generating stations or from other sources for transmission, sale, distribution and supply in the State;
 - (d) to promote competition, efficiency and economy in the activities of the electricity industry to achieve the objects and purposes of this Act.
- 1.3 After the Electricity Act, 2003 came into force, the earlier Electricity Regulatory Commission Act of 1998 stands repealed and the functions of SERCs are now defined under Section 86 of the Act.
- 1.4 In accordance with Section 86 (1) of the Act, the JSERC discharges the following functions: -
- (a) determine the tariff for generation, supply, transmission and wheeling of electricity, wholesale, bulk or retail, as the case may be, within the State:
- Provided that where open access has been permitted to a category of consumers under section 42, the State Commission shall determine only the wheeling charges and surcharge thereon, if any, for the said category of consumers;

- (b) regulate electricity purchase and procurement process of distribution licensees including the price at which electricity shall be procured from the generating companies or licensees or from other sources through agreements for purchase of power for distribution and supply within the State;
- (c) facilitate intra-state transmission and wheeling of electricity;
- (d) issue licences to persons seeking to act as transmission licensees, distribution licensees and electricity traders with respect to their operations within the State;
- (e) promote cogeneration and generation of electricity from renewable sources of energy by providing suitable measures for connectivity with the grid and sale of electricity to any person, and also specify, for purchase of electricity from such sources, a percentage of the total consumption of electricity in the area of a distribution licensee;
- (f) adjudicate upon the disputes between the licensees and generating companies; and to refer any dispute for arbitration;
- (g) levy fee for the purposes of this Act;
- (h) specify State Grid Code consistent with the Grid Code specified under Clause (h) of sub-section (1) of Section 79;
- (i) specify or enforce standards with respect to quality, continuity and reliability of service by licensees;
- (j) fix the trading margin in the intra-state trading of electricity, if considered, necessary;
- (k) discharge such other functions as may be assigned to it under this Act.

1.5 The Commission has to also advise the State Government as per sub section 2 of Section 86 of the Act, on all or any of the following matters, namely :-

- (a) promotion of competition, efficiency and economy in activities of the electricity industry;
- (b) promotion of investment in electricity industry;
- (c) reorganisation and restructuring of electricity industry in the State;
- (d) matters concerning generation, transmission, distribution and trading of electricity or any other matter referred to the State Commission by that Government.

- 1.6 The State Commission ensures transparency while exercising its powers and discharging its functions.
- 1.7 In discharge of its functions, the State Commission is also guided by the National Tariff Policy as brought out by GoI in compliance to Section 3 of the Act. The objectives of the National Tariff Policy are to:
- (a) ensure availability of electricity to consumers at reasonable and competitive rates;
 - (b) ensure financial viability of the sector and attract investments;
 - (c) promote transparency, consistency and predictability in regulatory approaches across jurisdictions and minimize perceptions of regulatory risks;
 - (d) promote competition, efficiency in operations and improvement in quality of supply.

The Petitioner - Chotanagpur Green Energy Development Private Limited, Ranchi

- 1.8 The Petitioner, Chotanagpur Green Energy Development Private Limited, Ranchi (hereinafter referred to as 'CGEDPL' or the 'Petitioner') is a private company limited incorporated under the Companies Act 2013 with its registered office at 805, Amravati Apartment, Lalpur Chowk, Ranchi, Jharkhand. The main objective pursued by the company is to promote, develop, operate and maintain power plants for generation, transmission, selling and distribution of all types of Renewable Energy and plans to set up Grid Connected Solar PV Power Plants at various locations in Jharkhand.
- 1.9 The Petitioner has initiated action to implement a 1.2 MW Solar PV project at Hesatu, Block-Angara, P.S.-Sikidri, Ranchi for sale to Jharkhand Bijli Vitran Nigam Ltd. (JBVNL) in the State of Jharkhand.

Scope of the Present Order

- 1.10 This Order relates to the Petition filed by CGEDPL before JSERC for approval of levellised generation tariff for 25 years for power generated from the proposed 1.2 MW Grid Connected Solar PV based power project.
- 1.11 The Petitioner in the above mentioned Petition has prayed for before the Commission:
- (a) To determine levellised tariff for 25 years for power generated from the proposed 1.2 MW Grid Connected Solar PV based power generation plant of CGEDPL at Hesatu, Block-Angara, P.S.-Sikidri, Ranchi for sale to Jharkhand Bijli Vitran Nigam Ltd.(JBVNL) in the State of Jharkhand;

- (b) To direct the licensee Jharkhand Bijli Vitran Nigam Ltd. (JBVNL) to purchase the electricity generated from the Solar PV project at the tariff approved by the Commission;
- (c) To direct the licensee JBVNL to provide evacuation facilities at 11 KV/ 33 KV to the project;
- (d) To pass such order(s) as the Hon'ble Commission may deem fit and proper keeping in view the facts and circumstances of the case.

