

Before the  
**MAHARASHTRA ELECTRICITY REGULATORY COMMISSION**  
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**CASE No. 204 of 2018**

In the matter of

**Determination of Generic Tariffs for Renewable Energy for FY 2018-19  
 (01 August, 2018 to 31 March, 2019)**

**Coram**

Shri. Anand B. Kulkarni, Chairperson  
 Shri. I.M. Bohari, Member  
 Shri. Mukesh Khullar, Member

**ORDER**

**Dated: 18 August, 2018**

1. The Commission notified the MERC (Terms and Conditions for Determination of Renewable Energy Tariff) Regulations, 2015, ('RE Tariff Regulations') on 10 November, 2015. The Regulations specify the terms and conditions and the procedure for determination of Generic Tariff in respect of the following types of Renewable Energy (RE) Generation Projects:
  - (a) Wind Power Projects;
  - (b) Biomass-based Power Projects;
  - (c) Non-Fossil Fuel-based Co-Generation Projects;
  - (d) Mini/Micro and other Small Hydro Power Projects;
  - (e) Solar Photo Voltaic (PV) and Solar Thermal Power Projects;
  - (f) Solar Roof-top PV Systems Power Projects.

2. Regulation 9.1 of the RE Tariff Regulations requires the Commission to determine the Generic Tariffs for RE technologies for which the norms have been specified in the Regulations:

*“9.1 The Commission shall notify the generic tariff at the beginning of each year of the Review Period considering the norms specified by the Central Commission from time to time with regard to the respective RE technologies:*

*Provided that, for the first year (FY 2015-16) of the Review Period, the generic tariff may be determined by the Commission within three months from the date of notification of these Regulations.”*

3. The Commission, vide its Order in Case No. 135 of 2015 dated 25 January, 2016, had determined the Generic Tariff for RE Technologies for FY 2015-16( 10 November, 2015 to 31 March, 2016). Further, the Commission, vide its Order dated 29 April, 2016 in Case No. 45 of 2016, had determined the Generic Tariff for RE Technologies for FY 2016-17. The Commission also determined the Generic RE Tariff for FY 2017-18 vide its Order dated 28 April, 2017 in Case No. 33 of 2017.
4. Through a Public Notice published in the daily newspapers Times of India and Indian Express (English) and Maharashtra Times and Loksatta (Marathi) on 09 July, 2018, the Commission invited comments by 31 July, 2018 on its Draft RE Tariff Order for FY 2018-19, which was made available on its websites, and intimated that a Public Hearing would also be held on that date. The Public Hearing was held on 31 July, 2018 at Office of the Commission at 13<sup>th</sup> Floor, World Trade Centre, Cuffe Parade, Mumbai. The list of persons who filed their written comments, suggestions and objections and/or made oral submissions during the Public Hearing is at Appendix-1, and the list of those present at the Public Hearing is at Appendix-2.
5. After considering the responses received on the Draft Order and in discharge of its mandate under Regulation 9.1 of the RE Tariff Regulations, 2015, the Commission hereby determines the Generic Tariff for RE Projects for FY 2018-19 (from 01 August, 2018 to 31 March, 2019). The Generic Tariff determined through this Order is based on the financial principles and technology specific parameters considered under either Approach 1 or 2 wherever applicable as explained in the subsequent paragraphs of this Order.

## **1. BACKGROUND**

The Ministry of New & Renewable Energy (MNRE), Government of India has set ambitious target of achieving 175 GW target for installed RE capacity by 2022. Over the years, various policy initiatives have been taken to promote RE in India. Determination of RE generic tariffs is one of such measures to incentivise the industry. Such measures, technology development and various policy initiatives have over time resulted in reduction of gap between tariffs of conventional power projects and those of RE projects. Guidelines have now been issued for carrying out Competitive Bidding for various RE projects. It is seen that the tariffs discovered by Competitive Bidding are considerably lower than the RE generic tariffs. As a result of lowering of tariffs discovered through competitive bids, the Distribution Licensees are more inclined to undertake Competitive Bidding process than to purchase RE at generic tariff determined by the Commission.

### **1.1. PROPOSED AMENDMENT IN TARIFF POLICY 2016**

The Ministry of Power (MoP) has proposed amendment in Tariff Policy, 2016 on 30 May 2018. As per para 6.4 of the proposed amendment, the States are encouraged to procure power from RE sources above the notified capacity through Competitive Bidding to keep the tariff low. The portion of proposed amendment of tariff policy is quoted below:

*“States shall endeavor to procure power from Renewable Energy sources through Competitive Bidding to keep the tariff low, except from the waste to energy plants. Procurement of power by Distribution Licensee from Renewable Energy sources from projects above the notified capacity shall be done through Competitive Bidding process, from the date to be notified by the Central Government.*

*However, till such notification, any such procurement of power from Renewable Energy sources projects may be done under Section 62 of the Electricity Act, 2003.”*

The Central Government has notified Competitive Bidding guidelines for Solar & Wind power projects on August 2017 & December 2017 respectively. As per bidding guidelines, intra-state Wind projects below 25 MW and Solar projects below 5 MW are excluded from applicability of tariff based Competitive Bidding for procurement of power from grid connected Solar and Wind power projects.

The Ministry of New & Renewable Energy (MNRE), Government of India has further clarified that the State Electricity Regulatory Commissions (SERCs) have statutory powers to determine tariff for procuring power from RE projects not covered under Competitive Bidding guidelines.

However, this Commission has received requests for deviation in bidding guidelines to allow participation of RE developers below notified capacity also in Competitive Bidding. Recently, the Commission has allowed such deviations in its Orders in Case No. 131 of 2018 and 122 of 2018.

## **2. RESPONSES RECEIVED AND COMMISSION’S RULINGS**

The written comments, suggestions and objections received and oral submissions made at the Public Hearing are set out below issue-wise, along with the Commission's rulings.

### **2.1. COMMENTS BY MR. RAMCHANDRA TULASKAR**

A suggestion was received from Mr. Ramchandra Tulaskar for establishing a pilot project of 10 MW generation capacity based on technology known as ‘Alternative for Fossil Fuel’ which produces electricity from coal without burning it. He requested for fund of Rs. 30 Crore for 10 MW project capacities from the concerned department of the State Government of Maharashtra.

#### ***Commission’s Ruling***

This Order is for determination of generic tariffs for RE projects which are Eligible Projects as defined in Regulation 2.1 (m) of RE Tariff Regulations, 2015. ‘Alternative for Fossil Fuel’ technology is not Eligible Project as per RE Tariff Regulations, 2015. Therefore, this suggestion is outside the purview of this Order.

As regards the issue of granting or directing to grant funds for a pilot project, it is clarified that it is not amongst functions of the State Commission as defined in Section 86 of the

Electricity Act, 2003. Therefore, this suggestions cannot be considered by the Commission being outside the purview of the present proceedings.

## 2.2. COMMENTS BY GRETA ENERGY LTD AND AA ENERGY LTD

Greta Energy Limited and AA Energy Limited, the Biomass power developers, requested the Commission to re-consider following financial parameters for determination of tariff of Biomass projects:

- a) The rate of interest on working capital should be taken between 13 to 14%. Banks don't give working capital loan facility to Biomass at rate as low as 11.48%.
- b) Overall working capital requirement is very high, because billing period is 30 days and bills are paid by Distribution Licensees in 60 days from billing date. Therefore, overall billing cycle should be taken as 90 days.
- c) Auxiliary power consumption should be increased from 10% to 11% .
- d) Fuel cost- Calorific value of fuel at 3611 kCal/kg depends on various factors including type of fuel, season during the year, etc. Procurement of Biomass fuel incurs heavy transportation cost, loading & unloading cost and transit losses. Increasing fuel and labour cost has added to cost of procurement of Biomass fuel.

Biomass sector helps in generating income for the local farmers who otherwise would have burnt the Biomass causing environmental pollution. Biomass plants are facing viability difficulties and many plants have shut down. No new Biomass plants are coming up and many are facing financial problems. The Commission has taken various steps to encourage the sector and Greta Energy Ltd. requests that the same may be continued.

### ***Commission's Ruling***

All the relevant concerns as raised by the objector here about Biomass sector and its development are addressed under the submissions of MEDA dated 30 July, 2018 in the present proceedings.

The RE Tariff Regulations, 2015 have been notified after a due process of public consultation. The Commission has calculated required financial and technical parameters in accordance with the applicable Regulations.

- a) Rate of interest on working capital (IoWC) is calculated as per Regulation 18 of RE Tariff Regulations, 2015 and in line with the first amendment in MERC (MYT) Regulations, 2015 dated 29 November, 2017. These Regulations have been notified after due process of public consultation. The Commission has considered rate of IoWC in accordance with the applicable Regulations. The rate of interest on working capital is revised from 11.48% to 11.56% as mentioned in Para 3.3.4 below. As per lending rates published by REC on 19 June, 2018 and by PFC on 18 June, 2018, RE projects, except Biomass, get term loans at interest rate in range 10% to 11.25% depending upon integrated credit rating. Therefore, no change in interest rate is required.

- b) Receivables for working capital requirement are considered as per Regulation 18.2 (c) of RE Tariff Regulations, 2015.
- c) Auxiliary power consumption is considered as per Regulation 41 of the RE Tariff Regulations 2015.
- d) Calorific value of the Biomass fuel is considered as per Regulation 48 of RE Tariff Regulations 2015.

### 2.3. COMMENTS BY COGENERATION ASSOCIATION OF INDIA

Cogeneration Association of India (CAI) has sought clarity on computation of capital cost for Non-Fossil Fuel-based Co-generation Project (Bagasse based). Following are the comments/suggestions of CAI:

- a) Approach-2 and the adoption of tariff using such an approach as done in Para 6.4 is not permissible by law as it is contrary to the provisions of the Electricity Act, 2003 and the provisions of the Regulations framed there under by this Commission. This Commission has specified RE Tariff Regulations, 2015 in exercise of powers under Section 61 of the Electricity Act, 2003. These Regulations specify norms for determination of tariff under Section 62 of the Electricity Act, 2003. The tariff to be determined / discovered through Competitive Bidding is as per Section 63 of the Electricity Act, 2003 and both these sections i.e. Section 62 and Section 63 while dealing with the determination of tariff operate in a completely different manner and cannot be merged. Approach 2 makes the RE Regulations redundant and therefore has no legal basis. It is also contrary to provisions of the Electricity Act, 2003 envisaging promotion of generation of electricity from RE sources.
- b) The RE Tariff Regulations, 2015 which are valid and operational till FY 2019-20 do not provide for the determination of generic tariff for RE technology by way of adopting a tariff discovered in Competitive Bidding conducted by a distribution licensee.
- c) CAI has questioned need of elaborate tariff determination process by Approach-1, if Approach-2 is being adopted by the Commission wherever feasible.
- d) Tariff adopted by Approach-2 does not provide reasonable return on equity to the generating company as provided in the Regulation.
- e) Escalation factor as calculated in Para. 4.3 of Draft Order is (-) negative 5.75%, while it has been taken in final calculations as (-) negative 6.75%.
- f) Regulation 54 provides for revision of Capital Cost considering the indexation mechanism specified under CERC RE Tariff Regulations. Therefore, the Capital Cost has to be revised as per the CERC RE Tariff Regulations and capital cost fixed at Rs. 492 lakhs/MW for FY 2018-19 needs to be incorporated.
- g) Inclusion of essential sugar factory modernization & energy efficiency improvement equipment in capital cost should be done.

- h) The average interest rates applied by the financial institutions for these projects are 13% for term loan & 13.5% for working capital loan.
- i) As the ROE ranges from 21.55% to 29.12%, the discount factor should be worked out on average ROE of 25.34% which works out to 10.54% instead of 10.29%.
- j) Higher values of auxiliary power consumption (10% vis-à-vis 8.5%), station heat rate (4000 vs 3600 kCal/kWh), O&M expenses (Rs. 25 lakh/MW vs Rs. 19.49 lakh/MW) were sought by CAI and should be so considered by the Commission.
- k) Following paragraphs are quoted from the proposed amendment in National Tariff Policy 2016 dated 30 May, 2018 in the Draft Order:

“States shall endeavor to procure power from Renewable Energy sources through Competitive Bidding to keep the tariff low, except from the waste to energy plants. Procurement of power by Distribution Licensee from Renewable Energy sources from projects above the notified capacity shall be done through Competitive Bidding process, from the date to be notified by the Central Government.”

CAI has submitted that the proposed amendment is yet to be notified by the Ministry of Power.

- l) Maharashtra State has not completed the notified capacity of 2000 MW power from Bagasse based cogeneration projects at sugar factories, as per the GRs of 2008 & 2015. Both the GRs of Govt. of Maharashtra have mentioned targets of 1000 MW of power from these projects each & there is no mention of installed capacity in both the GRs. The actual achievement as per the GoM policies & notifications by MSEDCL is only 1,375 MW of exportable surplus & additional 625 MW of exportable power must be absorbed by MSEDCL under generic tariff to meet the GoM notified capacity.

### ***Commission's Ruling***

The Commission notes that the primary objections raised by CAI in response to the Draft Order under the present proceedings are similar and based on same grounds/questions of law as it had contended in its Appeal No. 30 of 2018 before the Appellate Tribunal for Electricity (APTEL) seeking to set aside the Commission's Order in Case No. 183 of 2017 dated 11 January, 2018. Under that Order (MSEDCL's Petition) the Commission had accorded approval to the deviation in standard bidding document for procurement of Long Term Bagasse based Co-generation Power for meeting MSEDCL's Non-Solar Renewable Purchase Obligations (RPO). The Appellant (CAI) had presented following Questions of Law in Appeal No. 30 of 2018 for consideration before the APTEL:

- i. Whether the State Commission failed to appreciate that Section 63 of the Electricity Act, 2003 mandates that Competitive Bidding has to be conducted in accordance with the guidelines issued by the Central Government and as there are no specific guidelines for cogeneration power, the Competitive Bidding sought to be conducted by MSEDCL cannot be allowed?*

ii. *Whether the State Commission failed to appreciate that ceiling cap of Rs.4 per unit has no rational basis especially when the State Commission has itself determined preferential tariff at Rs.6.33 Per Unit for the year 2017-18?*

iii. *Whether the State Commission failed to consider that the deviations proposed by MSEDCL have no rational and therefore, allowing the same are contrary to the objective of the Electricity Act, 2003 which provides for promotion of Cogeneration and Renewable Energy sources ?*

iv. *Whether the State Commission erred to hold that the procurement of power by MSEDCL from the bagasse based co-generation projects through Competitive Bidding process would count towards the fulfilment of its non-solar RPO for the respective period?*

CAI, after about six hearings before the APTEL, withdrew its Appeal. In fact, as mentioned by CAI in its submission, many of its members participated in the Competitive Bidding process of MSEDCL to sell their Bagasse based Co-generation Power. 18 bidders submitted their bids to MSEDCL for tender of long term power procurement for 100 MW and 15 bidders submitted their bids for tender of long term procurement of 200 MW. The Commission has also duly adopted the tariff discovered in those two Bidding process in its two Orders in Case No. 130 and 165 of 2018. Therefore, CAI is now estopped from raising these issues as the Order dated 11 January, 2018 in Case No. 183 of 2017 has attained finality, because the Objector cannot probate and approbate as per its suitability.

CAI has mentioned in its written submission that members who participated in bidding were those with their projects becoming NPA and the Bidders were unable to pay their liabilities for a period more than 2 years. However, it is seen that some of the Bidders who were successful in e-reverse auction had new plants which had not even commenced recovery of their fixed charge. Question of not being able to pay debt for 2 years does not arise for such new plants which are commissioned in the recent past. Following is the list of such newly commissioned/yet to be commissioned plants:

Under Case No. 130 of 2018	Under Case No. 165 of 2018
Piyush Sagar and Power Pvt. Ltd.	Raosahebada Pawar Godganga SSKL
Shri Dnyaneshwar SSKL	Gokul Sugar Industries Ltd.
Shree Siddheshwar SSKL	
Vitthal Refined Sugars Ltd.	

Therefore, claim of CAI that returns from tariff are not sufficient to recover fixed charge is not correct as its members willingly quoted a rate in Competitive Bidding.

- a) Objection of CAI is that Approach- 2 and the adoption of tariff using such an approach is not permissible by law as it is contrary to the provisions of the Electricity Act, 2003 and the provisions of the Regulations framed there under by this Commission.

Section 61 of the Electricity Act, 2003 has given this Commission power to specify the terms and conditions for the determination of tariff. The same Section mentions guiding principles for specifying terms and conditions, which are as follows:

- The principles and methodologies specified by the Central Commission for determination of the tariff
- The generation, transmission, distribution and supply of electricity are conducted on commercial principles;
- The factors which would encourage competition, efficiency, economical use of the resources, good performance and optimum investments;
- Safeguarding of consumers' interest and at the same time, recovery of the cost of electricity in a reasonable manner;
- The principles rewarding efficiency in performance;
- Multi-year tariff principles;
- The tariff progressively reflects the cost of supply of electricity and also, reduces cross-subsidies in the manner specified by the Appropriate Commission;
- The promotion of co-generation and generation of electricity from Renewable sources of energy;
- The National Electricity Policy and tariff policy

Considering the mass interest i.e. the interest of the end consumers, the Commission has to maintain balance in terms of affordable power sold to consumers while determining tariff of cogeneration power plants for sale to Distribution Licensees. So far, Distribution Licensees have purchased power from cogeneration power plants at tariff much higher (preferential tariff) than their average cost of supply. Considering the present scenarios of availability of cheaper power from various RE sources such high tariff would be against the guiding principle of encouraging competition, efficiency, economical use of the resources, good performance and is not succeeding in safe-guarding interest of end consumer of electricity.

The promotion of co-generation and generation of electricity from RE sources of energy can not only be by way of providing preferential tariff to the generators, but also by way of providing competitive tariff to the Discoms at least from among various co-generation plants. High preferential tariff does not serve the purpose of promoting cogeneration if Discoms are not ready to pay for it and are not ready to enter into an EPA. Change of word 'preferential tariff' to 'generic tariff' in RE Tariff Regulations 2015 is not cosmetic in nature, but implies specific meaning. Change in approach of generators is required so that efficiency and good performance gets promoted. Even proposed amendment in National Tariff Policy has promoted power procurement through Competitive Bidding so that efficiency & good performance gets encouraged.

Distribution Licensees have to procure RE power so as to meet their RPO targets. To that extent, Discoms have options to fulfil their targets either by purchase of RE power or purchase of REC's or by combination of these two. The Commission observes that the Consumer Representatives have also stated during various proceedings that besides following Competitive Bidding for Bagasse based Co-generation power, Discoms/MSEDCL in order to meet its non-Solar RPO, (which are not pertaining to any specific RE technology), should also exercise the cheaper option such as Wind power procurement through competitive Bidding route. Under these circumstances, the Generic tariff fixed by the Commission in cases where Competitive Bidding is also permissible



will be deemed ceiling rate so as to remove difficulties in adoption of appropriate tariff. Obligated Entities cannot arbitrarily or discriminately adopt higher tariff between the two alternatives - generic tariff determined by the Commission and the tariff discovered through competitive bids. Therefore, in the interest of consumers, Generic tariffs as deemed ceiling rates will, at best, reflect the components of the fixed and the variable costs worked out as per the financial and operational norms fixed under RE Tariff Regulations. Approach-2, this way limits the generic tariff to the market rate of the Cogeneration power as discovered through the Competitive Bidding process approved by the Commission. Still, to remove any ambiguity in interpretation of the statutory provisions and to remove any operational difficulty for implementing the Order, the Commission in exercise of its power under Regulation 82 “Power to remove difficulties” of RE Tariff Regulations 2015, allows generic tariff to act as ceiling tariff for guiding the Competitive Bidding process.