Basis of Consideration

- 1.12 The Commission in this Order has determined levellised generation tariff for 25 years for power generated from the proposed 1.2 MW Grid Connected Solar PV based power plant after thorough scrutiny of the information submitted by the Petitioner.
- 1.13 While approving the generation tariff for the Petitioner, the Commission has taken into consideration the following:
 - (a) Provisions of the Electricity Act, 2003,
 - (b) Provisions of the National Electricity Policy (NEP),
 - (c) Provisions of the National Tariff Policy (NTP);
 - (d) Principles and provisions laid down in the JSERC (Determination Of Tariff For Procurement Of Power From Solar PV Power Project And Solar Thermal Power Project) Regulations, 2010 (hereinafter referred to as the 'Solar Tariff Regulations 2010');
 - (e) Principles and provisions laid down in the CERC (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2012 as amended from time to time (hereinafter referred to as 'the CERC RE Tariff Regulations 2012');
 - (f) Methodologies and principles adopted by the Central Electricity Regulatory Commission (CERC) in determination of generic levellised generation tariff for Solar PV power plants for FY 2015-16 (hereinafter referred to as 'the CERC RE Tariff Order FY 2015-16');

A2: PROCEDURAL HISTORY

Background

- 2.1 The Petitioner filed its Petition for approval of levellised generation tariff for the power produced from the proposed Solar PV power plant on October 15, 2014.
- 2.2 The Petitioner in the above mentioned Petition has prayed for before the Commission:
- (a) To determine levellised tariff for 25 years for power generated from the proposed 1.2 MW Grid Connected Solar PV based power generation plant of CGEDPL at Hesatu, Block-Angara, P.S.-Sikidri, Ranchi for sale to Jharkhand Bijli Vitran Nigam Ltd.(JBVNL) in the State of Jharkhand;
 - (b) To direct the licensee Jharkhand Bijli Vitran Nigam Ltd. (JBVNL) to purchase the electricity generated from the Solar PV project at the tariff approved by the Commission;
 - (c) To direct the licensee JBVNL to provide evacuation facilities at 11 KV/ 33 KV to the project;
 - (d) To pass such order(s) as the Hon'ble Commission may deem fit and proper keeping in view the facts and circumstances of the case.

Information Gaps in the Petition

- 2.3 In accordance with Section 64(3) of the Act, the State Electricity Regulatory Commission, within one hundred and twenty days of the filing of application for determination of tariff, is required to either accept it and issue a tariff order or reject the application for reasons to be recorded in writing. The Commission accepted the application submitted by the Petitioner for determination of tariff. As part of tariff determination exercise for the Control Period, several deficiencies/information gaps were observed in the Petition submitted by the Petitioner.
- 2.4 The deficiencies/ information gaps in the Petition were communicated to the Petitioner vide letter no JSERC/18 of 2014/664 dated December 19, 2014. The Petitioner submitted its replies vide letter no. CGEDPL/JSERC/01-0115 dated January 15, 2015.

Inviting Public Comments/Suggestions

- 2.5 The Commission directed the Petitioner to make available copies of the same to the members of general public on request, and also issue a public notice inviting comments/ suggestions on the Petition.

- 2.6 The aforesaid public notice was issued by the Petitioner in various newspapers and a period of twenty one (21) days was given to the members of the general public for submitting their comments/suggestions.

Table 1: List of newspapers and dates on which the public notice by CGEDPL appeared

Sl. No.	Newspaper (Jamshedpur edition)	Date of Publication
1.	The Pioneer (English)	31 st March 2015
2.	The Morning India (English)	31 st March 2015
3.	Aaj (Hindi)	31 st March 2015
4.	Jharkhand News Line (Hindi)	31 st March 2015

- 2.7 Subsequently, the Commission also issued a notice on its website www.jserc.org and various newspapers for conducting the public hearing on the Tariff petition filed by the Petitioner. The details of the newspapers where the notice was issued by the Commission are as under:

Table 2: List of newspapers and dates on which the public notice by JSERC appeared

Sl. No.	Newspaper (Jharkhand edition)	Date of Publication
1.	Hindustan	07th May 2015
2.	Prabhat Khabar	07th May 2015
3.	Dainik Bhaskar	07th May 2015
4.	Naya India	07th May 2015
5.	The Pioneer (English)	07th May 2015
6.	Dainik Jagran	08th May 2015
7.	Ranchi Express	08th May 2015
8.	The Hindustan Times (English)	08th May 2015
9.	Sanmarg	08th May 2015
10.	Morning India	08th May 2015

Submission of Comments/ Suggestions and Conduct of Public Hearing

- 2.8 A public hearing was held on May 20th, 2015 at the Hotel Ranchi Ashok, Doranda, Ranchi and many respondents voiced their views on the Petition filed by the Petitioner. The comments/suggestions voiced by the respondents and the Petitioner's response thereon along with the Commissions analysis on the response provided by the Petitioner are detailed in the **Section A4** of this Order.

A3: SUMMARY OF PETITION FILED BY THE PETITIONER

- 3.1 CGEDPL has filed a Petition before the Commission for determination of levellised generation tariff for 25 years for power generated from the proposed 1.2 MW Grid Connected Solar PV based power project.
- 3.2 The Petitioner has considered the following components of fixed cost for determining the tariff for the proposed Solar PV Power Plant:
- (a) Capital Cost
 - (b) Operation and Maintenance Expenses
 - (c) Interest on Long Term Loan
 - (d) Depreciation
 - (e) Interest on Working Capital
 - (f) Return on Equity
- 3.3 The cost parameters considered by the Petitioner to determine tariff for power generated from solar PV power projects are summarized in the table below:

Table 3: Cost Parameters considered by Petitioner

Parameters	Submitted by CGEDPL
Plant Capacity (MW)	1.2 MW
Useful Life (Years)	25
Construction Period (months)	12
Capital Cost (Rs Lakhs)	873.00
Capacity Utilisation Factor (%)	17.80%
Annual Degression (%)	0.60%
Auxiliary Consumption (%)	0.25%
Transmission Losses in System (%)	0.25%
O&M expenses for first year of operation (Rs Lakhs)	8.80
Annual Escalation in O&M expenses (%)	5.00%
Other Operating Cost (Rs Lakhs)	9.20
Debt- Equity Ratio	70:30
Loan Repayment Period (Years)	10
Interest on Loan (%)	16.25%
Interest on Working Capital (%)	15.75%
Depreciation (%)	7% for first 10 years 1.33% for remaining 15 years
Residual Value (%)	10%
Return on Equity (pre-tax) (%)	19% for first 10 years 24% for remaining 15 years
Levellised Tariff for 25 years (Rs/kWh)	10.10

A4: PUBLIC CONSULTATION PROCESS

- 4.1 In order to maintain transparency in the process for approval of the levellised generation tariff for the Petitioner, the Commission involved the stakeholders by initiating a public consultation process to understand their views on various aspects of the Petition filed by CGEDPL.
- 4.2 Accordingly, the public hearing on the Petition was held on 20th May 2015 in Hotel Ranchi Ashok, Doranda, Ranchi. The list of participants is attached as **Annexure-I**.
- 4.3 The comments and suggestion of the members of the public along with the response thereon of the Petitioner and the views of the Commission are detailed hereunder:

Cost of land in Jharkhand

Public Comments/Suggestions

- 4.4 The Objector commented that the rate of land is higher in Jharkhand in comparison to other States.

Petitioner's response

- 4.5 No response from the Petitioner.

Views of the Commission

- 4.6 The Commission has considered the capital cost in accordance with norms and prevalent market prices in the State while determining the levellised tariff for 1.2 MW Grid connected Solar PV project.

Solar radiation in Jharkhand

Public Comments/Suggestions

- 4.7 The Objector submitted that solar radiation is less by 8% to 10% in the State of Jharkhand as compared to other States.

Petitioner's response

- 4.8 No response from the Petitioner.

Views of the Commission

- 4.9 The Commission has considered the normative Capacity Utilisation Factor (CUF) for determination of solar energy generated as per norms and applicability in the State.

4.10 Moreover, it is pertinent to note that the draft Jharkhand State Solar Policy 2015 mentions that the State has high solar insolation around 300 days of clear sun and offers good sites having potential of more than 4.5 to 5.5 kWh/m²/day. Therefore, the Commission does not find any rationale for the submission of the Objector and has considered CUF on normative basis as specified in the Solar Tariff Regulations 2010.

Interest on loan from banks

Public Comments/Suggestions

4.11 The Objector submitted that rate of interest charged by banks is nearly 14% with monthly compounding.

Petitioner's response

4.12 No response from the Petitioner.

Views of the Commission

4.13 The Commission has dealt with this matter in detail in Paras 5.52 to 5.54 of this Order.

Higher capital cost on account of fencing/ boundary around the power plant

4.14 The Objector submitted that in order to protect the solar plant from local inhabitants, a boundary wall/ fence needs to be constructed around the power plant which increases the capital cost of the project.

Petitioner's response

4.15 The Petitioner submitted that boundary wall construction is a characteristic of the region in particular which would amount to an additional capital expenditure of Rs 30 Lakhs (@ Rs 5 Lakhs/ acre) for construction of a brick boundary wall with concertina wire on top.

Views of the Commission

4.16 The Commission is of the view that the cost of fencing of land is included in the civil works, which the Commission already approves as part of the capital cost. Similar approach has also been adopted by the CERC while determining the benchmark capital cost norms for Solar PV and Solar Thermal power plants for FY 2015-16 wherein the Central Commission has stated:

*“The cost associated with civil works includes testing of soil, preparation of soil/ground with all necessary works like earthmoving, digging holes for the foundations/pilings and levelling, **fencing of the land**, development of approach road, cable trenches, water supply arrangement in solar farm, control room etc.”*

4.17 Therefore, the Commission has not approved any cost for fencing of land while determining the capital cost for the Petitioner's plant.

Generation loss due to grid failure

4.18 The Objector submitted that nearly 2 to 4 hours of generation are lost on a daily basis due to failure of the grid, which needs to be considered while determining tariff for the plant.

Petitioner's response

4.19 No response from the Petitioner.

Views of the Commission

4.20 The Commission has considered the normative Capacity Utilisation Factor (CUF) for determination of solar energy generated as per norms and applicability in the State.

A5: LEVELLISED TARIFF DETERMINATION FOR 1.2 MW GRID CONNECTED SOLAR PV PROJECT

5.1 The Commission has scrutinized the Petition filed by CGEDPL for determination of levellised generation tariff for its proposed 1.2 MW grid connected solar PV power plant and has determined the same in accordance with the provisions laid out in the JSERC Solar Tariff Regulations, 2010.