Tariff achieved in Approach-2 is a benchmark used by this Commission and not tariff determination as per Section 63 itself. Therefore, there is no question of conflict between Section 62 and Section 63 of the Electricity Act, 2003 in Approach-2 as raised by CAI.

In view of above, the Commission has considered Approach-2 for determination of Generic Tariff.

- b) CAI has submitted that RE Tariff Regulations, 2015 are valid till FY 2019-20 and do not provide for Approach-2. However, the Commission has determined generic tariff as mentioned above considering guiding principles mentioned in Section 61 of the Electricity Act 2003, viz. encouragement to efficiency, economical use of the resources, good performance, safeguarding of consumers’ interest, cost of supply of electricity, promotion of co-generation by way of creating market demand by the Distribution Licensees of electricity from co-generation plants, proposed amendment in Tariff Policy, 2016.
- c) The Commission has followed elaborate process of tariff determination by Approach-1, in spite of adopting tariff by Approach-2, for Bagasse based cogeneration projects taking into consideration its ruling in Order in Case No. 84 of 2015 dated 12 July 2018. The Commission has given following ruling regarding ‘Ceiling Tariff’ for procurement of electricity through transparent Competitive Bidding process from the power generators whose EPA has expired (Option-3 as mentioned in the Order):

*“....In view of the above, it is decided to set a ceiling tariff of Rs. 0.75 per unit for discovery of fixed cost of Wind (Group III), Rs. 0.66 per unit for Bagasse co-generation projects and Rs. 0.55 per unit for Biomass projects, whose initial EPA have expired or is due for expiry. (It may be noted that, variable cost of existing Bagasse and Biomass projects shall be continued to be linked with the rates as determined under the generic tariff determined annually).”*

Therefore, determination of separate variable charge for cogeneration power projects is essential in order to determine Ceiling Tariff at which Competitive Bidding in Option-3 mentioned in that Order in Case No. 84 of 2015 can be carried out.

- d) As per CAI, Tariff by Approach-2 does not provide reasonable RoE. However, Tariff derived in Approach-2 is by referring to the Order in Case No. 165 of 2018 dated 30 June, 2018 of the Commission. The bidding is done by the developers taking into consideration commensurate Return on Equity. Therefore, the tariff by way of Approach-2 includes commensurate Return on Equity.

Return on Equity as per the CERC RE Tariff Regulations 2017 is 14%, i.e. 2% lower than that of this Commission. In view of above, no incremental tariff is required on account of RoE.

- e) CAI has presumed that escalation factor is erroneously taken as (-) negative 6.75% instead of (-) negative 5.75%. Escalation factor calculated as (-) negative 5.75% in Para. 4.3 of the Draft Order, as is apparent from the heading of the paragraph is for small hydro projects. Capital cost indexation mechanism used by CERC along with value of variables used in indexation mechanism is mentioned in Para. 4.3 of the Draft Order. Escalation factor for small hydro projects is (-) negative 5.75% using variables 'a' and 'b' as 0.60 and 0.40 respectively. As mentioned in the same Paragraph, variables 'a' and 'b' for calculation of escalation factor for cogeneration projects are 0.70 and 0.30 respectively. Using these variables, escalation factor arrived for cogeneration power plant is (-) negative 6.75%. It may be noted that values of F1, F2 and F3 also change for cogeneration projects. In RE Generic Tariff Order for FY 2017-18 in Case No. 33 of 2017 dated 28 April, 2017, calculation of escalation factor is not repeated for every RE technology for sake of brevity. Same approach is followed in this Order also.
- f) CAI has erroneously assumed that the Commission has to adopt capital cost indexation mechanism as well as Capital Cost of CERC RE Tariff Regulations 2017. Regulation 54 of RE Tariff Regulations 2015 clearly refers to only mechanism used by CERC for annual revision of capital cost for cogeneration projects. It does not imply that indexation mechanism will be applied on Capital Cost which will also be determined by CERC. This Commission has considered the Capital Cost for the first year of the review period as per Regulation 53 of RE Tariff Regulations, 2015.
- g) CAI has requested the Commission to include cost of factory modernization & energy efficiency improvement equipment in Capital Cost. CAI has sought revision of capital cost by including cost of energy efficiency improvement equipment, but it has not submitted any data related to downward revision in auxiliary consumption due to installation of such equipment. The Commission has considered the Capital Cost as well as Auxiliary Power Consumption as per RE Tariff Regulations, 2015. These Regulations have been notified after due public consultation. Equipment for modification/modernization of plant is requirement of already commissioned plants. For new plants commissioning in FY 2018-19, no expense related to modernization need to be considered.

It may also be noted that Bagasse based cogeneration plants receive Central Financial Assistance (CFA) as per MNRE scheme. Private sugar mills receive Rs. 15.00 lakh per MW of CFA, co-operative/public sector sugar mills receive Rs. 40-60 lakh per MW of CFA as per MNRE scheme. Rs. 20-30 lakh per MW of surplus power is available for boiler modification. The Commission has not deducted above CFA in determination of capital cost.

On the other hand, State Government approves reimbursement of capital cost incurred for transmission lines needed for evacuation of generated power upto Rs. 2.00 Crore from Green Fund. This reimbursement of transmission line capital cost is not deducted in computation of Capital Cost. It would therefore be unfair for the project promoters to claim costs for energy efficiency improvement equipment without reducing admissible auxiliary power consumption and to claim full capital cost while availing subsidies from the Central Government schemes & State Government Policy.

- h) CAI has requested for considering higher interest rates of 13% and 13.50% for loan capital and working capital respectively. Interest rates are considered as per relevant Regulations which have been notified after due public consultation. As per lending rates published by REC on 19 June, 2018 and by PFC on 18 June, 2018, RE projects, except Biomass, get term loans at interest rate in range 10% to 11.25% depending upon integrated credit rating. Therefore, no change in interest rate is required.
- i) CAI has incorrectly mentioned that RoE ranges from 21.55% to 29.12%. It is range for landed income tax rate, not RoE. RoE ranges from 20.39% to 22.57%. Therefore, average RoE cannot be higher than maximum RoE of 22.57% which has been correctly considered for calculation of discount rate.
- j) CAI has sought upward revision in parameters of performance like auxiliary power consumption, station heat rate, O&M expenses. Such revision cannot be considered at this stage as the relevant Regulations have been duly notified in 2015 after elaborate process of public consultation.
- k) The Commission is aware that the amendment in National tariff Policy 2016 is yet to be notified. The quoted section from amendment is referred to highlight the in-principle approach followed by the Commission while passing Order in Case No. 183 of 2017 in January 2018 allowing Competitive Bidding for Bagasse based Cogeneration plants in Maharashtra.
- l) CAI has submitted that shortfall of about 625 MW in achieving target of power procurement from cogeneration power projects must be absorbed by MSEDCL under generic tariff. The issue of fulfilment of RPO target has been considered by the Commission in the Order dated 11 January, 2018 in which it allowed Competitive Bidding for procurement of cogeneration power. It is upto Distribution Licensee to procure this power as per its requirement by following laid down process. In addition, it is upto the Distribution Licensees to decide whichever type of non-Solar power it wishes to procure to fulfil its RPO target. The Commission has specifically ruled in this regard

in Order in Case No. 33 of 2017 dated 28 April, 2017 for determination of Generic Tariff for RE for FY 2017-18. The Commission's Ruling in para. 1.29 of the said Order

*“To the extent that the Distribution Licensee chooses to procure RE power to fulfil its Non-Solar RPO, there is no requirement to do so from one particular type of Non-Solar RE Generator or another. The implementation of the Govt. of Maharashtra Policy in this regard is a matter between the State Govt. and MSEDCL, which is a State Utility, and not the Commission.*

*The Commission notes that, just as the Distribution Licensee has several options for fulfilment of its RPO, sale of power to Open Access consumers or to Power Exchanges is also open to RE Generators.”*

#### **2.4. COMMENTS BY VAYUNANDANA POWER LIMITED**

- a) Since inception of plant, various modifications, upgradations are done which result in capital expenditure. This capital expense is not considered in determination of tariff.
- b) Vayunandana Power submitted that O&M expenses have increased due to higher employee expenses and variable cost has increased due to higher fuel charges. In view of escalation in various costs associated, reduction in fixed cost of Rs. 0.12 kWh should be restored.

#### ***Commission's Ruling***

- a) The Commission has allowed recovery of capital cost before commissioning of the project through fixed tariff. Additionally, the Commission takes into consideration expenses towards repair & maintenance in O&M expenses. The generators are given tax adjusted RoE of 20.39% in the first 10 years and 22.57% in the remaining tariff period. Any capital expenditure towards modification & upgradation is to be funded from return on equity.
- b) The Commission determines fixed tariff based on year of commissioning of the project only. Fixed tariff does not change throughout tariff period. PPA of Vayunandana Power with MSEDCL is based on assumptions taken in 2008. Clause of reduction in fixed cost on annual basis is a specific case of Vayunandana Power Limited and cannot be dealt with in this Order.

#### **2.5. COMMENTS BY MR. T. P. VARTAK**

Mr. Vartak had filed a petition on 31 August, 2016 in Case No. 119 of 2016 requesting this Commission to determine the generic capital cost and corresponding tariff for mini and micro hydro projects in Maharashtra. Subsequently, the Commission had directed MEDA to submit a report on the same in consultation with Mr. Vartak, Koyna Design Circle (KDC) Pune of Water Resource Department of the Government of Maharashtra. As per him, the MEDA report has not been considered while determining the capital cost of mini and micro hydro projects in Maharashtra.

### ***Commission's Ruling***

The Commission observes that in order to promote the Mini/Micro Hydro power plants the Commission had provided a mark up tariff based on the tariff as decided for the SHP's. This approach and such tariff for Mini/Micro Hydro power plants based on the mark up tariff is still continued from the Year 2010 till date based on the relevant provisions of RE Tariff Regulations, 2010 and 2015. The issue of determination of the generic capital cost and corresponding tariff for Mini / Micro Hydro power plants in Maharashtra has come before the Commission through a Petition of Mr.T.P.Vartak in Case No. 119 of 2016. The Commission vide its Order dated 31 August, 2017 in that Case had directed MEDA as follows,

*14. In this context and for this purpose, the Commission directs MEDA to submit a detailed Report to the Commission on the techno-commercial parameters of existing and upcoming Mini and Micro HEPs in Maharashtra and, to the extent available, elsewhere in the country, with the assistance of WRD and other agencies. The Commission also notes that Shri Vartak has identified 5 Mini/Micro HEPs in Maharashtra for application of technologies designed by him which may reduce capital costs. The Report should include a comparative assessment of the techno-commercial parameters of such Project technologies also, and the Commission requests Shri Vartak to share the details with MEDA. MEDA should submit its Report within 4 months, following which the Commission will take an appropriate view.*

(Emphasis added)

The Commission observed that the Capital cost submitted by MEDA in its Report in the above matter was as per the assumed costs of Techno Economic Feasibility Report (TEFR) and not on the basis of the actual audited cost. MEDA in fact also sought this information from Water Resources Department in May, 2018 which is still awaited and MEDA is yet to finalise its recommendations/findings on that Report in terms of its independent view and analysis of techno-commercial parameters of Mini/Micro Hydro power plants. Therefore MEDA is hereby directed to expedite this matter and submit its final outcome within a one month from date of this Order failing which the Commission may take appropriate action in this regard.

However the Commission notes that the issue of tariff for Mini/Micro power plants based on the actual capital cost is still remains unaddressed. This is more so important in light of the submission of Shri Vartak that he has identified 5 Mini/Micro HEPs in Maharashtra for application of technologies designed by him which may reduce capital costs. In view of foregoing (that too after eight years) the Commission notes that the latest technological development in the Mini and Micro Hydro power plants has to be taken into account and it is appropriate now that a benchmark capital cost and corresponding tariff has to be fixed for Mini and Micro hydro projects in Maharashtra. Therefore the Commission in exercise of its powers under Regulation 82 "Power to remove difficulties" of RE Tariff Regulations rules that the existing and future developers of Mini and Micro Hydro Power plants in the State of Maharashtra may approach the Commission through a separate Petition for determination of its capital cost and corresponding project specific tariff for their Mini and Micro Hydro power plants. The Commission may take an appropriate view on such Petitions which may require a due process of public consultation.

## 2.6. COMMENTS BY PRAYAS ENERGY GROUP (PEG)

Approach-2 for determination of tariff has been welcomed by the objector. Additionally, following are the comments/suggestions by PEG:

- a) PEG have suggested that the Safeguard Duty imposed by Ministry of Finance, w.e.f 30 July, 2018 needs to be factored while determining the final generic tariffs for FY 2018-19.
- b) PEG has suggested some improvements in principle/norms and technology specific parameters to be considered in the generic tariff computation, tariff period for Solar/Wind developers, amendment of RE Tariff Regulations, RPO and Net Metering Regulations.

### *Commission's Ruling*

- a) The Commission has calculated capital cost of Solar PV projects based on recent bids of Solar auctions within the State of Maharashtra and not as 'summation of parts'. The Commission will take into consideration impact due to this development when conclusive information quantifying impact is available in due course of time.
- b) The Commission welcomes suggestions to improve principle/norms and technology specific parameters considered in the generic tariff computation. However, this tariff Order is in accordance with existent RE Tariff Regulations 2015. PEG may submit suggestions for improvement in principle/norms when the Commission invites public comments on amendment/revision in the Regulations.

## 2.7. COMMENTS BY MEDA

MEDA clarified that it has no comments regarding the generic tariff decided based on Approach-2 and MEDA also agrees with tariff determined for solar thermal power projects. Maharashtra Biomass Energy Developers Association (MBEDA) submitted its comments to MEDA. MBEDA has welcomed increase in variable cost as it will help in making projects financially more viable. AA Energy Limited submitted same comments through MEDA as it had submitted individually.

- a) MEDA requested to consider the report submitted by MEDA in January 2018 regarding Capital Cost of Mini/Micro power plants in compliance to directives of the Commission in Case No. 119 of 2016 dated 31 August, 2017.
- b) MEDA has agreed with the draft tariff and variable charge of Biomass based projects which will improve the financial viability of Biomass projects.
- c) Vayunandana Power Limited (VPL) submitted comments individually as well as through MEDA. VPL submitted that their fixed cost is as per PPA signed in 2008 and is very low. Further, there is a clause in the PPA for reduction of fixed cost on yearly basis. VPL mentioned about escalated financial costs due to delayed payments by MSEDCL. Further, VPL requested refund of revenue lost due to difference between variable cost for FY 2017-18 and for FY 2018-19.

- d) Varam Bio Energy (P) Limited submitted that parameters like fuel cost, fuel transportation cost, auxiliary consumption, interest rate considered need to be increased and GCV of fuel needs to be decreased to reflect realistic operational parameters.

***Commission's Ruling***

- a) The Commission's Rulings cited at para 2.5 of this Order may be referred on the issue of tariff for Mini/Micro power plants based on the actual capital cost in compliance to directives of the Commission in Order in Case No. 119 of 2016.
- b) The Commission has noted the comment of MEDA in this regard.
- c) Most of the comments/suggestions by Vayunandana Power Limited (VPL) are already dealt with in para. 2.4. Escalation in financial cost due to delayed payments by the power purchaser cannot be considered in determination of generic tariff. VPL can explore various other applicable forums to address its grievance with regard to delayed payments by MSEDCL. A request for refund of revenue lost in FY 2017-18 due to difference between variable cost for FY 2018-19 and FY 2017-18 is not tenable. VPL has incorrectly interpreted that increase in variable cost for FY 2018-19 is admission of variable cost for FY 2017-18 being lower than stipulated. Variable cost for every financial year is calculated as per the relevant Regulations. No such request for recovery of revenue is tenable.
- d) Ruling of the Commission can be referred in para. 2.2 of this Order.

**2.8. COMMENTS BY MAHARASHTRA STATE ELECTRICITY DISTRIBUTION COMPANY LIMITED (MSEDCL)**

MSEDCL has supported Approach-2 of determining tariff and welcomed generic tariff for Solar, Wind, Solar rooftop determined by way of Approach-2.

Following are the comments of MSEDCL in case of Approach-1:

- a) MSEDCL submits that tariff of cogeneration projects commissioning in FY 2018-19 will be lower than tariff discovered by Approach-2 in Draft Order. Due to recent change in interest rates, MSEDCL estimates that tariff by Approach-2 for cogeneration plants will be lowered further. Further, expected tariff for Biomass plants by Approach-2 will be lower than generic tariff in the Draft Order according to MSEDCL.
- b) MSEDCL suggested that the rates given in Approach-2 should not be a ceiling rate throughout the control period, but the rate with prevailing market conditions.

Following are the comments of MSEDCL in case of Approach-1:

- c) Rate of interest on loan capital may be considered as average 6 months MCLR of SBI plus 200 basis points as per CERC RE Tariff Regulations 2017 instead of 1 year MCLR of SBI plus 300 basis points. Rate of interest on working capital may be considered as average 6 months MCLR of SBI plus 300 basis points as per CERC RE Tariff Regulations 2017 instead of 1 year MCLR of SBI plus 350 basis points.

- d) Return on Equity may be considered as 14% as per CERC RE Tariff Regulations 2017 and as per RoE norms of other SERCs like Karnataka, Gujarat instead of 16% in the Draft Order.
- e) Debt-equity ratio may be considered as 80:20 instead of 70:30 in case of new plants where financial closure is yet to be achieved.
- f) MSEDCL has strongly opposed generic tariff for Wind power as per Wind zone classification and sought single tariff for all Wind zones in FY 2018-19.

### ***Commission's Ruling***

In case of comments on Approach-2 of MSEDCL, the Commission has following rulings:

- a) The Commission has taken into effect the recent changes in Base Rate as defined by the relevant Regulations while determining tariff in this Order. The weighted average Base Rate has marginally increased instead of decreasing. Therefore, claim that tariff will be lower due to lower interest rate cannot be justified. In case of Biomass power projects, the Commission cannot lower the generic tariff only based on estimation of MSEDCL. However, if any substantive information is available in future regarding tariffs achieved by Approach-2; the Commission may consider the same in due course of time.
- b) Generic Tariff determined in this Order is applicable only till end of FY 2018-19 contrary to request of MSEDCL to extend validity period till end of FY 2019-20. Tariff determination for subsequent years in control period is not in scope of this Order.

In case of comments on Approach-1 of MSEDCL, the Commission has following rulings:

- c) Interest rates are considered as per relevant Regulations which have been notified after due public consultation. As per lending rates published by REC on 19 June, 2018 and by PFC on 18 June, 2018, RE projects except Biomass get term loans at interest rate in range 10% to 11.25% depending upon integrated rating. Therefore, no change in interest rate can be done.
- d) Return on Equity is considered as per relevant Regulations which have been notified after due public consultation.
- e) The Commission finds no substantive justification in suggestion of MSEDCL to change debt-equity ratio of plants yet to achieve financial closure. On the contrary, tariff determined based on higher debt-equity ratio will make achievement of financial closure more difficult for new plants.
- f) Tariff determined by Approach-2 for Wind power projects commissioning in FY 2018-19 is applicable to all Wind zones. Decision regarding singular tariff for all Wind zones in subsequent years in the Control Period is outside scope of this Order.



## 2.9. COMMENTS AND SUGGESTIONS OF TATA POWER COMPANY LTD.

- a) Generic Tariff of Solar PV projects – TPC has stated that the Commission has adopted the tariff discovered under Competitive Bidding but has not considered the guidelines from Request for Selection (RfS) and Power Purchase Agreement (PPA) while arriving at the timelines for commissioning of the projects. As per these guidelines, the projects shall be set up and commissioned within a period not exceeding 13 months from the date of execution of PPA. The PPA has not been signed in these cases and accordingly the plants will get commissioned beyond 31 March, 2019. Hence, the discovered Tariff of Rs 2.72/kWh will be applicable for projects commissioned beyond 31 March, 2019. However, the draft Order is envisaging applicability of this Tariff. Hence, to protect the distribution licensee and the generator from variation of Tariff, the Commission is requested to make this Tariff applicable to power plants commissioned in FY 2019-20.
- b) Applicability of other Competitive Bidding PPA terms –
  - Change in Law : The Competitive Bidding tariff has the protection in change in law clause in the PPA while those under Generic Tariff do not seem to have. Hence, to bring the two at par, it is essential that generic tariff is also protected by change in law clause. Any change in law, such as change in the rate of any taxes, i.e., GST, safeguard duty, etc. which has direct effect on project should be allowed by the Commission and the cost passed on to the developer under removal of difficulties. TPC provided the specific rates and its impact due to safeguard duty and GST considering this as a huge financial impact to project developers and accordingly requested the Commission to allow pass through under change in law. Other terms and conditions of the PPA executed under the Competitive Bidding may not have been considered in the RE Tariff Regulations, 2015 should be made applicable as well.
  - Tariff Period – The term or Tariff period for Competitive Bidding PPAs is 25 years. If the generic tariff determined is as per Competitive Bidding, the corresponding Tariff period should also apply.
- c) Proposal for generic Tariff for Waste to Energy Projects – The CERC RE Tariff Regulations, 2017 as well as RE Tariff Regulations, 2015 specifies project specific tariff for Waste to Energy plants. However, determination of generic Tariff of Waste to Energy projects will bring substantial improvement in solid waste management sector. Further, National Tariff Policy dated 28 January, 2016 specifies compulsory procurement of 100% power produced under Waste to Energy plants. In view of this, TPC has proposed to introduce the Generic Tariff for Waste to Energy projects same as for Biomass projects. The Biomass based power projects uses different types of non-fossil fuels available within its vicinity. In Waste to Energy plants Municipal Solid Waste is being used as fuel which is also Biomass. The fuel content of Biomass projects and Waste to Energy projects are same. Therefore, for promotional purposes TPC proposed to make applicable Rs 7.31/kWh, the Tariff of Biomass projects based on Rankine Cycle technology to Waste to Energy projects as well.

- d) Mini/Micro Hydro projects – Capital Cost – The Tariff determination for these projects has not been done separately and only a markup of 50 – 100 paise has been provided over Small Hydro Projects (SHPs). A comprehensive prudence check of the associated costs for these projects should be carried out so that the Tariff truly reflects the cost of setting up such Mini/Micro hydro plants. Further, in Case No. 119 of 2016, the Commission has accepted that it is possible that the capital cost of such projects may need to be determined separately and has directed MEDA to submit a detailed report on the techno-commercial parameters of existing and upcoming projects in Maharashtra. TPC requested the Commission to evaluate the findings of this report and provide an appropriate view on this matter.
- e) Unforeseen and uncontrollable delays – During construction and commissioning of the projects there may be delays due to unforeseen and uncontrollable reasons beyond the developers controls. In such cases, TPC requests the Commission to consider such delays as uncontrollable and extend the applicability of Tariff Order for FY 2018-19 to such delayed projects.
- f) Scalability issues – The low Tariff discovered in the Competitive Bidding is mainly due to size or scale of the project. In the MSEDCL Solar Competitive Bidding, most of the winning bidders are going to set up capacities greater than 100 MW and some of them are even setting up capacity of 250 MW at one location. Hence, it is evident that economies of scale would play a vital role. Such large scale bidding may not be apt for licensees requiring lesser quantum and such low Tariff may not be discovered through Competitive Bidding for such small projects. Further, it appears from the draft Order that even small capacities (i.e. < 25 MW for Wind and 5 MW for Solar) are covered by the applicability of ceiling of tariffs discovered under Competitive Bidding. TPC submitted that these capacities should be excluded.
- g) Extension of applicability of Tariff Order – Regulation 9.1 of RE Tariff Regulations, 2015 was reproduced and specified that the generic Tariff should be determined prior to beginning of each year. However, keeping the applicability period for 8 months which is less than typical commissioning period, the intention of the Commission to incentivize RE capacity installation may not be met. Keeping in mind the commissioning timelines, RE developers and obligated entities may find it difficult to project returns as the generic tariff determined for the subsequent year of the Review Period will be different. Hence, it was requested to extend the applicability of the Tariff Order to RE projects commissioned from 1 August, 2018 to 31 March, 2020.
- h) Applicable charges for sourcing RE power from another distribution licensee – In the Order in Case No. 4 of 2007, the Commission has allowed a distribution licensee (BEST) sourcing power from an RE generator connected to the network of a different distribution licensee (MSEDCL) to claim applicable charges which it has to pay in addition to the applicable feed in tariff. TPC requested the Commission to incorporate the same principle in the RE Tariff Order for FY 2018-19 for sake of clarity.

### ***Commission's Rulings***

- a) Tata Power requested to make Generic Tariff for Solar PV plants applicable to power plants commissioned in FY 2019-20, because the development period is 13 months as per RfS of MSEDCL tender. The Commission has decided tariff for Solar photovoltaic projects as approved in Case No. 164 of 2018 dated 29 June, 2018. As per the conditions prescribed under the documents such as RfS and PPA for the MSEDCL 1000 MW Solar Tender issued prior to bidding, thirteen months is the maximum construction period available for the developers. There have been cases where Solar PV projects have been commissioned in much lesser construction period than thirteen months. TPC has quoted that *'the PPAs are yet to be signed by some of the Selected Bidders as on date'*. Delay in signing of PPA by some bidders cannot be ground for blanket extension of CoD for all Solar PV projects being planned at around same time.
- b) Tata Power has sought protection from 'Change in Law' in Generic Tariff Order. RE Tariff Regulations 2015 do not provide for any protection in 'Change in Law'. Regulation 25 of RE Tariff Regulations 2015 mentions as follows:

*"Provided that the taxes and duties levied by the appropriate Government on generation, and sale of electricity from such RE Project, such as Electricity Duty and Water Royalty, shall be allowed as a pass-through to the extent actually incurred."*

No additional protection can be granted under relevant Regulations to the developers. Tata Power requested to extend Tariff Period to 25 years instead of 13 years. However, Tariff period of 13 years has been set with objective to offer guaranteed returns during loan repayment period to the developers and is as per RE Tariff Regulations, 2015. Regulations have been prepared after due public consultation.

- c) Tata Power has sought Generic Tariff for MSW power projects. It may be noted that Organic content of Municipal Solid Waste (MSW) is different from organic content of Biomass. Calorific value of waste also changes from one place to another. By-products of MSW power plants are different from Biomass power plants. Capital cost of MSW projects changes substantially depending upon technology used. Few number of MSW projects in the State of Maharashtra do not necessitate generic tariff at present. Therefore, the Commission does not consider it necessary to give generic tariff for MSW projects.
- d) This suggestion regarding capital cost of Mini/Micro hydro projects is already dealt in great detail in the Commission's Rulings to comments by Mr. T. P. Vartak.
- e) Terms for protection from unforeseen and uncontrollable delays sought by Tata Power in Generic Tariff Order are in scope of PPA between the RE Generator and the Distribution Licensee. The Commission does not approve any individual EPA for RE.
- f) Tata Power has suggested for excluding the Solar and Wind power projects with small capacities from Tariff determined by Approach-2. Differential tariff for Solar and Wind projects as per the scale of project is not in accordance with RE Tariff Regulations,

2015. No other RE technology is given differential tariff due to scale of project due to no such provision being available in relevant Regulations.

- g) Extending applicability of Tariff Order to two years as suggested by Tata Power is not expedient taking into consideration sharply plummeting tariffs for various RE technologies due to rapid technological developments. Any change in Renewable Energy scenario during a year is required to be captured without any delay by the extant tariff Order to reflect actual market scenario.
- h) In relation to BEST Undertaking sourcing power from an RE generator connected to the network of MSEDCL, the Commission has given following ruling in Order in Case No. 4 of 2017:

*“In view of this peculiarity in the sourcing of RE power by BEST, the Commission will consider the RE power purchase cost inclusive of the Wheeling Charges and Losses and other applicable charges (but no trading margin, if any) borne by BEST for procurement from RE Generators injecting power through MSEDCL’s Distribution Network, provided that the energy supplied is being paid for at the rate approved by the Commission. BEST may provide the details for consideration during the MTR proceedings.”*

#### **2.10. COMMENTS AND SUGGESTIONS BY SHRI. ULHAS CHAUDHARY**

Shri. Ulhas Chaudhary stated that in draft RE Tariff Order the tariff for Solar Roof-top system needs to be mentioned and such tariff should be compulsory for farmers or any consumer who wish to install Solar Roof-top having capacity more than 3 kW connected to grid or for self use. O&M expenditure for 1MW shall be determined based on the salary of six employees as per Seventh pay Commission. Tariff should be fixed after considering Major repair and Insurance expenditure as 1 % of project cost.

The strict measure for penalising the consumers not using energy saving and efficient appliances/equipments is not being implemented by the Commission due to which 70% energy is not saved. This is main reason for Climate Change. The issue of environmental protection is a sensitive matter and before addressing these issues the Commission should not issue the tariff policy for generation, distribution and transmission

#### ***Commission’s Ruling***

The Tariff for Solar Roof-top PV projects is determined by the Commission and is given in Para. 8.15 of this Order. Further, the Objector has mentioned about power purchase from Solar sets which are used for captive consumption and also are grid-connected. Such systems are grid connected by net metering. Net energy units exported to grid by Solar rooftop plant are available for offset in subsequent billing cycles. Any surplus at end of carry forward period is set off at average power purchase cost per unit.

The suggestions regarding energy conservation and efficiency are outside the scope of these proceedings, but MEDA may consider to the extent of its mandate. Any suggestion related to policy matters will be dealt by the appropriate Government.

### 2.11. COMMENTS AND SUGGESTIONS BY MBEDA

Maharashtra Biomass Energy Developers Association (MBEDA) has welcomed proposed increase in variable cost. As per MBEDA, this will make Biomass plants financially a little more viable.

#### *Commission's Rulings*

The Commission has noted the comment of MBEDA.

### 2.12. COMMENTS AND SUGGESTIONS BY PADMASHRI DR.D.Y.PATIL, SAHAKARI SAKHA KARKHANA LTD., KOLHAPUR

Reduction in tariff proposed by this Commission will increase revenue gap of sugar factories, which will in turn increase payback period of already ailing sugar factories. This will in turn have adverse economic impact on farmers. Therefore, it is suggested to continue with same tariff of FY 2017-18 i.e. Rs. 6.36 per unit for cogeneration power plants.

#### *Commission's Rulings*

A representation as above addressed to the GoM was received from Padmashri Dr.D. Y. Patil Sahakari Sakhar karkhana Ltd., by this Commission. The representation has highlighted the loan defaults due to financial trouble of existing sugar factories. However, this Order is about those plants which are commissioning in FY 2018-19 and which are yet to start repaying their loans, if any. Tariff of existing cogeneration plants will continue to be governed by the relevant tariff Orders and the EPA's already entered between cogeneration plants and the distribution licensee, as the case may be. All other issues as mentioned in the representation are already dealt with in the Commission's Rulings to CAI above.

### 2.13. COMMENTS AND SUGGESTIONS BY NIDAR UTILITIES & INFRASTRUCTURE PVT. LTD.

Capital cost derived from SECI/NTPC bids is debatable as purchasing authority, payment security risk, contract tenure, contract terms & conditions are different for these bids vis-à-vis Distribution Licensees. Purchasing authority of Distribution Licensees in Maharashtra is different from SECI/NTPC. The Commission should take into consideration terms and conditions of contract sale under SECI & NTPC and use normative capital cost based on actual market conditions.

#### *Commission's Rulings*

The Commission is aware that the capital cost of the projects in solar park developed under the biddings called by SECI/NTPC cannot be directly considered for solar project to be developed for Distribution Licensees in Maharashtra. Accordingly, the Commission has already increased capital cost by Rs. 15 lakh per MW towards the cost for transmission line and contingency expenses in 'capital cost per MW' derived from L1 bids received for projects in Solar Park developed by SECI/NTPC. This action has brought both the approaches at equal footings. Therefore, the Commission deems it fit that the determination

of capital cost by using tariff from Competitive Bidding conducted by SECI/NTPC is acceptable.

### **3. COMMON PARAMETERS FOR DETERMINATION OF GENERIC TARIFF**

This Section sets out the norms for determination of the Generic levelised Tariff which are applicable to all types of RE technologies as specified in the RE Tariff Regulations.

#### **3.1. TARIFF PHILOSOPHY**

The Commission emphasizes that purpose of setting Financial Principles and Technology-specific parameters for each eligible RE technology is two-fold. It is not only to give assured returns to the RE developers in Order to make the project viable, but also to cap cost of RE purchase payable by Distribution Licensees. This cost is eventually borne by the consumers.

However, it is observed that RE tariffs discovered recently by various distribution licensees within the State of Maharashtra are considerably lower than the earlier RE Generic Tariffs determined by this Commission calculated in accordance with Financial Principles and Technology-specific parameters in RE Tariff Regulations, 2015. Many of these bids are by projects commissioned or to be commissioned in FY 2018-19.

As per Section 86 (a) of Electricity Act, 2003 reads as follows:

*“(1) The State Commission shall discharge the following functions, namely: -  
(a) Determine the tariff for generation, supply, transmission and wheeling of electricity, wholesale, bulk or retail, as the case may be, within the State:”*

In view of above, this Commission has adopted two approaches for determination of Generic Tariff for eligible RE technologies:

##### **3.1.1. Approach-1: No Precedent of Competitive Bidding**

If no tariff is adopted by this Commission for eligible RE technology by way of Competitive Bidding carried out by any distribution licensee within the State of Maharashtra; then Generic Tariff is calculated as per Financial Principles and Technology-specific parameters in RE Tariff Regulations, 2015.

##### **3.1.2. Approach-2: Precedent of Competitive Bidding**

If tariff adopted by this Commission which is discovered through Competitive Bidding process carried out by any Distribution Licensee within the State of Maharashtra is lower than the tariff calculated by the way of Financial Principles and Technology-specific parameters as defined in RE Tariff Regulations, 2015, then such tariff discovered through Competitive Bidding is considered to be the Generic Tariff.

If any such tariff by way of Competitive Bidding is adopted and is higher than tariff calculated by Financial Principles and Technology-specific parameters in RE Tariff Regulations, 2015; then the latter would be Generic Tariff.

### 3.2. REVIEW PERIOD

Regulation 6.1 of the RE Tariff Regulations specifies that the Review Period for determination of the Tariff for RE Projects shall be five financial years, starting from the date of publication of the Regulations (i.e. 10 November, 2015). Thus, FY 2015-16 was the first year of the Review Period and FY 2018-19 is the fourth year of this Review Period.

### 3.3. GENERAL & FINANCIAL PRINCIPLES (MERC RE TARIFF REGULATIONS 2015) FOR APPROACH-1

#### 3.3.1. TARIFF STRUCTURE

Regulation 10 specifies that the Tariff for RE Projects shall be a single-part Tariff consisting of the following fixed cost components:

- (a) Return on Equity;
- (b) Interest on loan capital;
- (c) Depreciation;
- (d) Interest on working capital;
- (e) Operation and maintenance expenses.

For RE technologies with a fuel cost component, like Biomass-based Projects and Non-Fossil Fuel-based Co-Generation Projects, a single-part Tariff with two components, viz., fixed cost and fuel cost, has been determined in this Order. The relevant cost components and basis for determination of the Generic Tariff for each RE technology have been elaborated in the technology-specific Sections of this Order.

#### 3.3.2. TARIFF DESIGN

As per Regulation 11, the Tariff Design for RE Generating Stations is as under:

*“11.1 The tariff shall be determined on a levelised basis for the Tariff Period:*

*Provided that, for RE Projects having a single-part tariff with two components, the tariff shall be determined on a levelised basis considering the year of commissioning of the Project for the fixed cost component, while the fuel cost component shall be specified on the basis of the year of operation.*

*11.2 For the purpose of computation of levelised tariff, a discount factor equivalent to the normative post-tax weighted average cost of capital shall be considered.*

*11.3 Levelisation shall be carried out for the ‘useful life’ of the RE Project, while tariff shall be determined for the period equivalent to the Tariff Period.”*

### 3.3.3.INTEREST ON LOAN

Regulation 15.1 specifies loan tenure of 12 years for determination of the Generic Tariff for RE Projects. Regulation 15.2 provides for consideration of the rate of interest on loan as follows:

*“For the purpose of computation of tariff, the Base Rate of the State Bank of India prevailing during the previous year plus 300 basis points shall be considered as the normative interest rate.*

*Notwithstanding any moratorium period availed, the repayment of loan shall be considered from the first year of commercial operation of the Project and shall be equal to the annual depreciation allowed.”*

However, the Commission observes that, the reference rate for sanction of new loan has been shifted to MCLR instead of SBI Base Rate. Accordingly, the Commission while determining generic RE Tariff for FY 2017-18 vide its Order dated 28April,2017 in Case 33 of 2017 considered as below:

*However, as per the RBI guidelines dated 3 March, 2016 (updated on 29 March, 2016),*

*“All rupee loans sanctioned and credit limits renewed w.e.f. April 1, 2016 shall be priced with reference to the Marginal Cost of Funds based Lending Rate (MCLR) which will be the internal benchmark for such purposes.”*

*SBI will continue to declare its Base Rate for existing loans, but new loans will be sanctioned on the basis of MCLR.*

Considering this difficulty of unavailability of new loan with reference of SBI Base Rate, the Commission invoked the provision of Regulation 82 of RE Tariff Regulations, 2015 as below:

Regulation 82 of the RE Tariff Regulations empower the Commission as follows:

*“82. Power to remove difficulties*

*If any difficulty arises in giving effect to the provisions of these Regulations, the Commission may, by general or specific Order, make such provisions not inconsistent with the provisions of the Act, as may appear to be necessary for removing the difficulty.”*

*The Commission has invoked the provisions of Regulation 82 in view of the change in the circumstances and dispensation concerning interest rates and the consequent issues in persisting with consideration based on the SBI Base Rate.*

Hence, the Commission has determined the Interest Rate as 11.06% for determination of Generic RE Tariff for FY 2018-19. Further the Commission also amended the provisions of MERC (MYT) Regulations, 2015 vide amendment dated 29 November, 2017, wherein the Commission has amended the definition of Base Rate as below:

*2. Amendment to Regulation 2.1 (10)*



*Regulation 2.1 (10) of the principal Regulations shall be substituted by the following:*

**“Base Rate” shall mean the one-year Marginal Cost of Funds-based Lending Rate (‘MCLR’) as declared by the State Bank of India from time to time;”**

Considering the above discussed difficulties in implementing provisions of RE Tariff Regulations related to Interest Rate, the Commission has invoked the provisions of Regulation 82 of RE Tariff Regulations, 2015, *Power to remove difficulties* in view of the change in the circumstances and dispensation concerning interest rates and the consequent issues in pursuing rate to be linked to MCLR instead of SBI Base Rate.