5.2 As per Regulation 4.7 of the Solar Tariff Regulations, 2010,

“Energy generation from solar plant utilizes sunshine as a resource. It does not utilize any fuel for generation of electricity in case of solar PV generation whereas in case of solar thermal power plant salt is used. Hence, the tariff for solar power generation does not have a variable fuel cost component but has a significant fixed cost component. Hence the Commission has considered a single-part tariff for solar PV and solar thermal power projects.”

5.3 Further, Clause 4.8 of the Solar Tariff Regulations, 2010 states that,

“Solar energy generation depends upon natural factor such as availability of solar density in the region where the plant is located and is inherently Non-firm power. It is pertinent to ensure that the project should be viable for the project developer and at the same time the interests of utility and consumers are protected by avoiding huge cost burden on them. Though there are several approaches for tariff determination, such as front loaded, back loaded, and average tariff etc but each of these approaches has its advantages and disadvantages. It is important to capture the time value of money in the tariff structure which is incorporated in the levellised tariff approach. The Commission has, therefore, considered a levellised tariff approach in these regulations”.

5.4 The component-wise description of the Petitioner’s submission and the Commission’s analysis thereon is given below.

NORMS OF OPERATION

Capacity Utilization Factor (CUF)

Petitioner’s submission

5.5 The Petitioner has submitted that based on irradiation information, the CUF has been considered at 17.80% for the first year of operation with an annual depression of 0.60%.

Commission's analysis

- 5.6 Regulation 4.3 of the Solar Tariff Regulations 2010 specifies CUF of 19% to be considered for determination of tariff for Solar PV projects. CERC in its RE Tariff Order for FY 2015-16 has also considered CUF at 19% for determination of tariff for Solar PV plants. The Commission, therefore, approves CUF at 19% for the Petitioner's solar PV plant.
- 5.7 Further, the Solar Tariff Regulations 2010 do not provide for annual degression. Accordingly, the Commission has not approved annual degression claimed by the Petitioner.

Life of Plant

Petitioner's submission

- 5.8 The Petitioner has considered the useful life of the plant to be 25 years.

Commission's analysis

- 5.9 The Commission approves the useful life of plant to be 25 years in accordance with Regulation 4.4 of the Solar Tariff Regulations 2010.

Auxiliary Consumption and Transmission Losses

Petitioner's submission

- 5.10 The Petitioner has considered an auxiliary consumption of 0.25% of the plant's generation towards power required for air conditioning of inverters and control room, cleaning, water softening and pumping system, security and yard lighting. Another 0.25% has been attributed towards the transmission losses in the system.

Commission's analysis

- 5.11 As per the Solar Tariff Regulation 2010, the Commission does not approve any auxiliary consumption and transmission losses for the Solar PV plant of the Petitioner.

DETERMINATION OF FIXED COST

Capital Cost

Petitioner's submission

- 5.12 The Petitioner submitted that it plans to deploy Multi Crystalline Solar panels of capacity 240Wp in the proposed solar PV project. The modules are connected in series to achieve higher system voltage, lower current flows and reduced cable losses.
- 5.13 The financial outlay for the proposed 1.2 MW Solar PV power project is Rs 873.00 Lakhs, the breakup of which is as follows:

Turnkey EPC Offer:

- 5.14 The Petitioner submitted that it has followed the regulatory cost approach substantiated by the current market cost to arrive at the EPC cost after discussions with leading PV equipment manufacturers like Canadian Solar, First Solar, Trina Solar etc. for procurement of PV modules. For Engineering, Procurement and Construction, insights from leading EPC players in the industry like Juwi, Moser Baer were taken.
- 5.15 The Petitioner submitted that it has negotiated with the EPC contractors and has been able to bring down the costs to the tune of Rs. 750 Lakhs for the 1.2 MW Solar PV power plant.

Transmission Line and Bay Extension Cost:

- 5.16 The Petitioner has also considered an expenditure of Rs.36 Lakhs as transmission line and bay extension cost, over and above the cables and transformers cost, which is the evacuation cost only up to interconnection point.

Land Cost:

- 5.17 The Petitioner has further submitted that the cost of land has not been made a part of the benchmark capital cost as land cost cannot be generalized across the State and is site specific. The land will not be purchased rather taken up on lease by the Petitioner for 27 years surpassing the useful life of the Project to compensate for any eventuality/delay. The lease cost has been included in the operating cost of the project and does not form part of the capital cost.

Soft Cost (including during construction, preliminary expenses, development cost etc):

- 5.18 The Petitioner submitted that the development cost/ preliminary/ pre-operating expenses include transportation of equipment, storage of equipment at site, insurance (of modules), contingency, taxes and duties, IDC and finance charges etc. The Petitioner has considered these charges to be 10% of the total project cost in line with the provisions adopted by CERC in its Order on generic levellised tariff for RES for FY 2014-15.
- 5.19 The component-wise capital cost as submitted by the Petitioner has been summarised in the following table:

Table 4: Capital Cost as submitted by the Petitioner

Components	Cost (in Rs lakhs)
Turnkey EPC Offer	750.00
Transmission Line and Bay Extension	36.00
Land Cost	-
Upfront Financing Fee (Inc. L.E fees)	12.00
Interest during Construction	19.00
Bank Guarantee Cost	1.00
Development Cost/ Preliminary Expense	43.00
Contingency	12.00
Total Capital Cost	873.00