Accordingly, the Commission has determined the Interest on loan considering 1-year average (from August 2017 to July 2018) of 1 year MCLR of SBI as shown in the Table below:

<b>Date of Revision of 1 Year MCLR by SBI</b>	<b>MCLR by SBI</b>	<b>No. of days</b>
01 August 2017	8.00%	31
01 September 2017	8.00%	30
01 October 2017	8.00%	31
01 November 2017	7.95%	30
01 December 2017	7.95%	31
01 January 2018	7.95%	31
01 February 2018	7.95%	28
01 March 2018	8.15%	31
01 April 2018	8.15%	30
01 May 2018	8.15%	31
01 June 2018	8.25%	30
01 July 2018	8.25%	31
Average 1 year MCLR	<b>8.06%</b>	
<b>1 Year MCLR + 300 Basis points</b>	<b>11.06%</b>	

Hence, the Commission has considered the Interest on term Loan as  $8.06\% + 3\% = 11.06\%$  for the purpose of determination of Tariff.

### **3.3.4.INTEREST ON WORKING CAPITAL**

Regulation 18.3 provides for computation of the rate of IoWC as follows:

*"Interest on Working Capital shall be the average of the Base Rate of State Bank of India prevalent during the previous year, plus 350 basis points."*

As discussed earlier in Para 3.3.3, the SBI Base Rate-linked interest rate for working capital is no longer available for new RE Projects. The Commission has worked out Average of 1 year MCLR as 8.06%. Hence the Commission considers the Interest on Working Capital as  $8.06\% + 3.50\% = 11.56\%$ . In view of the above, as in the case of interest on long term loan,

the Commission invokes its powers under Regulation 82 to remove difficulties and to apply, for the purposes of this Order, interest rate on working capital loan of 11.56% is considered for FY 2018-19.

### 3.3.5. REVISION IN INCOME TAX RATE

In Union Budget 2018-19, it was proposed to extend benefit of reduced income tax rate of 25% to companies who have reported turnover upto Rs. 250 crore in FY 2016-17. This benefit is expected to benefit almost 99% of companies filing their tax returns. Moreover, the existing three per cent education cess is proposed to be replaced by a four per cent “Health and Education Cess”. As a result of these proposed changes, income tax rates are changed as follows:

Particulars		Income tax	MAT
Corporate Tax		25%	18.50%
Surcharge	12%	3.00%	2.22%
Corporate Tax + surcharge		28.00%	20.72%
Health & Education Cess	4%	1.12%	0.83%
Total Tax Rate		29.12%	21.55%

### 3.3.6. LEVELISED TARIFF

The Levelised Tariff is computed by undertaking levelisation over the Useful Life of each RE technology considering a discount factor equivalent to the normative post-tax weighted average cost of capital, to represent the time value of money.

#### Discount Factor

The discount factor considered for this purpose is 10.29%, which is equal to the normative post-tax weighted average cost of capital on the basis of the normative debt-equity ratio of 70:30 specified in the Regulations, and the weighted average rates for the debt and equity components.

The Interest Rate considered for the loan component (i.e., 70%) of Capital Cost is 11.06%. For the equity component (i.e., 30%), the rate of RoE is computed at the base rate of 16%, grossed up as per the applicable tax rate. The rate of RoE is to be computed by grossing up the base rate with the tax rate equivalent to MAT for the first 10 years from the Commercial Operation Date (COD), and the normal tax rate for the remaining years of Project life.

The Discount Factor is computed as  $10.29\% = ((11.06\% \times 0.70 \times (1 - 29.12\%)) + (16.00\% \times 0.30))$ .

### 3.3.7. ESCALATION RATE FOR O&M EXPENSE AND FOR CAPITAL COST COMPUTATION

In May 2017, the base year of All-India WPI has been revised from 2004-05 to 2011-12 by the Office of Economic Advisor (OEA), Department of Industrial Policy and Promotion, Ministry of Commerce and Industry to align it with the base year of other macroeconomic

indicators to capture structural changes in the economy. Therefore, 2011-12 WPI series is used for undertaking the capital cost indexation for the RE technologies, i.e., Biomass, non-fossil fuel based cogeneration, small hydro power (SHP).

For determination of escalation rate for O&M expenses in RE generic tariff orders for FY 2016-17 and FY 2017-18, WPI series with base year 2004-05 was used. In calculation of annual escalation rate for O&M expenses, the five year monthly average WPI escalation rate is required as per amendment in MERC (MYT) Regulations, 2016. However, WPI data of 2011-12 series is available only from January 2014. Therefore, 2004-05 WPI series, which has data available for more than five years but only till March 2017, is referred for calculation of O&M escalation rate.

### **3.3.8. GRANT, SUBSIDY OR INCENTIVE FROM CENTRAL/ STATE GOVERNMENTS**

Regulation 24 of the RE Tariff Regulations, 2015 specifies that:

*“The Commission shall take into consideration any grant, subsidy or incentive offered by the Central or State Government or their agencies, including accelerated/additional depreciation benefit, if availed, while determining the tariff under these Regulations:*

*Provided that the State Nodal Agency shall inform the Distribution Licensee regarding any such grant, subsidy or incentives received by a Project Entity on a quarterly basis;*

*Provided further that any such grant, subsidy or incentives availed by a Project Entity shall be deducted by the Distribution Licensee in subsequent bills raised by the particular Project Entity towards sale of electricity in suitable installments or within such period as may be stipulated by the Commission;*

*Provided also that the following principles shall be considered for ascertaining the Income Tax benefit on account of accelerated or additional depreciation, if availed, for the purpose of tariff determination:*

*a. The assessment of benefit shall be based on normative Capital Cost, accelerated/additional depreciation rate as per the relevant provisions of the Income Tax Act and the Corporate Income Tax rate;*

*b. Capitalisation of RE Projects for the full financial year;*

*c. Per-unit benefit shall be derived on levelised basis at a discounting factor equivalent to the post-tax weighted average cost of capital;*

*Provided also that, in case the Central or State Government or their agencies provide any generation-based incentive which is specifically over and above the tariff, such incentive shall not be taken into account while determining the tariff.”*

Accordingly, for Projects availing the benefit of accelerated depreciation, the applicable Corporate Income Tax rate of 29.12% (25% Income Tax rate + 12% surcharge + 4% Health & Education Cess) has been considered. As per the Circular dated 7 November, 2016 of the Income Tax Department, the accelerated depreciation rates have been revised to 40% for FY 2017-18.

For determining the net depreciation benefits, depreciation @ 5.28% as per the Straight Line Method (book depreciation as per the Companies Act, 2013) has been compared with depreciation as per the Income Tax Act, i.e., 40% under the Written Down Value method. Moreover, additional 20% depreciation in the initial year is proposed to be extended to new assets acquired by Generation Companies vide the amendment to Section 32 (1) (ii a) of the Income Tax Act.

Depreciation for the first year has been computed at the rate of 40% and the accelerated depreciation at 20%, assuming the Project to be capitalized for the full financial year as per the second proviso to Regulation 24 of the RE Tariff Regulations. The tax benefit has been worked out as per the Corporate Income Tax rate on the net depreciation benefit. The 'per unit levelised accelerated depreciation benefit' has been computed considering the weighted average cost of capital as the discounting factor of 10.29 %, as detailed in para 3.3.6 of this Order. The detailed computation of benefit of accelerated depreciation in respect of each RE technology is set out in the technology-specific Sections.

As per the second proviso to Regulation 24, in case the Central or State Government or their agencies provide any generation-based incentive which is specifically intended to be over and above the Tariff, such incentive shall not be taken into account while determining the Tariff. Thus, while determining the Tariffs for RE Projects in this Order, no such incentives have been considered.

### **3.3.9. SHARING OF CDM BENEFITS**

As per Regulation 22, all risks, costs and efforts associated with the availing of carbon credits shall be borne by the Project Entity. The entire proceeds of carbon credit from an approved Clean Development Mechanism (CDM) Project, if any, shall be retained by it.

### **3.3.10. APPLICABILITY OF TARIFF ORDER**

The Commission vide its Order dated 24 April, 2018 in Case No. 113 of 2018 extended the applicability of existing Generic Tariff Order dated 28 April 2017 in Case No. 33 of 2017 for RE technologies along with its related terms and conditions, till 31 July 2018 or the issue of new RE Generic Tariff Order, whichever is earlier. Therefore, this Tariff Order shall be applicable to RE Projects commissioned in FY 2018-19, i.e. from 01 August, 2018 to 31 March, 2019.

The Variable Charge component determined for Biomass-based Power Projects and Non-Fossil Fuel-based Co-Generation Projects commissioned in FY 2018-19 shall also be applicable to such existing Projects commissioned prior to FY 2018-19.

The Fixed Charge component of the Tariff of such Projects shall continue to be governed by the other relevant Orders of the Commission.

The applicable Tariff Rate, Tariff Structure and other terms and conditions for other RE Projects commissioned on or before 31 July, 2018 will be in accordance with the provisions of the relevant Generic RE Tariff Orders.

The following sections of this Order outline the technology-wise norms and corresponding Generic Tariffs for RE Projects to be commissioned in FY 2018-19 based on various RE technologies.

#### 4. WIND ENERGY PROJECTS

##### 4.1. USEFUL LIFE

Regulation 2.1 (mm) of the RE Tariff Regulations defines ‘Useful Life’ in relation to a Unit of a Generating Station (including evacuation system) to mean the period from the COD till such time as specified under the Regulations. The Useful Life of Wind Energy Projects under Regulation 2.1 (mm) is 25 years from COD.

##### 4.2. TARIFF PERIOD

Regulation 7 specifies the Tariff Period for various RE Projects. The Tariff Period for Wind Energy Projects is 13 years, considered from the COD of the Project, and the Tariff determined under the Regulations is applicable only for the duration of the Tariff Period.

##### 4.3. CAPACITY UTILISATION FACTOR

Under Regulation 28 of the RE Tariff Regulations, the CUF norms for Wind Energy Projects are as under:

<i>Wind Zone</i>	<i>Annual Mean Wind Power Density (W/m<sup>2</sup>)</i>	<i>CUF</i>
<i>Zone 1</i>	<i>&lt;=250</i>	<i>22%</i>
<i>Zone 2</i>	<i>&gt;250 - &lt;=300</i>	<i>25%</i>
<i>Zone 3</i>	<i>&gt;300 - &lt;=400</i>	<i>30%</i>
<i>Zone 4</i>	<i>26.1.1 &gt;400</i>	<i>32%</i>

*Provided that these CUF norms may be revised by the Commission through general or specific Order considering data that may become available subsequently.”*

In accordance with Regulation 28.2, the annual mean Wind power density is to be measured at 80 metre hub height.

##### 4.4. CAPITAL COST

Due to technological advancements, capital cost of Wind energy projects has plummeted over last few years. In CERC RE Tariff Regulations 2017 dated 17 April, 2017, Wind energy tariffs shall be determined project specific on case to case basis as per Regulation 7 (a). Karnataka, Rajasthan and Tamilnadu are some of the major states which have issued generic tariff orders after CERC RE Tariff Regulations 2017 were notified. Following are the observations of Karnataka Electricity Regulatory Commission (KERC) and Rajasthan Electricity Regulatory Commission (RERC):

Karnataka Electricity Regulatory Commission (KERC)

Vide Order dated 4<sup>th</sup> September 2017 for revision of generic tariff for Wind power projects, KERC have made following observations in paragraph 2:

*“Periodic upward revision of tariff especially for Wind power can no longer be taken as the norm for promoting the sector:*

- a) The new Tariff Policy dated 28.01.2016 issued by the Central Government envisages procurement of Renewable Energy (except from waste to energy plants) in future, only through Competitive Bidding, as per its notified bidding framework.*
- b) The CERC, which was hitherto determining the Generic Tariff annually for the Wind projects, has not determined the same for the FY18, following its amended Regulations, wherein it has decided to determine project specific tariff for Wind projects, in line with the Tariff Policy, 2016.*
- c) The GERC, in its Order dated 30.08.2016, has revised the Wind power tariff (net of AAD of 53 paise/unit) to Rs.4.19/unit from the earlier tariff of Rs. 4.23/unit [2012 Order] and the APERC has also reduced the Wind power tariff from the existing Rs.4.70/unit [2012 Order] to Rs.4.25/unit, in its Order dated 26.03.2016. Further, in the bids called by the SECI for procurement of 1000 MW Wind power, the lowest tariff quoted is Rs. 3.46/unit.”*

In view of above, KERC had initially proposed capital cost of Rs. 4.80 crore/MW in its discussion paper. However, in final Order by KERC, approved capital cost for Wind energy projects is Rs. 6.20 crore/MW. Approved capital cost by KERC is primarily based on data from projects allocated by Karnataka Renewable Energy Development Ltd (KREDL) during FY 2015-16 and FY 2016-17. Considering project cost of Wind energy projects allotted 2 to 3 years ago for generic tariff of FY 2018-19 would not incorporate impact on capital cost during FY 2017-18. Therefore, MERC has not considered capital cost approved by KERC.

#### Rajasthan Electricity Regulatory Commission (RERC)

Vide Order dated 10<sup>th</sup> July 2017 for determination of generic tariff for sale of electricity from Wind power plants getting commissioned during FY 2017-18, RERC has made following observations in paragraph 10:

“

- a) Indexation mechanism being based on WPI indices may not capture the impact of technological advancements such as high tower with increased rotor diameter, next generation towers, change in design etc., that have taken place since FY 2014-15;*
- b) There exists a potential of reduction in the capital cost by consolidation of the supply chain and manufacturing process;*
- c) In the recent past higher rating units of Wind turbine are being deployed. In future, mostly higher capacity Wind turbines viz. 1.5/2 MW or more are expected to be installed in the State.*

“

Considering aforementioned factors, RERC has taken capital cost of Wind energy projects for FY 2017-18 is adopted to be Rs. 525 lakh/MW for projects commissioning during FY

2017-18 without indexation.

#### Tamilnadu Electricity Regulatory Commission (TNERC)

Vide Order dated 13<sup>th</sup> April 2018 for determination of generic tariff for Wind power plants commissioned during FY 2018-19 to FY 2019-20, TNERC has made following observations in paragraph 6.2:

“

##### *6.2.1*

*The cost of Wind turbines have considerably reduced over the years from 2010. One of the reasons widely reported for lower tariffs of Rs.3.46 per unit and Rs.2.64 per unit in the auctions conducted by SECI is the significant reduction in the price of Wind turbines with advanced technologies and discounts offered by the Wind turbine manufacturers. The cost of Wind turbine with tall Wind towers and advanced technology have reportedly come down by 20% in terms of cost per MW. Stakeholders have requested to adopt capital costs ranging from Rs.5 crores to Rs.7.5 crores and have requested to factor in land costs, evacuation, operation and maintenance costs, forecasting of Wind power etc.*

##### *6.2.2*

*Commission adopted a capital cost of Rs.6.2 crores per MW in the Wind tariff Order of 2016. With the cost of the Wind turbine that makes for 70% or more for a Wind power project added with other costs for installation, and considering the reduced prices of machinery, a capital cost of Rs.5.25 crores per MW is adopted. It is upto the developer to identify land, factor in various parameters that influence the performance of the plant. Based on the recommendation of MNRE, Commission in its tariff orders No.1 of 2009, Order No.6 of 2012 and Order No.3 of 2016, considered 85% of the capital cost as attributable to machinery cost, 10% for civil works and 5% for land cost. Commission decides to adopt the same percentage in this Order also.*

In view of above orders by RERC and TNERC, MERC has taken capital cost for FY 2018-19 equal to Rs. 525 lakh/MW without applying any further reduction in capital cost.

#### **4.5. DEBT-EQUITY RATIO**

Regulation 14.1 of the RE Tariff Regulations provides for a debt-equity ratio of 70:30 for determination of Generic Tariff. Considering this normative ratio and the above Capital Cost, the debt and equity components for Wind Energy Projects work out to Rs. 367.50 lakh per MW and Rs. 157.50 lakh per MW, respectively.

#### **4.6. RETURN ON EQUITY**

Regulation 17.2 and 17.3 specifies the normative RoE as under:

*“The Return on Equity shall be computed at the base rate of 16%, to be grossed up as per the applicable tax rate.*

*The rate of Return on Equity shall be computed by grossing up the base rate with the tax rate equivalent to Minimum Alternate Tax (MAT) during the year for the first 10 years from COD and the weighted average of normal tax rate during the year for the remaining years of Project life."*

Accordingly, the RoE for the applicable period of this Order is worked out as follows:

(Rs. crore)	
<b>Particulars</b>	<b>Amount</b>
Opening Equity (Rs lakh / MW)	157.50
Return on Equity for first 10 years @16% grossing up with MAT rate of 21.55% (Rs lakh per MW)	20.39%
Return on Equity after first 10 years @16% grossing up with Income Tax rate of 29.12% (Rs lakh per MW)	22.57%

Grossing up of the RoE is done as per the Formula:  $\text{RoE (\%)} / [1 - \text{Tax Rate (\%)}]$

#### **4.7. INTEREST ON LOAN**

As explained in para. 3.3.3 of this Order, the interest rate of 11.06% has been considered for Wind Energy Projects for a loan amount of Rs. 367.50 lakh per MW.

#### **4.8. DEPRECIATION**

Regulation 16 specifies that depreciation is to be allowed up to 90% of the Capital Cost of the asset. The depreciation rate for the first 12 years of the Tariff Period shall be 5.83% per annum, and the remaining depreciation shall be spread over the remaining Useful Life of the Project from the 13<sup>th</sup> year onwards.

Accordingly, for Wind Energy Projects, the depreciation rate is 5.83% for the first 12 years, and works out to 1.54% thereafter for the remaining Useful Life of 13 years.

#### **4.9. INTEREST ON WORKING CAPITAL**

Regulation 18.1 of the RE Tariff Regulations provides for computation of the Working Capital requirements of Wind Energy Projects as follows:

*"(a) Operation & Maintenance expenses for one month;*

*(b) Receivables equivalent to Two months of tariff for sale of electricity calculated on the normative CUF;*

*(c) Maintenance spares @ 15% of O & M expenses."*

As explained earlier at para. 3.3.4, IoWC is considered as 11.56 % for computation of the Tariff of Wind Energy Projects for the period for FY 2018-19.



#### 4.10. OPERATION AND MAINTENANCE EXPENSES

Regulations 29 of the RE Tariff Regulations stipulates that as follows:

“

29.1)

*Normative O&M expenses for the base year of the Review Period shall be 1.47% of the Capital Cost for the purpose of tariff determination.*

29.2)

*Normative O&M expenses allowed under these Regulations shall be escalated at the rate specified in the Regulations of the Commission governing Multi Year Tariff, to compute the levelised tariff.*

“

As per Regulation 29.1, O&M expense is Rs. 8.83 lakh/MW for base year i.e. FY 2015-16. Applying escalation rates arrived as per MERC MYT Regulations, 2015 applicable at time of each of the subsequent financial year in control period; O&M expense per MW for each of the financial year in control period is as follows:

Financial Year	O&M escalation rate (%)	O&M expense (Rs. Lakh/MW)
FY 2015-16		8.83
FY 2016-17	2.96%	9.09
FY 2017-18	4.85%	9.53

O&M expense for FY 2018-19 as per above methodology is Rs. 9.94 lakh/MW. This O&M expense as percentage of revised capital cost in para. 4.4 of this Order (Rs. 525 lakh/MW) is 1.89%. This is on higher side vis-à-vis normative O&M expense of 1.47% of capital cost mentioned in Regulation 29.1 of RE Tariff Regulations 2016. Percentage deviation from percentage mentioned in Regulation 29.1 mentioned above is 29% [calculated as  $(1.89\% - 1.47\%) / 1.47\%$ ].

Such anomaly is as a result of revision of capital cost to reflect current correction due to technological advancements, but application of O&M escalation rate on base year O&M expenses derived from capital cost of FY 2015-16. Therefore, O&M expense mentioned above does not reflect recent developments in Wind energy projects.

Further, TNERC has made following observations in paragraph 6.4 of Order dated 13<sup>th</sup> April 2018 for determination of generic tariff for Wind power plants commissioned during FY 2018-19 to FY 2019-20:

“

6.4.1

*Commission in its previous orders of 2009, 2012 and 2016 adopted per annum O&M expenses of 1.1% on 85% of the capital investment and 0.22% on 15% of the capital investment and escalation factor of 5% from second year onwards. The 85% of the capital cost refers to the plant and machinery cost and 15% refers to the land and civil works.*

6.4.2

*Some of the stakeholders have requested for adoption of 2% to 3% of capital cost as O&M cost. Some of them have requested flat rates of Rs.9 to 12 Lakhs per MW. The issue of operation and maintenance cost has been dealt in the Order of Hon'ble APTEL in Appeal No.197,198 etc of 2012 wherein the Commission's methodology has been upheld. Further, the Central Electricity Regulatory Commission's Regulations on Terms and Conditions of determination of Tariff from Renewable Energy Sources, 2017 specify determination of O&M expenses in a Project specific case based on prevailing market information. Commission decides to adopt an O&M expense of 1.1% on 85% of Capital investment (plant and machinery cost) and 0.22% on 15% of the Capital investment (land and civil works) with an escalation of 5% from second year onwards as adopted in its earlier orders.*

“

In view of revised capital cost of Wind energy projects as per para. 4.4 and of Regulation 29.1 of RE Tariff Regulations, 2015, O&M expense for FY 2018-19 is calculated as 1.47% of revised capital cost i.e.7.72 lakh/MW.

#### Rate of escalation for O&M expenses

Regulations 19 of the RE Tariff Regulations stipulates that the Base Year O&M is to be escalated at the rate specified in the MYT Regulations over the Tariff Period for determination of the levellised Tariff. The Commission amended the provisions Regulations 45.1(c), of the MERC (Multi-Year Tariff) Regulations, 2015 ('MYT Regulations') vide amendment dated 29 November, 2017. The amended provisions as applicable for generation projects specify the norms for escalation of O&M expense in subsequent years beyond the base year as follows:

*“ (c) The Operation and Maintenance expenses for each subsequent year shall be determined by escalating these Base Year expenses of FY 2015-16 by an inflation factor with 50% weightage to the average yearly inflation derived based on the monthly Wholesale Price Index of the past five financial years as per the Office of Economic Advisor of Government of India and 50% weightage to the average yearly inflation derived based on the monthly Consumer Price Index for Industrial Workers (all-India) of the past five financial years as per the Labour Bureau, Government of India, as reduced by an efficiency factor of 1% or as may be stipulated by the Commission from time to time, to arrive at the permissible Operation and Maintenance expenses for each year of the Control Period:”*

Accordingly, the Commission has analyzed the last 5 year average WPI and CPI indices from FY 2012-13 to FY 2016-17 considering 50% and 50% weightage to WPI and CPI, which works out to 5.27% per annum.

Particulars	Value
Average WPI rates for 2012-13 to 2016-17	3.31%
Weightage of WPI	50%
Effective Wt. avg. Value of WPI	1.65%
Average CPI rates for 2012-13 to 2016-17	7.23%

Particulars	Value
Weightage of CPI	50%
Effective Wt. Avg. Value of CPI	3.62%
Wt. Avg. value of inflation rate considering WPI (50%)+CPI(50%) for 2012-13 to 2016-17 less 1% efficiency factor	4.27%

Accordingly, the Commission has considered annual escalation factor for projecting O&M expenses works out to 4.27% per annum.

#### 4.11. TARIFF AS PER APPROACH-1 FOR WIND ENERGY PROJECTS

As mentioned in para. 4.1 above, the Wind Zone-wise 'Approach-1 Tariffs' for Wind Energy Projects commissioned from 1 August, 2018 to 31 March, 2019 have been determined as follows. The discount factor for levelisation of Tariff for Wind Energy Projects is 10.25%.

##### Tariff for Wind Energy Projects for FY 2018-19 by Approach-1

Wind Energy Zone	Tariff Period	Levelised Tariff from 1 August, 2018 to 31 March, 2019	Benefits of Tax and Additional Depreciation (if availed)	Net Levelised Tariff, adjusting for Tax and Additional Depreciation Benefit (if availed)
		Rs/kWh	Rs/kWh	Rs/kWh
Zone-1	13	4.65	0.37	4.28
Zone-2	13	4.09	0.33	3.76
Zone-3	13	3.41	0.27	3.14
Zone-4	13	3.19	0.26	2.94

Notes:

- Detailed computations of Tariffs for Wind Zones 1, 2, 3 and 4 are provided in Annexures 1A, 1B, 1C and 1D of this Order, respectively.

#### 4.12. TARIFF AS PER APPROACH-2 FOR WIND ENERGY PROJECTS

The Tariff discovered through Competitive Bidding in the State of Maharashtra for Wind energy projects for FY 2018-19 is Rs. 2.87 per unit as adopted by the Commission in its Order in Case No. 129 of 2018 dated 14 June, 2018.

#### 4.13. GENERIC TARIFF FOR WIND ENERGY PROJECTS FOR FY 2018-19

As per para. 4.11 and 4.12 above, Tariff as per Approach-2 is lower than Tariff as per Approach-1 for all Wind zones. Following table gives comparison of the two approaches:

Comparison of Wind Energy Tariff by Approach-1 and by Approach-2		
Particulars	Approach-1	Approach-2
Wind zone-1	4.65	2.87
Wind zone-2	4.09	
Wind zone-3	3.41	
Wind zone-4	3.19	

Therefore, Rs. 2.87 per unit is proposed to be a Generic Tariff applicable for all new Wind projects in all Wind zones by this Commission.

Notes:

- The above Tariff shall be valid for Projects commissioned from 1 August, 2018 to 31 March, 2019.
- The above Tariff shall be valid for a Tariff Period of 13 years from the COD.

## **5. SMALL (INCLUDING MINI/MICRO) HYDRO POWER PROJECTS**

### **5.1. USEFUL LIFE**

The Useful Life specified for SHPs, including Mini/Micro Hydro Projects, under Regulation 2.1 (mm) of the RE Tariff Regulations is 35 years from COD.

### **5.2. TARIFF PERIOD**

Regulation 7.2 specifies a Tariff Period of 13 years for SHPs of a capacity higher than 5 MW and upto and including 25MW.

Regulation 7.3 specifies a Tariff Period of 35 years for Mini/Micro Hydro Projects and for other SHPs upto and including 5 MW. The Tariff Period matches the Useful Life in case of these Projects, reflecting a longer preferential treatment for them.

### **5.3. CAPITAL COST OF SMALL HYDRO PROJECTS**

For the purpose of the RE Tariff Regulations, SHPs are those Projects located at sites approved by the State Government/ State Nodal Agency using new plant and machinery and with installed power plant capacity lower than or equal to 25 MW. For Capital Cost, SHPs have been classified into two categories based on their installed capacities, viz., a) SHPs above 1 MW and upto and including 5 MW, and b) SHPs above 5 MW and lower than or equal to 25 MW.

Under Regulation 30.1, the Commission has considered the normative Capital Cost for SHPs for the first year of the Review Period (Base Year) as below:

<b>Project Size</b>	<b>Capital Cost (Rs. lakh/MW)</b>
> 1 MW and upto and including 5 MW	605.28
> 5 MW and upto and including 25 MW	550.70

This Capital Cost has been escalated by applying the indexation mechanism of the CERC RE Tariff Regulations, as stipulated in Regulation 31 of the Commission's Regulations. The computation steps are shown in table below. For FY 2018-19, that base Capital Cost has been revised applying the indexation specified in the CERC RE Tariff Regulations, as stipulated in Regulation 27 of this Commission's Regulations. The computation is shown

below.

#### Indexation Formula

$$CC(n) = P \& M(n) * [1 + F1 + F2 + F3]$$

$$dn = (a * (SI_n - 1 / SI_0) - 1) + b * (EI_n - 1 / EI_0) - 1) / (a + b)$$

$$P \& M(n) = P \& M(0) * (1 + dn)$$

Where: a=Weightage for Steel Index and b= Weightage for Electrical Machinery Index

#### Capital Cost Indexation for FY 2018-19

	Variables				
Technology	a	b	F1	F2	F3
Small Hydro	0.60	0.40	0.16	0.10	0.14
Biomass	0.70	0.30	0.10	0.09	0.14
Co-Generation	0.70	0.30	0.10	0.09	0.14

#### Wholesale Price Index (WPI)

	WPI of Electrical Machinery		WPI of Iron and Steel	
	2017	2014	2017	2014
January	108.30	106.90	89.20	102.40
February	108.00	106.20	90.80	103.60
March	108.00	107.20	93.20	103.60
April	108.40	108.00	96.30	106.30
May	108.50	108.60	95.20	107.70
June	109.00	108.00	92.00	107.00
July	109.60	109.10	92.40	105.40
August	109.90	110.90	92.30	102.80
September	110.70	110.70	93.50	102.30
October	110.20	111.30	93.80	102.00
November	109.70	110.40	95.40	99.10
December	110.00	109.60	95.50	98.40
<b>Average</b>	<b>109.19</b>	<b>108.91</b>	<b>93.30</b>	<b>103.38</b>

Variable	Year	Value
SI <sub>0</sub>	2014	103.38
SI <sub>n-1</sub>	2017	93.30
EI <sub>0</sub>	2014	108.91
EI <sub>n-1</sub>	2017	109.19
<b>Dn</b>		<b>-5.75%</b>

The normative Capital Cost for FY 2018-19 computed as per the mechanism specified in the CERC RE Tariff Regulations is shown in the Table below.

Parameter	Particulars	SHP of > 1 MW and upto	SHP of > 5 MW and upto
-----------	-------------	------------------------	------------------------

		<b>and including 5 MW</b>	<b>and including 25 MW</b>
1+F1+F2+F3		1.40	1.40
CC <sub>0</sub> (Rs. lakh/MW)	Capital Cost for the Base Year	605.28	550.70
P&M <sub>0</sub> (Rs. lakh/MW)	Plant and Machinery Cost for the Base Year Capital Cost	432.34	393.36
P&M <sub>n</sub> (Rs. lakh/MW)	Plant & Machinery Cost for the nth Year (FY 2018-19)	407.49	370.75
<b>CC<sub>n</sub>(Rs. lakh/MW)</b>	<b>Capital Cost for the nth Year (FY 2018-19)</b>	<b>570.49</b>	<b>519.05</b>

#### 5.4. DEBT-EQUITY RATIO

In accordance with Regulation 14.1, the debt and equity components for SHPs with capacities above 1 MW and up to and including 5 MW work out to Rs. 399.34 lakh per MW and Rs. 171.15 lakh per MW (i.e., 70% and 30% of the Capital Cost), respectively. For Projects of capacities above 5 MW and lower than or equal to 25 MW, the debt and equity components work out to Rs. 363.33 lakh per MW and Rs. 155.71 lakh per MW, respectively.

#### 5.5. RETURN ON EQUITY

In accordance with Regulation 17.2, the RoE works out as shown in the Table below:

<b>Particulars</b>	<b>&gt; 1 MW and up to and including 5 MW</b>	<b>&gt; 5 MW and up to and including 25 MW</b>
Opening Equity (in Rs lakh per MW)	171.15	155.71
Return on Equity for the first 10 years @16% grossing up with MAT rate of 21.55% (Rs lakh per MW)	34.81	31.76
Return on Equity after first 10 years @16% grossing up with Income Tax rate of 29.12% (Rs lakh per MW)	41.88	35.15

Grossing up of the RoE is done as per the Formula:  $\text{RoE (\%)} / [1 - \text{Tax Rate (\%)}]$

#### 5.6. INTEREST ON LOAN

The interest rate of 11.06% has been taken for SHPs with capacities above 1 MW and up to and including 5 MW, with a gross opening loan amount of Rs. 399.34 lakh per MW; and for SHPs above 5 MW and lower than or equal to 25 MW, with a gross opening loan amount of Rs. 363.33 lakh per MW in the applicable period of this Order.

## 5.7. DEPRECIATION

In accordance with Regulation 16.2, the depreciation for SHPs will be charged at 5.83% for the first 12 years and at 0.87% thereafter for the remaining Useful Life of 23 years.

## 5.8. INTEREST ON WORKING CAPITAL

Regulation 18.1 of the RE Tariff Regulations provides for computation of the working capital requirements of SHPs as follows:

*"(a) O & M expenses for one month;*

*(b) Receivables equivalent to two months of tariff for sale of electricity calculated on the normative CUF;*

*(c) Maintenance spares @ 15% of O & M expenses."*

The IoWC is taken as 11.56% for computation of the Tariff for SHPs for FY 2018-19.

## 5.9. OPERATION AND MAINTENANCE EXPENSES

Regulation 34.1 provides for the normative O&M Expenses for SHPs for FY 2015-16 (Base Year), in accordance with which the following normative O&M expenses have been considered for the Base Year:

Project Size	O&M Expense Norm	O&M Expenses (Rs. lakh/MW)
> 1 MW and upto and including 5 MW	3.60% of the Capital Cost	21.79
> 5 MW and upto and including 25 MW	2.80% of the Capital Cost.	15.42

These O&M Expenses are escalated by 2.96% for FY 2016-17 and further escalated at of 4.85% for FY 2017-18. From FY 2018-19 onwards, O&M expense is escalated at 4.27% per annum as explained in para. 4.10. Accordingly, the Commission has applied the O&M expense norm for SHPs for FY 2018-19 as shown in the Table below:

Project Size	O&M Expenses (Rs. lakh/MW) for FY 2018-19
> 1 MW and upto and including 5 MW	24.53
> 5 MW and upto and including 25 MW	17.36

## 5.10. CAPACITY UTILISATION FACTOR

In accordance with Regulation 32, a CUF of 30% has been applied for determination of Tariff for SHPs.

## 5.11. AUXILIARY POWER CONSUMPTION

In accordance with Regulation 33, a Normative Auxiliary Consumption of 1.0% has been considered for determination of Tariff.



## 5.12. TARIFF MARK-UP FOR MINI/MICRO HYDRO PROJECTS

The RE Tariff Regulations provide for a higher Tariff for Mini/Micro Hydro Projects than for other SHPs, as below:

*“35.1 The tariff for Mini Hydro Power Projects of capacity of 1 MW and less but more than 500 kW, shall be higher by Rs 0.50 per kWh than that applicable to Small Hydro Power Projects with installed capacity of 5 MW or less, but more than 1 MW.*

*35.2 The tariff for Micro Hydro Power Projects of a capacity of 500 kW and below shall be higher by Rs. 1.00 per kWh than that tariff applicable to Small Hydro Power Projects with installed capacity of 5 MW or less but more than 1 MW.”*

Accordingly, the Commission has determined a higher Tariff for Mini/Micro Hydro Projects which is higher by 50 paise and Re. 1 per kWh, respectively, than for other SHPs.

## 5.13. TARIFF AS PER APPROACH-1 FOR SMALL HYDRO PROJECTS

Considering the above parameters and the discount factor of 10.25% for levelisation of Tariff for SHPs, the ‘Approach-1 Tariffs’ during the applicable period of this Order for SHPs commissioned from 1 August, 2018 to 31 March, 2019 have been determined as under:

**Tariff for Mini/Micro Hydro Projects and other SHPs by Approach-1**

Type of SHP	Tariff Period (Years)	Levelised Tariff from 1 August, 2018 to 31 March, 2019	Benefit of Accelerated Depreciation (if availed)	Net Levelised Tariff (upon adjusting for accelerated depreciation benefit, if availed)
		(Rs/kWh)	(Rs/kWh)	(Rs/kWh)
<b>Mini and Micro Hydro Projects</b>				
500 kW and below	35	5.64	0.28	5.36
Above 500 kW and up to and including 1 MW	35	5.14	0.28	4.86
<b>Other SHPs</b>				
Above 1 MW and up to and including 5 MW	35	4.64	0.28	4.36
Above 5 MW and upto and including 25 MW	13	3.92	0.26	3.66

- Detailed computations of Tariffs for SHPs of 1 MW to 5 MW, and for SHPs of 5 MW to 25 MW are provided in Annexures 2A and 2B of this Order, respectively.



#### 5.14. TARIFF AS PER APPROACH-2 FOR SMALL HYDRO POWER PROJECTS

In FY 2018-19, no tariff is adopted for hydro power projects (including Mini/Micro) through Competitive Bidding. Therefore as mentioned in para. 3.1.2 above, if any such tariff by way of Competitive Bidding is discovered and is approved by the Commission in FY 2018-19 for small hydro (including Mini/Micro), such tariff will be considered to be the Approach-2 Tariff for small hydro (including Mini/Micro) for FY 2018-19 from the date of approval by this Commission.

#### 5.15. GENERIC TARIFF FOR SMALL HYDRO POWER PROJECTS FOR FY 2018-19

As per para. 5.13 and 5.14 above, due to non-availability of Approach-2 tariff for small hydro projects; tariff by Approach-1 is adopted to be the Generic Tariff.