Commission's analysis

- 5.20 As per the Solar Tariff Regulations, 2010, the capital cost of a solar PV power project primarily consists of the cost of Photo Voltaic modules, balance of plant equipments, power conditioning equipments, taxes and duties, cost of inter-connection, civil works and erection & commissioning.
- 5.21 The Commission in the Solar Tariff Regulations 2010 had proposed a normative capital cost of Rs 1700 Lakhs/MW in accordance with the capital cost considered in CERC (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2009.
- 5.22 It is pertinent to note that with the decline in capital cost for Solar PV projects owing to regulatory and technological developments, the normative capital cost specified in the Solar Tariff Regulations 2010 is on the higher side. In light of this context, the CERC has also revised the capital cost for Solar PV projects to Rs 605.85 Lakhs/MW vide its Order on determination of generic levellised tariff for RES for FY 2015-16 dated 31st March 2015.
- 5.23 Accordingly, the Commission has re-determined the capital cost for the proposed solar project of the Petitioner after applying a prudence check.

Turnkey EPC Offer:

5.24 The Petitioner has submitted a letter of intent (LOI) from a potential partner for development of the power plant and an EPC offer of Rs 750 Lakhs for the plant. Based on the Petitioner's submission, the Commission approves Rs 750 Lakhs as the EPC cost for the project which includes civil works, erection and commissioning.

Transmission Line and Bay Extension Cost:

5.25 As per Regulation 5.26 of the Solar Tariff Regulations 2010, the State Transmission Utility (STU) shall bear 100% of the cost of evacuation infrastructure.

5.26 Further, the draft Jharkhand State Solar Policy 2015 states:

“Transco/Discom shall bear the entire cost of construction of power evacuation facilities from the project's generator switchyard to the interconnection point (injection point), up to a maximum length of 10 km.”

5.27 Therefore, the Commission has not approved any cost towards transmission line and bay extension.

Land Cost:

5.28 The Petitioner has proposed to take up land on lease and has included the lease cost of land in the operating cost of the plant. As per JSERC Solar Regulations 2010, operation and maintenance expenses consist of employee expenses, administrative and general expenses, repair and maintenance expenses, cost of spares and insurance expenses. There is no provision for including lease cost of land as part of operation and maintenance expenses. Moreover, Commission is of the view that cost of land should be capitalised and included in the capital cost of the project. Similar approach has also been adopted by CERC in the RE Tariff Order for FY 16.

5.29 The Commission observes that average market price of industrial land in Hsatu, Angara is Rs 4071 per dismil or Rs 4.071 lakhs per acre. As per the CERC RE Tariff Order for FY 2015-16, land required for a Solar PV plant is 5 acre/MW. Thus, the cost of land for the Petitioner's 1.2 MW land is computed to be Rs 24.426 Lakhs (Rs 4.071 lakhs/acre x 6 acre).

Soft Cost (including during construction, preliminary expenses, development cost etc):

5.30 The Commission observes that since the project is yet to be established, various soft cost components such as preliminary expenses, contingency costs, development cost, IDC etc. can only be estimated at this point of time. The actual costs incurred by the Petitioner can only be ascertained once the plant is commissioned.

5.31 CERC in its Order on determination of benchmark capital cost norms for Solar PV and Solar Thermal power projects for FY 2015-16 has determined soft cost for Solar PV projects to be 8% of the total capital cost of the project. Accordingly, the Commission has adopted the methodology as followed by CERC and approves soft cost of the project to be 8% of the total capital cost.

5.32 The capital cost of the project as approved by the Commission is summarised in the following table:

Table 5: Capital Cost approved by the Commission (in Rs Lakhs)

Components	Submitted by the Petitioner	Approved by the Commission
Hard Cost		
Turnkey EPC Offer	750.00	750.00
Transmission Line and Bay Extension	36.00	-
Land Cost	-	24.426
Soft Cost		
Upfront Financing Fee (Inc. L.E fees)	12.00	67.39
Interest during Construction	19.00	
Bank Guarantee Cost	1.00	
Development Cost/ Preliminary Expense	43.00	
Contingency	12.00	
Total Capital Cost	873.00	841.82

Operating Cost

(a) Operation and Maintenance Expenses

Petitioner's submission

5.33 The Petitioner has submitted O&M expenses of Rs 8.8 Lakhs for the first year of operation with annual escalation of 5.0%.

Commission's analysis

5.34 As per clause 4.11 of the Solar Tariff Regulations, 2010, the O&M expenses consist of employee expenses, administrative and general expenses, repairs and maintenance expenses, cost of spares and insurance expenses.

- 5.35 The Commission as per Clause 4.12 of Solar Tariff Regulations 2010 has considered O&M expenses at Rs 9.00 lakhs/MW for the first year of operation with an escalation of 5.72% per annum.
- 5.36 Accordingly, the Commission approves O&M expenses of Rs 10.80 lakhs for 1.2 MW solar plant of the Petitioner for first year of operation with an annual escalation rate of 5.72%.