**Generic Tariff for Mini/Micro Hydro Projects and other SHPs**

Type of SHP	Tariff Period (Years)	Generic Tariff from 1 August, 2018 to 31 March, 2019	Benefit of Accelerated Depreciation (if availed)	Net Generic Tariff (upon adjusting for accelerated depreciation benefit, if availed)
		(Rs/kWh)	(Rs/kWh)	(Rs/kWh)
<b>Mini and Micro Hydro Projects</b>				
500 kW and below	35	5.64	0.28	5.36
Above 500 kW and up to and including 1 MW	35	5.14	0.28	4.86
<b>Other SHPs</b>				
Above 1 MW and up to and including 5 MW	35	4.64	0.28	4.36
Above 5 MW and upto and including 25 MW	13	3.92	0.26	3.66

- The above Tariffs shall apply to Projects commissioned from 1 August, 2018 to 31 March, 2019
- The above Tariffs shall be valid for a Tariff Period of 35 years from COD for SHPs of capacity up to and including 5 MW, and for 13 years for SHPs with installed capacity greater than 5 MW and up to and including 25 MW.

## 6. BIOMASS-BASED POWER PROJECTS

### 6.1. KEY PROVISIONS OF RE TARIFF REGULATIONS

Chapter 5 of the RE Tariff Regulations specifies the technology-specific norms for determination of Tariff for Biomass-based Power Projects based on Rankine Cycle technology applications using water-cooled condensers, as below:

*"37.1 The Capital Cost and performance norms as specified in this Chapter shall be applicable only to new Biomass-based Power Projects commissioned after notification of these Regulations.*

*37.2 The fuel-related aspects specified in Regulations 44 to 50 shall be applicable to both existing and new Biomass-based Power Projects;*

*Provided that the norms in respect of SHR and Auxiliary Consumption factor for existing Biomass-based Power Projects shall be as stipulated in the respective RE Tariff Orders referred to in Regulation 3.2."*

Regulation 49 specifies the Biomass fuel price as Rs. 3987 /MT during the first year of the Review Period, i.e., FY 2015-16, escalated for each subsequent year as per the indexation mechanism specified in Regulation 50. Regulation 50.1 reads as follows:

*"50.1 In the case of both existing and new Biomass-based Power Projects, the following indexing mechanism for adjustment of fuel prices for each year of operation will be applicable for determination of the variable charge component of tariff:*

*The Variable Charge for the nth year shall be computed as under:*

$$VC_n = VC_1 \times (P_n / P_1)$$

*where,*

*VC<sub>1</sub> represents the Variable Charge based on Biomass Price P<sub>1</sub> for FY 2015-16 as specified under Regulation 49, and shall be determined as under:*

*P<sub>(n)</sub> = Price per tonne of Biomass for the n<sup>th</sup> year to be considered for tariff determination*

*P<sub>(n-1)</sub> = Price per tonne of Biomass for the (n-1)<sup>th</sup> year to be considered for tariff determination. P<sub>1</sub> shall be the Biomass price for FY 2015-16 as specified under Regulation 49."*

*The Biomass fuel price shall be revised by the Commission taking into consideration the Biomass fuel price determined by the Central Commission or a normative escalation factor of 5% per annum, as it may consider appropriate."*

Accordingly, in case of Biomass-based Power Projects commissioned on or before 31 March, 2019, the Variable Charge component of the Tariff for FY 2018-19 shall be determined as outlined in para 6.14 of this Order. The Fixed Charge component shall continue to be governed by the relevant RE Tariff Orders of the Commission.

## 6.2. CAPITAL COST OF BIOMASS-BASED POWER PROJECTS

Regulation 38 specifies the normative Capital Cost for Biomass-based Power Projects based on Rankine Cycle technology as Rs. 494.32 lakh per MW for FY 2015-16 (Base Year). This Base Year Cost has been revised as per the indexation mechanism of the CERC RE Tariff Regulations, as stipulated in Regulation 39 of the Commission's Regulations. The computation steps are as shown in para. 5.3 of this Order. The normative Capital Cost for FY 2018-19 computed accordingly is shown in the Table below.

Parameter	Description	Cost
1+F1+F2+F3		1.33
CC <sub>0</sub>	Capital Cost for the Base Year (Rs. lakh/MW)	494.32
P&M <sub>0</sub>	Plant & Machinery Cost for the Base Year Capital Cost (Rs. lakh/MW)	371.67
P&M <sub>n</sub>	Plant & Machinery Cost for the nth Year (FY 2018-19) (Rs. lakh/MW)	346.58
CC <sub>n</sub>	<b>Capital Cost for the nth Year (FY2018-19) (Rs. lakh/MW)</b>	<b>460.96</b>

## 6.3. DEBT-EQUITY RATIO

In accordance with Regulation 14.1, the debt and equity components for Biomass-based Power Projects to be commissioned in FY 2018-19 work out to Rs. 322.67 lakh per MW and Rs. 138.29 lakh per MW respectively.

## 6.4. RETURN ON EQUITY

In accordance with Regulation 17.2, the RoE is as shown in the Table below:

Particulars	Amount (Rs. lakh/MW)
Opening Equity	138.29
Return on Equity for the first 10 years @16% grossing up with MAT rate of 21.55%	28.20
Return on Equity after first 10 years @16% grossing up with Income Tax rate of 29.12%	31.22

Grossing up of the RoE is done as per the Formula:  $\text{RoE (\%)} / [1 - \text{Tax Rate (\%)}]$

## 6.5. INTEREST ON LOAN

The interest rate of 11.06% has been considered for Biomass-based Power Projects commissioned in FY 2018-19, with a gross opening loan amount of Rs. 322.67 lakh per MW.

## 6.6. DEPRECIATION

In accordance with Regulation 16.2, depreciation will be charged at 5.83% for the first 12 years, and at 2.50% thereafter for the remaining Useful Life of 8 years.

## 6.7. INTEREST ON WORKING CAPITAL

Regulation 18.2 provides for computation of the working capital requirements of Biomass-based Power Projects as under:

*"(a) Fuel costs for four months equivalent to normative Plant Load Factor(PLF);*

*(b) O & M expenses for one month;*

*(c) Receivables equivalent to two months of fixed and variable charges for sale of electricity calculated on the target PLF;*

*(d) Maintenance spares @ 15% of O & M expenses"*

IoWC is taken as 11.56% for computation of the Tariff of Biomass Power Projects for FY 2018-19.

## 6.8. PLANT LOAD FACTOR

In accordance with Regulation 40.1 of the RE Tariff Regulations, 2015 the Plant Load Factor (PLF) for determining the Fixed Charge component of the Tariff for Biomass-based Power Projects will be as follows:

- a) During stabilisation: 60%
- b) During the remaining period of the first year (after stabilisation): 70%
- c) From 2nd Year onwards: 80%.

## 6.9. AUXILIARY POWER CONSUMPTION

In accordance with Regulation 41, a Normative Auxiliary Consumption of 10.0% has been considered.

## 6.10. STATION HEAT RATE

In accordance with Regulation 42, the Normative SHR of 4200 kcal/kWh has been considered for determination of Tariff.

## 6.11. OPERATION AND MAINTENANCE EXPENSES

Regulation 43.1 specifies the normative O&M Expenses for Biomass-based Power Projects for FY 2015-16 (Base Year) as 5.32% of the Capital Cost. This works out to Rs. 26.30 lakh per MW, which is to be escalated at 2.96% for the second year FY 2016-17, and further escalated by 4.85% for FY 2017-18 as per the RE tariff orders for FY 2016-17 and FY 2017-18 respectively. From FY 2018-19 onwards, O&M expense is escalated at 4.27% per

annum as explained in para. 4.10. Accordingly, the Commission has taken the O&M expense norm for Biomass Projects for FY 2018-19 as Rs. 29.60 lakh per MW.

#### **6.12. CALORIFIC VALUE**

In accordance with Regulation 48, the average Calorific Value of the Biomass Fuel (s) of 3,611 kcal/kg has been considered for determination of Tariff.

#### **6.13. FUEL COST**

Regulation 49 specifies the Biomass fuel price in the first year of the Review Period, i.e., FY 2015-16, as Rs. 3987/MT, to be linked to the indexation mechanism specified under Regulation 50. As per Regulation 50.1, the Biomass fuel price is to be revised taking into consideration the Biomass fuel price determined by the CERC or a normative escalation factor of 5% per annum, as it may consider appropriate.

The CERC had notified its RE Tariff Regulations, 2017 for 3 years starting from FY 2017-18. The CERC Regulations specify the Biomass fuel price for Maharashtra for FY 2017-18 as Rs. 3344.85/MT. The Commission, in RE tariff Order for FY 2017-18, had calculated the Biomass fuel price considering the principle of equivalent heat value. Accordingly, the approved Biomass fuel price for Maharashtra for FY 2017-18 was Rs. 3,896.21 /MT as per the last RE generic Tariff Order.

Regulation 50.1 provides for revision of Biomass fuel price as below:

*“the Biomass fuel price shall be revised by the Commission taking into consideration the Biomass fuel price determined by the Central Commission or a normative escalation factor of 5% per annum, as it may consider appropriate.”*

Accordingly, the Commission has escalated fuel price of FY 2017-18 by 5% per annum to arrive at fuel price of Rs. 4,091.02/MT for FY 2018-19.

Considering this, Fuel Cost, the Commission has computed the Variable Charge as Rs. 5.29/kWh in accordance with Regulation 50.1, considering GCV of 3611 kcal/kg, SHR as 4200 kCal/kWh and Auxiliary Consumption as 10%.

#### **6.14. VARIABLE CHARGE FOR BIOMASS-BASED POWER PROJECTS COMMISSIONED PRIOR TO 1 AUGUST, 2018**

As per Regulation 37.2, the fuel-related aspects specified in Regulations 44 to 50 shall be applicable to both existing and new Biomass-based Power Projects, except for the SHR and Auxiliary Consumption norms which shall be as stipulated in the respective RE Tariff Orders referred to in Regulation 3.2. Accordingly, the norms in respect of Fuel Price and GCV shall be applicable to existing Projects as per Regulations 48, 49 and 50. Further, as detailed in para. 1.18 of the Generic RE Tariff Order in Case No. 135 of 2015, the SHR for existing Projects has been considered the same as for new Projects, i.e. 4200 kcal/kWh. The Auxiliary Consumption Factor for existing Projects commissioned prior to 1 April, 2018

shall be as stipulated in the respective Tariff Orders (i.e., 10%). Based on these parameters, the variable cost of the Projects commissioned before 1 April, 2018 works out to Rs 5.29/kWh.

The Fixed Charge component of the FY 2018-19 Tariff for Biomass-based Power Projects commissioned prior to 1 August, 2018 shall be the levelised Fixed Charge approved under the respective RE Tariff Orders.

#### 6.15. TARIFF AS PER APPROACH-1 FOR BIOMASS-BASED POWER PROJECTS FOR FY 2018-19

Considering the above parameters and the discount factor of 10.29% (as computed at para 3.3.6 of this Order) for levelisation of Tariff, the 'Approach-1 Tariffs' for Biomass-based Power Projects for FY 2018-19 have been determined as in the Table below:

**Tariff for Biomass based Projects by Approach-1**

Year of Commissioning of Project	Fixed Charge (Rs/kWh)	Variable Charge (Rs/kWh)	Tariff from 01 August, 2018 to 31 March, 2019 (Rs/kWh)	Benefit of Accelerated Depreciation (if availed) (Rs/kWh)	Net Levelised Tariff (upon adjusting for accelerated depreciation benefit, if availed) (Rs/kWh)
<b>FY 2018-19</b>	2.15	5.29	7.44	0.14	7.30
<b>FY 2017-18</b>	2.20 <sup>^</sup>	5.29	7.49	0.16 <sup>^</sup>	7.33
<b>FY 2016-17</b>	2.25 <sup>***</sup>	5.29	7.54	0.17	7.37
<b>FY 2015-16 (10 November, 2015 to 31 March, 2016)</b>	2.35 <sup>@</sup>	5.29	7.64	0.16	7.48
<b>FY 2015-16 (1 April to 9 November, 2015)</b>	2.27 <sup>*</sup>	5.29	7.56	0.22 <sup>*</sup>	7.34
<b>FY 2014-15</b>	2.27 <sup>*</sup>	5.29	7.56	0.22 <sup>*</sup>	7.34
<b>FY 2013-14</b>	2.17 <sup>#</sup>	5.29	7.46	0.21 <sup>#</sup>	7.25
<b>Prior to FY 2013-14</b>	1.70 <sup>**</sup>	5.29	6.99	NA	6.99

<sup>^</sup> As per Order Dt 28 April, 2017 in Case No. 33 of 2017 (from 1<sup>st</sup> April, 2017 to 31<sup>st</sup> March, 2018)

<sup>\*\*\*</sup> As per Order Dt 29 April, 2016 in Case No. 45 of 2016 (from 1<sup>st</sup> April, 2016 to 31<sup>st</sup> March, 2017)

<sup>@</sup> As per Order dt 25 January, 2016 in Case No 135 of 2015 (from 10 November, 2015 to 31 March, 2016)

<sup>\*</sup> As per Order dt 7 July, 2014 in Case No. 100 of 2014 (extended till 31 Dec 2015)

<sup>#</sup> As per Order dt 22 March, 2013 in Case No. 6 of 2013

<sup>\*\*</sup> Considering first year of operation as per Order dt 8 August, 2005 in Case Nos. 37 of 2003 and 83 of 2008.

The detailed computations of Tariff for FY 2018-19 for Biomass-based Power Projects are provided in Annexure 3 of this Order.

The Tariff Rate comprises (i) Fixed Charge component, and (ii) Variable Charge component, and shall be applicable for sale of power by Rankine Cycle-based Projects to Distribution Licensees in Maharashtra in FY 2018-19.

#### 6.16. TARIFF AS PER APPROACH-2 FOR BIOMASS BASED POWER PROJECTS

In FY 2018-19, no tariff is adopted for Biomass based power projects through Competitive Bidding. Therefore as mentioned in para. 3.1.2 above, if any such tariff by way of Competitive Bidding is discovered and is approved by the Commission in FY 2018-19 for Biomass based power projects, such tariff will be considered to be the Approach-2 Tariff for Biomass based power projects for FY 2018-19 from the date of approval by this Commission.

#### 6.17. GENERIC TARIFF FOR BIOMASS-BASED POWER PROJECTS FOR FY 2018-19

As per para. 6.15 and 6.16 above, due to non-availability of Approach-2 tariff for Biomass based power projects; tariff by Approach-1 is adopted to be the Generic Tariff.

##### Levelised Tariff for Biomass based Projects

Year of Commissioning of Project	Fixed Charge (Rs/kWh)	Variable Charge (Rs/kWh)	Tariff from 01 August, 2018 to 31 March, 2019 (Rs/kWh)	Benefit of Accelerated Depreciation (if availed) (Rs/kWh)	Net Levelised Tariff (upon adjusting for accelerated depreciation benefit, if availed) (Rs/kWh)
<b>FY 2018-19</b>	2.15	5.29	7.44	0.14	7.30
<b>FY 2017-18</b>	2.20^	5.29	7.49	0.16^	7.33
<b>FY 2016-17</b>	2.25***	5.29	7.54	0.17	7.37
<b>FY 2015-16 (10 November, 2015 to 31 March, 2016)</b>	2.35@	5.29	7.64	0.16	7.48
<b>FY 2015-16 (1 April to 9 November, 2015)</b>	2.27*	5.29	7.56	0.22*	7.34
<b>FY 2014-15</b>	2.27*	5.29	7.56	0.22*	7.34
<b>FY 2013-14</b>	2.17#	5.29	7.46	0.21#	7.25
<b>Prior to FY 2013-14</b>	1.70**	5.29	6.99	NA	6.99

➤ The above Tariffs shall apply to Projects commissioned from 1 August, 2018 to 31 March, 2019

## 7. NON-FOSSIL FUEL-BASED CO-GENERATION PROJECTS

### 7.1. KEY PROVISIONS OF RE TARIFF REGULATIONS

Chapter 6 of the RE Tariff Regulations provides the technology-specific norms for determination of Tariff for Non-Fossil Fuel-based Co-Generation Projects. Regulations 52.1 and 52.2 read as follows:

*"52.1 The Capital Cost and performance norms specified in this Chapter shall be applicable only to Non-Fossil Fuel-based Co-Generation Projects commissioned after notification of these Regulations.*

*52.2 The fuel-related aspects specified under Regulations 59 to 66 shall be applicable to both existing and new Non-Fossil Fuel-based Co-Generation Projects:*

*Provided that the norms in respect of specific fuel consumption and Auxiliary Consumption factor for existing Non-Fossil Fuel-based Co-Generation Projects shall be as stipulated in the respective RE Tariff Orders referred to in Regulation 3.2."*

The Regulations also specify that the fuel price for each year of operation, for both existing and new Projects, shall be adjusted according to the following indexation mechanism:

*"61.1 In the case of both existing and new Non-Fossil Fuel-based Co-Generation Projects, the following indexing mechanism for adjustment of fuel prices for each year of operation will be applicable for determination of the variable charge component of tariff:*

*The Variable Charge for the nth year shall be computed as under:*

$$VC_n = VC_1 \times (P_n / P_1)$$

*where,*

*VC<sub>1</sub> represents the Variable Charge based on Bagasse Price P<sub>1</sub> for FY 2015-16 as specified under Regulation 60, and shall be determined as under:*

$$VC_1 = \frac{\text{Station Heat Rate (SHR)}}{\text{Gross Calorific Value (GCV)}} \times \frac{1}{(1 - \text{Auxiliary Consumption Factor})} \times \frac{P_1}{1000}$$

*P<sub>(n)</sub> = Price per tonne of Bagasse for the n<sup>th</sup> year to be considered for tariff determination*

*P<sub>(n-1)</sub> = Price per tonne of Bagasse for the (n-1)<sup>th</sup> year to be considered for tariff determination. P<sub>1</sub> shall be the Bagasse price for FY 2015-16 as specified under Regulation 60.*

*The Bagasse fuel price shall be revised by the Commission taking into consideration the Bagasse fuel price determined by the Central Commission for each year or a normative escalation factor of 5% per annum, as it may consider appropriate."*



Accordingly, in case of Non-Fossil Fuel-based Co-Generation Power Projects commissioned on or before 31 March, 2018, the Variable Charge component of the Tariff for FY 2018-19 shall be determined as per para. 6.14 of this Order. The Fixed Charge component shall continue to be governed by the relevant Orders issued by the Commission.

## 7.2. CAPITAL COST OF NON-FOSSIL FUEL-BASED CO-GENERATION PROJECTS

The normative Capital Cost of Non-Fossil Fuel-based Co-Generation Projects for the first year of the Review Period (FY 2015-16) has been specified in Regulation 53 as Rs. 489.02 lakh per MW. This Base Year Capital Cost has been escalated considering the CERC RE Tariff Regulations indexation mechanism, as stipulated in Regulation 54 of the Commission's Regulations. The computation steps are as shown in para. 5.3 of this Order. The normative Capital Cost for FY 2018-19 computed accordingly is as shown in the Table below.

Parameter	Description	Cost
1+F1+F2+F3		1.33
CC <sub>0</sub>	Capital Cost for the Base Year (Rs. lakh/MW)	489.02
P&M <sub>0</sub>	Plant & Machinery Cost for the Base Year Capital Cost (Rs. lakh/MW)	367.68
D <sub>n</sub>	Capital Cost Escalation Factor	-6.75%
P&M <sub>n</sub>	Plant & Machinery Cost for the nth Year (FY 2018-19) (Rs. lakh/MW)	342.87
CC <sub>n</sub>	<b>Capital Cost for the nth Year (FY2018-19) (Rs. lakh/MW)</b>	456.01

## 7.3. DEBT-EQUITY RATIO

In accordance with Regulation 14.1, the debt and equity components work out to Rs. 319.21 lakh per MW and Rs. 136.80 lakh per MW, respectively.

## 7.4. RETURN ON EQUITY

In accordance with Regulation 17, the RoE works out as shown in the Table below:

Particulars	Amount (Rs. lakh/MW)
Opening Equity	136.80
Return on Equity for the first 10 years @16% grossing up with MAT rate of 21.34%	27.90
Return on Equity after first 10 years @16% grossing up with Income Tax rate of 34.61%	30.88

Grossing up of the RoE is done as per the Formula:  $\text{RoE (\%)} / [1 - \text{Tax Rate(\%)}]$ .

#### **7.5. INTEREST ON LOAN**

As explained in para. 3.3.3 of this Order, an interest rate of 11.06% has been taken, with a gross opening loan amount of Rs. 319.21 lakh per MW in FY 2018-19.

#### **7.6. DEPRECIATION**

In accordance with Regulation 16, the depreciation will be charged at 5.83% for the first 12 years, and at 2.50% thereafter for the remaining Useful Life of 8 years.

#### **7.7. INTEREST ON WORKING CAPITAL**

Regulation 18 provides for computation of the working capital requirements as follows:

- a) *“ Fuel costs for four months equivalent to normative Plant Load Factor (‘PLF’);*
- b) *O&M expenses for one month;*
- c) *Receivables equivalent to two months of fixed and variable charges for sale of electricity calculated on the target PLF;*
- d) *Maintenance spares @ 15% of O&M expenses.”*

Further, as explained in para. 3.3.4, the IoWC is considered as 11.56% for computation of the Tariff for FY 2018-19.

#### **7.8. OPERATION AND MAINTENANCE EXPENSES**

Regulation 58.1 specifies the normative O&M Expenses for Non-Fossil Fuel-based Co-Generation Projects for FY 2015-16 (Base Year) as 3.54% of the Capital Cost, which works out to Rs. 17.31 lakh per MW. This is to be escalated at 2.96% for the second year of control period i.e. FY 2016-17, and at 4.85% for the third year of control period i.e. FY 2017-18 as per the RE tariff orders for FY 2016-17 and FY 2017-18 respectively. From FY 2018-19 onwards, O&M expense is escalated at 4.27% per annum as explained in para. 4.10. Accordingly, the Commission has taken the O&M expense norm for Non-Fossil Fuel-based Co-Generation Projects for FY 2018-19 as Rs. 19.49 lakh per MW.

#### **7.9. PLANT LOAD FACTOR**

In accordance with Regulation 55.2, PLF of 60% has been considered.

#### **7.10. AUXILIARY POWER CONSUMPTION**

In accordance with Regulation 56, the Auxiliary Consumption of 8.5% has been applied.

#### **7.11. STATION HEAT RATE**

In accordance with Regulation 57, the Normative SHR is 3600 kcal/kWh.

### **7.12. CALORIFIC VALUE**

Under Regulation 59, the average Calorific Value of Bagasse fuel is considered as 2250 kcal/kg for determination of Tariff.

### **7.13. FUEL COST**

Regulation 60.1 specifies the Bagasse fuel price during the first year, i.e., FY 2015-16, as Rs. 2326.84/MT, which is linked to the indexation mechanism specified under Regulation 61.

As per the indexation mechanism specified in Regulation 61.1, the Bagasse fuel price shall be revised taking into consideration the fuel price determined by the CERC or a normative escalation factor of 5% per annum, as may be considered appropriate. The CERC had notified its RE Tariff Regulations, 2017 for 3 years starting from FY 2017-18. The CERC Regulations specify the Bagasse price for Maharashtra for FY 2017-18 as Rs. 2273.75/MT. The Commission, in RE tariff Order for FY 2017-18, approved the Bagasse fuel price of Rs. 2,273.75/MT for Maharashtra considering the equivalent calorific value method, as per the last RE generic Tariff Order.

Regulation 61.1 provides for revision of Biomass fuel price as below:

*“The Biomass fuel price shall be revised by the Commission taking into consideration the Biomass fuel price determined by the Central Commission or a normative escalation factor of 5% per annum, as it may consider appropriate.”*

Accordingly, the Commission has escalated fuel price of FY 2017-18 by 5% per annum to arrive at fuel price of Rs. 2,387.44/MT for Maharashtra for FY 2018-19.

Considering this Fuel Cost, the Commission has computed the Variable Charge as Rs. 4.17/kWh for Projects to be commissioned in FY 2018-19, in accordance with Regulation 61.1, considering GCV as 2250 kcal/kg, SHR as 3600 Kcal/kWh and Auxiliary Consumption as 8.5%.

### **7.14. VARIABLE CHARGE FOR BAGASSE-BASED CO-GENERATION POWER PROJECTS COMMISSIONED PRIOR TO 1 AUGUST, 2018**

As per Regulation 55.2, the fuel-related aspects specified in Regulations 59 to 66 shall be applicable to both existing and new Non-Fossil Fuel-based Co-Generation Projects, except for the SHR and Auxiliary Consumption norms which shall be as stipulated in the respective RE Tariff Orders referred to in Regulation 3.2. Accordingly, the norms in respect of Fuel Price and GCV shall be applicable to existing Projects as per Regulations 59, 60 and 61. The Auxiliary Consumption Factor for existing Projects commissioned prior to 1 April, 2018 shall be as stipulated in the respective Tariff Orders (i.e., 8.5%). Based on these parameters, the variable cost of the Projects commissioned prior to 1 April, 2018 works out to Rs. 4.17/kWh.

The Fixed Charge component of the Tariff for Projects commissioned prior to 1 August, 2018 shall be the levelised Fixed Charge approved under the respective RE Tariff Orders.

#### 7.15. TARIFF AS PER APPROACH-I FOR NON-FOSSIL FUEL-BASED CO-GENERATION PROJECTS FOR FY 2018-19

Considering the above parameters and the discount factor as 10.25% for levelisation of Tariff of Non-Fossil Fuel-based Co-Generation Projects commissioned from 1 August, 2018 to 31 March, 2019, the 'Approach-1 Tariffs' for such Projects for FY 2018-19 have been determined as under:

**Tariff of Non-Fossil Fuel-based co-generation Projects by Approach-1**

Year of Commissioning	Fixed Charge (Rs/kWh)	Variable Charge (Rs/kWh)	Tariff (Rs/kWh)	Benefit of Accelerated Depreciation (if availed) (Rs/kWh)	Net Levelised Tariff (upon adjusting for accelerated depreciation benefit, if availed) (Rs/kWh)
<b>FY 2018-19</b>	2.28	4.17	6.45	0.14	6.31
<b>FY 2017-18</b>	2.35 <sup>^</sup>	4.17	6.52	0.16	6.36
<b>FY 2016-17</b>	2.43 <sup>***</sup>	4.17	6.60	0.21	6.39
<b>FY 2015-16 (10 Nov, 2015 to 31 March, 2016)</b>	2.52 <sup>@</sup>	4.17	6.69	0.21	6.48
<b>FY 2015-16 (1 April to 9 November, 2015)</b>	2.46 <sup>*</sup>	4.17	6.63	0.28	6.35
<b>FY 2014-15</b>	2.46 <sup>*</sup>	4.17	6.63	0.28	6.35
<b>FY 2013-14</b>	2.38 <sup>#</sup>	4.17	6.55	0.27	6.28
<b>Prior to FY 2013-14</b>	2.26 <sup>**</sup>	4.17	6.43		6.43

<sup>^</sup> As per Order Dt 28 April, 2017 in Case No. 33 of 2017 (from 1<sup>st</sup> April, 2017 to 31<sup>st</sup> March, 2018)

<sup>\*\*\*</sup> As per Order dt 29 April, 2016 in Case No. 45 of 2016 (from 1<sup>st</sup> April 2016 to 31<sup>st</sup> March, 2017)

<sup>@</sup> As per Order dt 25 January, 2016 in Case No 135 of 2015 (from 10 November, 2015 to 31 March, 2016)

<sup>\*</sup> As per Order dt 7 July, 2014 in Case No. 100 of 2014 (extended till 31 Dec 2015)

<sup>#</sup> As per Order dt 22 March, 2013 in Case No. 6 of 2013

<sup>\*\*</sup> As per Order dt 11 January, 2010 in Case No. 123 of 2008.

The computations of Tariff for FY 2018-19 are provided in Annexure 4 of this Order. The Fixed Charge component of the Tariff for Projects commissioned prior to 1 August, 2018 shall be the levelised Fixed Charge approved under the respective RE Tariff Orders. The Tariff Rate comprises (i) Fixed Charge component, and (ii) Variable Charge component, and shall be applicable for sale of power by such Projects to Distribution Licensees in Maharashtra in FY 2018-19.

#### 7.16. TARIFF AS PER APPROACH-2 FOR NON-FOSSIL FUEL-BASED CO-GENERATION PROJECTS

As mentioned in para. 3.1.2 above, the Tariff discovered through Competitive Bidding in the State of Maharashtra proposed (Fixed Charge + Variable Charge) for non-fossil fuel based cogeneration projects for FY 2018-19 is Rs. 4.99/unit as approved by the Commission in its Order in Case No. 165 of 2018 dated 30 June, 2018.

#### 7.17. GENERIC TARIFF FOR NON-FOSSIL FUEL-BASED CO-GENERATION PROJECTS

As per para.7.16 and 7.17, Tariff as per Approach-2 is lower than Tariff as per Approach-1. Following table gives comparison of the two approaches:

Comparison of Co-generation Tariff by Approach-1 and by Approach-2

Particulars	Approach-1	Approach-2
Co-generation	6.45	4.99

Therefore, Rs. 4.99 per unit is adopted as Generic Tariff for non-fossil fuel based cogeneration projects by this Commission.

Note:

- The above Tariff shall be valid for Projects commissioned from 1 August, 2018 to 31 March, 2019.

#### 7.18. TARIFF FOR NON-FOSSIL FUEL-BASED CO-GENERATION PLANTS USING BIOMASS

Regulation 60.2 specifies that the fuel price for Non-Fossil Fuel-based Co-Generation Projects using Biomass other than Bagasse will be the Biomass prices specified under Regulation 49. Accordingly, the fuel cost for such Projects is considered as Rs. 4,091.02/MT as set out in para. 6.13 of this Order. The corresponding Calorific Value of Biomass fuel (3611 kcal/kg) has been taken as set out in para 6.12. Considering the Auxiliary Consumption and SHR applicable to Non-Fossil Fuel-based Co-Generation Projects set out at para 7.10 and 7.11, respectively, the Commission has computed the Variable Charge as Rs. 4.46/kWh for Non-Fossil Fuel-based Co-Generation Projects using Biomass for FY 2018-19 (for the period for which such Projects are using Biomass) as follows:

$$\text{Variable Charge} = \frac{\text{Station Heat Rate (SHR)}}{\text{Gross Calorific Value (GCV)}} \times \frac{1}{(1 - \text{Auxillary Consumption Factor})} \times \frac{\text{Price per tonne of Fuel}}{1000}$$

$$4.46 = \frac{3600}{3611} \times \frac{1}{(1 - 8.5\%)} \times \frac{4091.02}{1000}$$

The Project Entity shall, along with its monthly energy bill, furnish a monthly fuel procurement and fuel usage statement certified by a Chartered Accountant to the Distribution Licensee with whom an EPA has been entered into and to the State Nodal

Agency (presently, MEDA) for monitoring the fossil and Non-Fossil fuel consumption as per Regulation 46. The State Nodal Agency shall verify the use of Biomass other than Bagasse for applicability of the Biomass fuel Tariff for Non-Fossil Fuel-based Co-Generation Projects using Biomass. Before making payment of the monthly energy bills, the Distribution Licensees shall satisfy themselves about the monthly fuel procurement and fuel usage as per the statement certified by a Chartered Accountant and verified by the State Nodal Agency. The Distribution Licensees shall also submit an annual consolidated report to the Commission, giving details of monthly fuel bills and fuel use statement for such Projects having EPAs with them.

#### **7.19. TARIFF FOR NON-QUALIFYING NON-FOSSIL FUEL-BASED CO-GENERATION PLANTS**

The Tariff of Non-Qualifying Non-Fossil Fuel-based Co-Generation Projects will be equivalent to the Average Power Purchase Cost (APPC) of the respective Distribution Licensees for FY 2018-19, in accordance with Regulation 67.

### **8. SOLAR PHOTO VOLTAIC PROJECTS**

#### **8.1. USEFUL LIFE**

Regulation 2.1 (mm) defines ‘Useful Life’ in relation to a Unit of a Generating Station (including evacuation system) to mean the duration from the COD till such time as specified under the Regulations for such generation facility. The Useful Life specified for Solar Photo Voltaic (PV) Projects is 25 years.

#### **8.2. REVIEW PERIOD**

The Control Period for Solar PV Projects shall be in accordance with the relevant stipulations at para 3.2 of this Order.

#### **8.3. TARIFF PERIOD**

Regulation 7 specifies the Tariff Period for Solar PV Projects as 13 years. In terms of Regulation 7.5, the Tariff Period specified shall be reckoned from the COD of the RE Projects, and the Tariff determined under the Regulations shall be applicable only for the duration of the Tariff Period.

#### **8.4. OPERATION AND MAINTENANCE EXPENSES**

RE Regulations, 2015 have not given any relation between O&M expenses and capital cost similar to that of Wind energy projects. However, vide the fifth amendment in CERC Regulations for tariff determination from RE sources 2016 dated 30 March, 2016, O&M expenses for Solar PV projects were modified by CERC as follows;

“

*Provided that Normative O&M expenses for the last year of the Control Period (i.e. FY 2016-17) shall be Rs. 7 lakhs per MW.*

“

This Commission has observed that actual O&M expenses per MW are much lower than Rs. 7 lakhs per MW. In tariff petition dated 11<sup>th</sup> December 2017 of IREDA to Kerala State Electricity Regulatory Commission (KSERC) for determination of tariff for 50 MW Solar PV plant, annual O&M charges are taken as Rs. 7 lakh/MW as per above amendment by CERC. However, Letter of Intent (LoI) dated 29<sup>th</sup> December 2015 for this project to ‘EPC and O&M contractor’ mentions annual O&M cost of Rs. 2,57,62,500/- for 50 MW i.e. at Rs. 5,15,250/- per MW without any escalation. This shows that annual O&M expenses of Rs. 7 lakhs per MW for FY 2016-17 is more than adequate for O&M expense.

In view of absence of any benchmark for O&M expense as percentage of capital cost, this Commission is adopting normative O&M expense for FY 2016-17 as given in the fifth amendment of CERC (mentioned above). This is further escalated by 4.85% for FY 2017-18 (as per Generic RE Order for FY 2017-18) and by 4.27% for FY 2018-19 (as per para. 4.10 mentioned above). Therefore, annual O&M expense per MW for FY 2018-19 is Rs. 7.65 lakh per MW.

However, this Commission may adopt any reliable benchmark for O&M expense as percentage of capital cost as and when it is available.

#### 8.5. CAPITAL COST OF SOLAR PV PROJECTS

Regulation 69 specifies the normative Capital Cost of Solar PV Projects as Rs. 605.85 lakh/MW for the Base Year FY 2015-16. In RE Tariff Order for FY 2016-17 dated 29 April, 2016 in Case No.45 of 2016, the Commission had taken the Capital Cost of Solar PV Projects as Rs. 530.02 lakh/MW, in line with the CERC’s RE tariff Order dated 23 March, 2016.

However, for FY 2018-19, CERC has not determined a benchmark Capital Cost for Solar PV Projects and its RE Tariff Regulations, 2017 do not envisage such generic determination. The Commission notes that the capital cost of Solar PV modules has decreased significantly during last twelve months. Hence, for deriving the normative Capital Cost for Solar PV Projects for FY 2018-19, the Commission evaluated the following three options:

##### a) **Option 1: Capital Cost determined by other SERCs for FY 2018-19**

The Commission considered the Capital Cost specified by other SERCs, primarily Gujarat (GERC), Madhya Pradesh (MPERC), Rajasthan (RERC), Tamilnadu (TNERC) and Karnataka (KERC) for FY 2017-18. Except for RERC, all others have considered a Capital Cost in the range of Rs. 440 lakh/MW to Rs. 615 lakh/MW, i.e. higher than the Capital Cost considered by this Commission for FY 2017-18.

In its recent Order dated 9 October, 2017, the RERC has taken a Capital Cost of Rs. 358.36 lakh/MW. Following is the summary of capital costs considered by various states for FY 2017-18:

State	Capital Cost for FY 2017-18 (lakh/MW)
Gujarat	615.00
Madhya Pradesh	530.00

Tamilnadu	470.00
Karnataka	440.00
Rajasthan	358.36
<b>Average Capital Cost</b>	<b>482.67</b>
Capital cost for Maharashtra	424.74

Karnataka Electricity Regulatory Commission (KERC) has issued discussion paper on 7<sup>th</sup> February 2018 for determination of tariff and other norms, including capital cost, for Solar photovoltaic projects. Proposed capital cost of ground mounted MW scale Solar photovoltaic projects for FY 2018-19 is Rs. 350 lakh/MW. However, no final Order is issued in this regard as on date of this Order.

As per CERC (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2017; project specific tariff shall be determined for Solar photovoltaic projects. Therefore no benchmark capital cost is available.

**b) Option 2: Derived Capital Cost considering Viability Gap Funding and tariff discovered under reverse bidding process of SECI under JNNSM and NTPC**

In this option, capital cost is derived from tariff discovered through Competitive Bidding process. It may not be justifiable to apply all the parameters such as rate of interest on long term loans, rate of interest on working capital, return on equity as considered in RE tariff regulations 2015 while computing capital cost from tariff discovered in Competitive Bidding, because L1 bidders in reverse bidding process have access to competitive cost of funds and return expectations. Accordingly, the Commission has taken more aggressive parameters to estimate capital cost used for Competitive Bidding from the L1 tariffs. The Commission has considered competitive bids from the Government of India (GoI) Undertaking only, like SECI & NTPC.

Competitive bidding conducted by the state utilities like TANGEDCO and GUVNL is not considered as there is significant difference in tariffs received by both the state utilities even though both had conducted e-reverse auction at same time. This is mainly due to difference in various factors like Solar insolation, Discom ratings, payment security, etc.

**i. Competitive bidding conducted for the GoI enterprises**

The Government of India owned enterprises like NTPC and SECI had invited bids during FY 2017-18. These tenders were not for the projects in the State of Maharashtra, but for Solar parks in other states. The tariffs discovered through Competitive Bidding are summarized in table below:

No.	Tender	Capacity (MW)	Month	L1 tariff (Rs./unit)
1	SECI Bhadla (ILFS Solar Park)	500	May 2017	2.44
2	SECI Bhadla (Adani park)	250	May 2017	2.62
3	NTPC Kadappa Solar park	250	April 2017	3.15



No viability gap funding was sought by any of the L1 bidders. The Commission notes, however, that there are several provisions in the bid documents and structuring of the Solar Parks that has enabled significant reduction in the price. Some of the important factors include (a) very large project size enabling economies of scale, (b) Solar park model which reduces development risk; (c) evacuation arrangement with ISTS connectivity (d) long term off-take assurance with pre-identified credit-worthy customers (e) conducive payment security mechanism supported by suitable fund which minimises risk and facilitates long term capital (f) payment guarantee support, etc.