(b) Other operating cost (Insurance Cost, Inverter Replacement Cost, Lease Cost of Land)

Petitioner's submission

- 5.37 The Petitioner has proposed cost of Rs 2.2 lakhs per annum towards insurance of plant and machinery.
- 5.38 The Petitioner has considered inverter replacement cost as a percentage of capital cost in the 13th/14th year of operation. Accordingly, for the first 15 years of operation the Petitioner has submitted an inverter replacement cost of Rs 2.0 lakhs per annum..
- 5.39 The Petitioner further stated that the land for the project is proposed to be taken up on lease. The Petitioner has considered Rs 5.00 lakhs per annum as the recurring expense for land while determining the operating cost of the project.

Commission's analysis

- 5.40 As per clause 4.11 of the Solar Tariff Regulations, 2010, the O&M expenses consist of employee expenses, administrative and general expenses, repairs and maintenance expenses, cost of spares and insurance expenses.
- 5.41 The Commission has approved Rs 9.00 lakhs/MW as O&M expenses as stated in para 5.35 of this Order. The Commission is of the view that the insurance cost and inverter replacement cost form part of the normative O&M expenses and as such the Regulations do not provide for separate approval of these components under other operating cost as claimed by the Petitioner. The cost of land has been included as part of the capital cost of the plant as detailed in para 5.28 and 5.29 of this Order and therefore, the Commission has not approved any cost towards lease of land.
- 5.42 Further, it is pertinent to note that CERC while approving the capital cost for Solar PV projects for FY 2015-16 has considered/approved the cost of power conditioning unit (inverter) considering the overhaul/ replacement cost in the 12th-14th year in the capital cost itself. The Petitioner was asked to submit the breakup of the turnkey EPC offer of Rs 750 lakhs so that the Commission could assess the components of the capital cost already included in the turnkey EPC offer. However, the Petitioner did not provide an appropriate response to the same.

5.43 The Commission in this Order has approved total capital cost of Rs 841.82 lakhs or Rs 701.51 lakhs/MW which is higher than the capital cost of Rs 605.85 lakhs/MW approved by CERC in its RE Tariff Order for FY 2015-16. Therefore, the Commission is of the view that there is no rationale in providing any separate approval for inverter replacement cost.

5.44 Accordingly, the Commission has not approved any operating cost other than the normative O&M expenses of Rs 10.8 Lakhs (i.e. Rs 9.00 Lakhs/MW).

5.45 The operating costs for the first year of operation approved by the Commission have been summarized in the following table:

Table 6: Operating Costs approved by the Commission for first year of operation (in Rs Lakhs)

Components	Submitted by the Petitioner	Approved by the Commission
Operation and Maintenance Expenses	8.8	10.8
Insurance Expenses	2.2	
Inverter Replacement Cost	2.0	
Recurring Expenses for Land	5.0	
Total Capital Cost	18	10.8

Depreciation

Petitioner's submission

5.46 The Petitioner has submitted that in line with the provisions regarding depreciation, a salvage value of 10% has been considered and thus the plant has been depreciated upto 90% of the asset value.

5.47 Depreciation has been considered at 7% of capital cost per annum for first ten years and 1.33% for the remaining fifteen years.

Commission's analysis

5.48 In accordance with Regulation 4.10 of the Solar Tariff Regulations 2010, the Commission has considered depreciation rate of 7% for the first 10 years and 1.33% for the remaining 15 years of the total plant life.

Interest on Loan

Petitioner's submission

5.49 The Petitioner has submitted that it has calculated the interest on long term debt by considering:

- (a) Debt: Equity ratio of 70:30 and accordingly long term debt as 70% of the Capital Cost.
 - (b) Interest rate of 150 basis points above long term Prime Lending Rate of State Bank of India.
- 5.50 The Petitioner has considered the existing prime lending rate of SBI of 14.75% for working out interest rate of 16.25% for interest on long term loan.
- 5.51 The repayment period has been considered as 10 years with equal instalments in line with the Regulations.

Commission's analysis

- 5.52 The Commission has considered a normative debt equity ratio of 70:30 to determine the tariff for the Petitioner's plant as specified under Regulation 4.6 of the Solar Tariff Regulations 2010.
- 5.53 An interest rate which is 150 basis points (1.50%) above the long-term prime lending rate of State Bank of India during the previous year is considered as the interest rate on debt for determination of tariff for the solar project as specified in Regulation 4.9 of Solar Tariff Regulations 2010.
- 5.54 The Commission observes that the benchmark PLR of SBI during FY 2014-15 was 14.75%. Therefore, rate of interest on debt is approved at 16.25%.

Interest on Working Capital

Petitioner's submission

- 5.55 As per the Solar Tariff Regulations 2010, the interest on working capital is computed by considering:
- (a) 1 month of O&M cost;
 - (b) 2 months of receivables;
 - (c) Maintenance spare equivalent to 15% of O&M expenses;
- 5.56 However, the Petitioner submitted that it has not considered one month's O&M expenses and maintenance of spares as part of the working capital, since the O&M costs are separately allowed as part of the fixed cost and two monthly receivable automatically covers two months O&M expenses.

5.57 The Petitioner has considered the rate of interest on working capital as 100 basis points above long term Prime Lending Rate of State Bank of India. The existing prime lending rate of SBI of 14.75% for working out interest rate of 15.75% for interest on working capital.

Commission's analysis

5.58 The following norms for working capital have been considered by the Commission as per Regulation 4.13 of the Solar Tariff Regulations 2010:

- (a) 1 month of O& M cost and
- (b) 2 months of receivables.
- (c) Maintenance spares equivalent to 15% of O&M expenses

5.59 An interest rate which is 100 basis points (1%) above the short-term prime lending rate of State Bank of India during the previous year is considered for calculation of interest on working capital for determination of tariff as specified in Regulation 4.14 of Solar Tariff Regulations 2010.

5.60 The Commission observes that the benchmark PLR of SBI during FY 2014-15 was 14.75%. Therefore, rate of interest on working capital is approved at 15.75%.

Return on Equity (RoE)

Petitioner's submission

5.61 The Petitioner has submitted that in line with Solar Tariff Regulations 2010, equity has been considered at 30% of capital cost of the project.

5.62 Further, the pre-tax return on equity has been considered at 19% of capital cost per annum for first ten years and 24% for the next ten years.

Commission's analysis

5.63 The Commission has considered a normative debt equity ratio of 70:30 to determine the tariff for the Petitioner's plant as specified under Regulation 4.6 of the Solar Tariff Regulations 2010.

5.64 The Commission has determined Return on Equity at 19% for the first 10 years and 24% for the remaining 15 years of the project as per Regulation 4.16 of the Solar Tariff Regulations 2010.

Approved Levellised Generation Tariff

Petitioner's submission

5.65 The Petitioner has proposed levellised tariff of Rs 10.10/kWh for 25 years of the useful life of the plant.

Commission's analysis

5.66 Based on the approval granted for the various operational and financial parameters as discussed above, the Commission has calculated the fixed cost for each year of the useful life of the plant i.e. 25 years.

5.67 The discount factor considered for the purpose of levellisation is equal to the post-tax weighted average cost of the capital (WACC) on the basis of normative debt to equity ratio (70:30) specified in the Regulations.

- Interest rate considered for the loan component (i.e.70%) of capital cost is 16.25% as explained in para 5.54 of this Order.
- For equity component (i.e. 30%), the Commission has computed the weighted average post-tax ROE of 14.5% based on weighted average pre-tax ROE of 22% considering ROE of 19% for the first 10 years and 24% for the remaining 15 years.
- The discount factor derived by this method for all technology is 11.87%. $((16.25\% \times 0.70 \times (1 - 33.99\%)) + (14.5\% \times 0.30))$.

5.68 The parameters considered by the Commission to determine the levellised tariff for power generated from the Petitioner's solar PV power plant have been summarized in the table below:

Table 7: Parameters approved by the Commission

Parameters	Submitted by CGEDPL	Approved by the Commission
Plant Capacity (MW)	1.2 MW	1.2 MW
Useful Life (Years)	25	25
Construction Period (months)	12	12
Capital Cost (Rs Lakhs)	873.00	841.82
Capacity Utilisation Factor (%)	17.80%	19.00%
Annual Degression (%)	0.60%	-
Auxiliary Consumption (%)	0.25%	-
Transmission Losses in System (%)	0.25%	-
O&M expenses for first year of operation (Rs Lakhs)	8.80	10.80

Parameters	Submitted by CGEDPL	Approved by the Commission
Annual Escalation in O&M expenses (%)	5.00%	5.72%
Other Operating Cost (Rs Lakhs)	9.20	-
Debt- Equity Ratio	70:30	70:30
Loan Repayment Period (Years)	10	10
Interest on Loan (%)	16.25%	16.25%
Interest on Working Capital (%)	15.75%	15.75%
Depreciation (%)	7% for first 10 years 1.33% for remaining 15 years	7% for first 10 years 1.33% for remaining 15 years
Residual Value (%)	10%	10%
Return on Equity (pre-tax) (%)	19% for first 10 years 24% for remaining 15 years	19% for first 10 years 24% for remaining 15 years
Weighted Average Cost of Capital (WACC)	16.25%	11.87%
Levellised Tariff for 25 years (Rs/kWh)	10.10	7.97

Table 8: Approved Tariff for the Solar PV Plant

Year of Operation	1	2	3	4	5	6	7	8	9	10	11	12
Installed Capacity (MW)	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Net Generation (MU)	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
COST OF GENERATION (Rs Lakhs)												
O&M Expenses	10.80	11.42	12.07	12.76	13.49	14.26	15.08	15.94	16.85	17.82	18.84	19.91
Depreciation	58.93	58.93	58.93	58.93	58.93	58.93	58.93	58.93	58.93	58.93	11.22	11.22
Interest on term loan	90.97	81.39	71.82	62.24	52.67	43.09	33.51	23.94	14.36	4.79	0.00	0.00
Interest on working Capital	6.03	5.81	5.60	5.39	5.17	4.97	4.76	4.56	4.36	4.16	3.16	3.22
Return on Equity	47.98	47.98	47.98	47.98	47.98	47.98	47.98	47.98	47.98	47.98	60.61	60.61
Total Fixed Cost	214.71	205.54	196.40	187.30	178.24	169.23	160.27	151.35	142.49	133.68	93.83	94.97
PER UNIT COST OF GENERATION (Rs/kWh)												
O&M Expenses	0.54	0.57	0.60	0.64	0.68	0.71	0.75	0.80	0.84	0.89	0.94	1.00
Depreciation	2.95	2.95	2.95	2.95	2.95	2.95	2.95	2.95	2.95	2.95	0.56	0.56
Interest on term loan	4.55	4.08	3.60	3.12	2.64	2.16	1.68	1.20	0.72	0.24	0.00	0.00
Interest on working Capital	0.30	0.29	0.28	0.27	0.26	0.25	0.24	0.23	0.22	0.21	0.16	0.16
Return on Equity	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	3.03	3.03
Total COG per unit	10.75	10.29	9.83	9.38	8.92	8.47	8.02	7.58	7.13	6.69	4.70	4.76
Discount Factor	1.000	0.894	0.799	0.714	0.639	0.571	0.510	0.456	0.408	0.365	0.326	0.291
Levellised Tariff (Rs/Kwh)	7.97											

Year of Operation	13	14	15	16	17	18	19	20	21	22	23	24	25
Installed Capacity (MW)	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Net Generation (MU)	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
COST OF GENERATION (Rs Lakhs)													
O&M Expenses	21.05	22.26	23.53	24.88	26.30	27.80	29.39	31.07	32.85	34.73	36.72	38.82	41.04
Depreciation	11.22	11.22	11.22	11.22	11.22	11.22	11.22	11.22	11.22	11.22	11.22	11.22	11.22
Interest on term loan	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interest on working Capital	3.30	3.38	3.46	3.55	3.64	3.74	3.84	3.95	4.06	4.18	4.31	4.45	4.59
Return on Equity	60.61	60.61	60.61	60.61	60.61	60.61	60.61	60.61	60.61	60.61	60.61	60.61	60.61
Total Fixed Cost	96.19	97.47	98.82	100.26	101.77	103.37	105.07	106.86	108.75	110.75	112.87	115.10	117.47
PER UNIT COST OF GENERATION (Rs/kWh)													
O&M Expenses	1.05	1.11	1.18	1.25	1.32	1.39	1.47	1.56	1.64	1.74	1.84	1.94	2.05
Depreciation	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56
Interest on term loan	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interest on working Capital	0.17	0.17	0.17	0.18	0.18	0.19	0.19	0.20	0.20	0.21	0.22	0.22	0.23
Return on Equity	3.03	3.03	3.03	3.03	3.03	3.03	3.03	3.03	3.03	3.03	3.03	3.03	3.03
Total COG per unit	4.82	4.88	4.95	5.02	5.10	5.18	5.26	5.35	5.44	5.55	5.65	5.76	5.88
Discount Factor	0.260	0.233	0.208	0.186	0.166	0.149	0.133	0.119	0.106	0.095	0.085	0.076	0.068

5.69 Accordingly, the levellised tariff for a period of 25 years for power generated from the Petitioner's Solar PV plant is determined as Rs 7.97/kWh as detailed in Table 8 of this Order.

This Order is signed and issued by the Jharkhand State Electricity Regulatory Commission on this the 8th of July, 2015.

Sd/-
(SUNIL VERMA)
MEMBER (F)

Sd/-
(N.N Tiwari, J)
CHAIRPERSON

A6: ANNEXURE-I**List of participating members of public in the public hearing****Table 9: List of participating members of public in the public hearing**

Sl. No.	Name	Address / Organization if any
1	Deepak Kumar Singh	Sikidiri
2	Santosh Bhagt	Sikidiri
3	M. Kumar	Sikidiri
4	Raj Kumar Gupta	Sikidiri
5	Asleshwar Kumar	Sikidiri
6	Sandeep Kumar	Sikidiri
7	Umesh Kumar Sinha	Sikidiri
8	Amit Kumar	Sikidiri
9	Santosh Kumar Sahu	Sikidiri
10	Ashok Sahu	Sikidiri
11	R. S. Kujur	CGEDPL
12	Lalit N. Lakra	CGEDPL
13	Deokinandan Paswan	Nagrik Kalyan Samity
14	Ashok Kumar Verma	Pee Pee Compound, GPS
15	Rohit Kumar	Kijalk Infrastructure Pvt. Ltd.
16	Amit Das	Prabhat Khabar
17	Puran Mahto	Dipatoli, Ranchi
18	Arun Kashap	Ranchi Town
19	Sadashiv Kashap	Ramar, Ranchi
20	S.S. Gupta	ITI, Bazar, Ranchi
21	Vikash Kumar	GL-JP Trust, Ranchi
22	B.N.P. Singh	Director, CGEDPL
23	SKF Kujur	Director, CGEDPL
24	Sumit Kujur	Pathalkudwa, Ranchi
25	Ravi Niranjana Toppo	Kokar, Ranchi
26	Loybak Leoxes	Namkum
27	S.S. Kujur	Ranchi
28	Dinesh Shukla	Hindustan Press
29	A. Lal	ETV
30	Sanjay Kumar Singh	Inland Power Ltd.
31	Hari Budhia	Bihar Foundry
32	Kaushal Anand	Dainik Bhaskar
33	Bipin Singh	Reporter, Khabar Mantra
34	A. Ganguly	The Telegraph