Solar park developers have to pay land lease payments and O&M costs to Solar park developers for facilities including roads, drainage system, and evacuation infrastructure. Some developmental costs are also paid upfront.

However, the present Generic Tariff determination has accommodated cost of transmission line unlike Solar park projects which are provided with transmission line by the state utilities by virtue of being government sponsored projects. Therefore, it would be appropriate to include cost of transmission lines in capital cost considered for Solar park projects. Capital cost per MW of transmission lines depends upon distance of the project site from the nearest substation with spare bays for power evacuation and generation capacity. These two factors are project specific and vary on case to case basis. Cost towards contingency and other miscellaneous expenses are also higher for typical Solar PV developers vis-à-vis project developers in Solar park due to various project risks which are not encountered by Solar park projects. Therefore, Rs. 15 lakh per MW are added towards cost for transmission line and contingency expenses in 'capital cost per MW' derived from L1 bids for Solar park.

Accordingly, following capital costs were discovered by Competitive Bidding for SECI & NTPC:

(Rs. lakh/MW)

No.	Tender	L1 tariff (Rs./ unit)*	Capital Cost		
			Solar park	Cost of transmission line	Total
1	SECI Bhadla (ILFS Solar Park)	2.44	211	15	226
2	SECI Bhadla (Adani park)	2.62	233	15	248
3	NTPC Kadappa Solar park	3.15	297	15	312

It may be noted that NTPC is selling power from Kadappa Solar park to Andhra Pradesh State Power Distribution Company Limited (APSPDCL) at rate lower than Rs. 3.15 per unit. However, this Commission has not reduced the L1 rate further to PSA rate, because PSA rate is for Solar power bundled with thermal power from other plants of NTPC.

**c) Option 3: Component-wise cost-plus approach based on market cost for Solar PV modules and Balance of Systems (BoS) of Projects**

The Capital Cost of Solar PV Projects broadly comprises the PV module and the non-module components, or the BoS of the Project. The Commission analysed the module and non-module cost separately at market trends and considered the component-wise Capital Cost as below:

Item	Component-wise Capital Cost (Rs. lakh/MW)	Remarks
PV Module*	184.28 <sup>^</sup>	Based on Market Analysis
Power Conditioning Unit	25.00	
Land	25.00	Similar to CERC's Order for FY 2016-17
Civil & general Works	35.00	
Ground Mounting Structures	35.00	
Cables and transformers	44.00	
Preliminary/Pre-operating expenses	27.63	
<b>Total in Rs. lakh/MW</b>	<b>375.91</b>	

\* Minimum poly silicon PV module rate on 28<sup>th</sup> February 2018 is USD 0.27/W (source: wap.pvinsights.com);  
1 USD=INR 65.00

<sup>^</sup> Minimum 1.05 MW Solar PV modules at DC side assumed for 1 MW AC output

The Capital Cost set out in **Option-1** above may not be representative of the prevalent Solar PV market scenario trend as most of the SERC Orders, except RERC Order, were issued a year ago. As regards **Option-3** for estimating the component-wise Capital Cost, the CERC RE Tariff Regulations, 2017 do not envisage any generic benchmark Capital Cost for Solar PV Projects, and the Capital Cost would be determined on a Project-specific basis. Thus, no benchmark for component-wise Capital Cost for FY 2018-19 is available at this stage, and the component-wise cost benchmark for FY 2016-17, is available from the CERC's earlier RE Tariff Order.

Estimating the component-wise Capital Cost for FY 2018-19 under Option-3 considering the percentage share of different cost components as approved for FY 2016-17 would not be appropriate considering the rapid decline in the PV Module costs. The PV module costs based on current and expected market price trends may be considered for Capital Cost estimation for FY 2018-19, but projection of other non-Module costs (e.g. land, power evacuation, erection and installation costs) would be challenge without assessment of ground realities. Estimation of non-module costs linked to approved costs for FY 2016-17, as envisaged under Option-3, would not appropriately represent the projected cost estimates for FY 2018-19.

The Commission notes that, out of 20 GW + Solar PV installed capacity in India (as on 31<sup>st</sup> January, 2018), majority of capacity has been set up through the bidding process under Central schemes (SECI/NTPC) or State-level programmes, and only a relatively small component of Solar capacity addition has taken place under the cost-plus regulated regime. Hence, it may be appropriate to consider cost benchmarks emerging through the bidding process as it reflects prevalent market conditions, emerging trends in technology and costs and corresponding expectations of risks and returns. The process referred to in **Option-2** was undertaken by various central and state enterprises like SECI through open Competitive

Bidding. Moreover, the Projects under this bidding process are expected to be commissioned in FY 2018-19.

Hence, the Commission is of the view that it would be appropriate to consider the Capital Cost derived from Option-2 above. Therefore, average capital cost for Solar PV power project for determination of the Generic Tariff for FY 2018-19 is as calculated in table below:

No.	Tender	L1 tariff (Rs./unit)	Capital Cost (Rs. lakh/MW)
1	SECI Bhadla (ILFS Solar Park)	2.44	226.0
2	SECI Bhadla (Adani park)	2.62	248.0
3	NTPC Kadappa Solar park	3.15	312.0
	<b>Average capital cost (Rs. lakh/MW)</b>		<b>262.00</b>

#### 8.6. DEBT-EQUITY RATIO

In accordance with Regulation 14.1, the normative debt and equity components for Solar PV Projects shall be Rs. 183.40 lakh per MW and Rs. 78.60 lakh per MW, respectively.

#### 8.7. RETURN ON EQUITY

In accordance with Regulation 17.1, the RoE works out as shown in the Table below:

Particulars	Amount (Rs. lakh/MW)
Opening Equity	78.60
Return on Equity for the first 10 years @16% grossing up with MAT rate of 21.55%	16.03
Return on Equity after first 10 years @16% grossing up with Income Tax rate of 29.12%	17.74

Grossing up of the RoE is done as per the Formula:  $\text{RoE (\%)} / [1 - \text{Tax Rate (\%)}]$ .

#### 8.8. INTEREST ON LOAN

An interest rate of 11.06% has been taken for a loan amount of Rs. 183.40 lakh per MW in FY 2018-19.

#### 8.9. DEPRECIATION

In accordance with Regulation 16, depreciation will be charged at 5.83% for the first 12 years, and at 1.54% thereafter for the remaining Useful Life of 13 years.

#### 8.10. INTEREST ON WORKING CAPITAL

Regulation 18.1 provides for computation of the working capital requirements for Solar PV Projects as under:

- a) "O&M expenses for one month;
- b) Receivables equivalent to two months of tariff for sale of electricity calculated on the normative CUF;
- c) Maintenance spares @ 15% of O&M expenses."

The IoWC is considered as 11.56 % for computation of the Tariff.

#### 8.11. CAPACITY UTILISATION FACTOR

In accordance with Regulation 70, a CUF of 19% has been taken.

#### 8.12. TARIFF AS PER APPROACH-1 FOR SOLAR PV POWER PROJECTS

Considering the parameters discussed above, the Generic Tariff for Solar PV Projects commissioned from 1 August, 2018 to 31 March, 2019 has been determined as shown below:

Tariff for Solar PV Power Projects commissioned in FY 2018-19				
Particulars	Tariff Period	Levelised Tariff	Benefit of Accelerated Depreciation (if availed)	Net Levelised Tariff (upon adjusting for Accelerated Depreciation benefit, if availed)
		(Rs/kWh)	(Rs/kWh)	(Rs/kWh)
Solar PV Projects	13	3.02	0.21	2.81

The Tariff computations for FY 2018-19 are provided in Annexure 5A of this Order.

#### 8.13. TARIFF AS PER APPROACH-2 FOR SOLAR PHOTOVOLTAIC PROJECTS

As mentioned in para. 3.1.2 above, the Tariff discovered through Competitive Bidding in the State of Maharashtra for Solar photovoltaic projects commissioned in FY 2018-19 is Rs. 2.72/unit as approved by the Commission in its Order in Case No. 164 of 2018 dated 29 June, 2018.

#### 8.14. GENERIC TARIFF FOR SOLAR PHOTOVOLTAIC PROJECTS FOR FY 2018-19

As per para. 8.12 and 8.13 above, Tariff as per Approach-2 is lower than Tariff as per Approach-1. Following table gives comparison of the two approaches:

Comparison of Co-generation Tariff by Approach-1 and by Approach-2

Particulars	Approach-1	Approach-2
Solar Photovoltaic	3.02	2.72

Therefore, Rs. 2.72 per unit is adopted as Generic Tariff for Solar photovoltaic projects by this Commission.

Notes:

- The above Tariff shall be valid for Projects commissioned from 1 August, 2018 to 31 March, 2019.

#### 8.15. GENERIC TARIFF FOR SOLAR ROOF-TOP PV PROJECTS

The Solar Roof-top PV Projects covered in this Order under the RE Tariff Regulations, 2015 are distinct and separate from and do not include those covered under the MERC (Net Metering for Roof-top Solar PV Systems) Regulations, 2015.

Regulation 72 of the RE Tariff Regulations specifies that the Tariff for Solar Roof-top PV Projects shall be Rs 0.50 per kWh higher than that of other Solar PV Projects. Accordingly, the Tariff for such Projects during FY 2018-19 shall be as follows:

**Comparison of Tariff for Solar Roof-top PV Projects by Approach-1& Approach-2**

Particulars	Tariff Period	Approach-1			Approach-2
		Levelised Total Tariff	Benefit of Accelerated Depreciation (if availed)	Net Levelised Tariff (upon adjusting for Accelerated Depreciation benefit, if availed)	
Solar Roof-top PV and other small Solar Power Projects	13	3.52	0.21	3.31	3.22

Therefore, Rs. 3.22 per unit is adopted as Generic Tariff for Solar Roof-top PV projects by this Commission.

Note:

- The above Tariff shall be valid for Projects commissioned from 1 August, 2018 to 31 March, 2019.

## **9. SOLAR THERMAL POWER PROJECTS**

### **9.1. USEFUL LIFE**

Regulation 2.1 (mm) defines the 'Useful Life' of a Unit of a Generating Station (including evacuation system) to mean the duration from the COD till such time as specified under the Regulations for such generation facility. The Useful Life specified for Solar Thermal Power Projects is 25 years.

### **9.2. REVIEW PERIOD**

The Control Period for Solar Thermal Power Projects shall be in accordance with the relevant stipulations in para 3.2 of this Order.

### **9.3. TARIFF PERIOD**

Regulation 7 specifies the Tariff Period for Solar PV Projects as 25 years. In terms of Regulation 7.5, the Tariff Period is reckoned from the COD of the RE Project, and the Tariff determined under the Regulations is applicable only for the duration of the Tariff Period.

### **9.4. CAPITAL COST OF SOLAR THERMAL POWER PROJECTS**

Regulation 74 specifies the normative Capital Cost of a Solar Thermal Power Project for FY 2015-16 (Base Year) as Rs. 1200 lakh/MW. The CERC in its RE Tariff Regulations, 2017 has considered Solar Thermal Power Projects for Project-specific tariff determination.

This Commission's RE Tariff Regulations do not specify the indexation mechanism for Solar Thermal Power Projects. No recent benchmark Capital Cost is available for consideration, and no specific suggestions have been received from Solar Thermal Power Project Developers in these proceedings. The Commission has taken the normative benchmark Capital Cost of Rs. 1,200 Lakhs/MW as specified in the RE Tariff Regulations for the base year for the Projects to be commissioned in FY 2018-19 also. However, Developers may also approach the Commission for Project-specific Tariff determination as provided in the RE Tariff Regulations.

### **9.5. DEBT-EQUITY RATIO**

In accordance with Regulation 14.1, the normative debt and equity components for Solar Thermal Projects shall be Rs. 840 lakh per MW and Rs. 360 lakh per MW, respectively.

### **9.6. RETURN ON EQUITY**

In accordance with Regulation 17.1, the RoE for such Projects works out as shown in the Table below:

Particulars	Amount (Rs. lakh/MW)
Opening Equity	360.00
Return on Equity for the first 10 years @16% grossing up with MAT rate of 21.55%	73.42
Return on Equity after first 10 years @16% grossing up with Income Tax rate of 29.12%	81.26

Grossing up of the RoE is done as per the Formula:  $\text{RoE (\%)} / [1 - \text{Tax Rate (\%)}]$ .

#### 9.7. INTEREST ON LOAN

The interest rate of 11.06% has been considered for Solar Thermal Power Projects for a loan amount of Rs. 840.00 lakh per MW for FY 2018-19.

#### 9.8. DEPRECIATION

In accordance with Regulation 16, Depreciation will be charged at 5.83% for the first 12 years, and at 1.54% thereafter for the remaining Useful Life of 13 years.

#### 9.9. INTEREST ON WORKING CAPITAL

Regulation 18.1 provides for computation of the working capital requirements for Solar Thermal Power Projects as follows:

- “a) O&M expenses for one month;*
- b) Receivables equivalent to two months of tariff for sale of electricity calculated on the normative CUF;*
- c) Maintenance spares @ 15% of O&M expenses.”*

The IoWC is considered as 11.56% for computation of Tariff for FY 2018-19.

#### 9.10. OPERATION AND MAINTENANCE EXPENSES

Regulation 76.1 specifies the normative O&M Expenses for Solar Thermal Power Projects for FY 2015-16 (Base Year) as Rs. 15 lakh per MW. These are to be escalated at 2.96% for the second year FY 2016-17 and further escalated at 4.85% for FY 2017-18. From FY 2018-19 onwards, O&M expense is escalated at 4.27% per annum as explained in para. 4.10. Accordingly, the Commission has considered the O&M expenses for Solar Thermal Power Projects for FY 2018-19 as Rs. 16.88 lakh per MW.

#### 9.11. CAPACITY UTILISATION FACTOR

In accordance with Regulation 75, CUF of 23% has been considered for determination of the Tariff for such Projects.

#### 9.12. LEVELISED TARIFF FOR SOLAR THERMAL POWER PROJECTS COMMISSIONED IN FY 2018-19

Considering the parameters discussed in the preceding paragraphs, the Generic Tariff for Solar Thermal Power Projects commissioned in FY 2018-19 has been determined as under:

Particulars	Tariff Period (Years)	Levelised Tariff	Benefit of Accelerated Depreciation (if availed)	Net Levelised Tariff (adjusting for Accelerated Depreciation benefit, if availed)
		(Rs/kWh)	(Rs/kWh)	(Rs/kWh)
Solar Thermal Power Projects	25	11.23	0.90	10.32

The Tariff computations for FY 2018-19 are provided in Annexure 5B of this Order.

#### 9.13. TARIFF AS PER APPROACH-2 FOR SOLAR THERMAL PROJECTS

In FY 2018-19, no tariff is adopted for Solar thermal power projects through Competitive Bidding. Therefore as mentioned in para. 3.1.2 above, if any such tariff by way of Competitive Bidding is discovered and is approved by the Commission in FY 2018-19 for Solar thermal power projects, such tariff will be considered to be the Approach-2 Tariff for Solar thermal power projects for FY 2018-19 from the date of approval by this Commission.

#### 9.14. GENERIC TARIFF FOR SOLAR THERMAL PROJECTS FOR FY 2018-19

As per para. 9.12 and 9.13 above, due to non-availability of Approach-2 tariff for Solar thermal projects; tariff by Approach-1 is adopted to be the Generic Tariff.

##### Generic Tariff for Solar Thermal Projects

Particulars	Tariff Period (Years)	Levelised Tariff	Benefit of Accelerated Depreciation (if availed)	Net Levelised Tariff (adjusting for Accelerated Depreciation benefit, if availed)
		(Rs/kWh)	(Rs/kWh)	(Rs/kWh)
Solar Thermal Power Projects	25	11.23	0.90	10.32

Note:

- The above Tariff shall be valid for Projects commissioned from 1 August, 2018 to 31 March, 2019.

10. The detailed computations of the Generic Tariff for various RE technologies are set out in the following Annexures to this Order:



<b>S.No.</b>	<b>Renewable Energy Projects</b>	<b>Annexure</b>
<b>1</b>	<b>Wind Power Projects</b>	
	Wind Zone-I	Annexure 1A
	Wind Zone-II	Annexure 1B
	Wind Zone III	Annexure 1C
	Wind Zone IV	Annexure 1D
<b>2</b>	<b>Small Hydro Power Projects</b>	
	SHP above 1MW and upto and including 5 MW	Annexure 2A
	SHP above 5 MW and upto and including 25 MW	Annexure 2B
<b>3</b>	<b>Biomass Power Projects</b>	Annexure 3
<b>4</b>	<b>Non-Fossil Fuel-based Co-Generation Projects</b>	Annexure 4
<b>5</b>	<b>Solar Projects</b>	
	Solar PV Projects	Annexure 5A
	Solar Thermal Power Projects	Annexure 5B

**Sd/-**  
**(Mukesh Khullar)**  
**Member**

**Sd/-**  
**(I. M. Bohari)**  
**Member**

**Sd/-**  
**(Anand B. Kulkarni)**  
**Chairperson**

  
**(Abhijit Deshpande)**  
**Secretary**



## Appendix-1

### List of Organisations, persons who submitted Suggestions and Objections

Sr. No.	Name
1	Maharashtra State Electricity Distribution Co. Ltd. (MSEDCL) Plot No. G-9, Prakashgad, Bandra (East), Mumbai 400 051
2	AA Energy Ltd, 101, Nikalas Tower, Central Bazar Road, Ramdaspath,Nagpur-10
3	Co-Generation Association of India, First Floor, Sakhar Sankul,Shivajinagar,Pune-411 005
4	Ulhas Pandharinath Choudhari ,56/5,Gorai (2), Boriwali (W), Mumbai-400 091
5	Prayas Energy Group, Pune
6	Maharashtra Energy Development Agency (MEDA), Pune.
7	Vayunandana Power Limited, 953,Sector -31,,Gurugram , Harayana,India-122 001
8	The Tata Power Company Ltd. Corporate Center, 34, Sant Tukaram Road, Carnac Bunder, Mumbai-400 009
9	Shri. T.P. Vartak, Pune
10	Maharashtra Biomass Energy Developers Association , 7th Floor, Minerva Complex,94,S.D.Road,Secunderabad-500 003
11	Mr. Ramchandra Tulaskar, Kalyan (East)
12	Greta Energy, Chandrapur
13	Nidar Utilities and Infrastructure Pvt. Ltd., Mumbai.

**List of Persons present for the Public Hearing**

<b>Sr. No.</b>	<b>Name</b>
1	Shri. Pradeep Mittal, Dalmia Sugar and Industries Ltd.
2	Shri. S.C. Nattu, Co-Generation Association of India
3	Shri. Vishal Gupta, (Adv.) Co-Generation Association of India
4	Shri. Y.K. Prasad, MSEDCL
5	Shri. Jagdish Farsinvis, MBEDA
6	Shri. M. M. Daware, BEST
7	Shri. Kishor Kumbhare, Vayunandan Power Ltd.
8	Shri. Swapnil Agarwal, AA Energy
9	Shri. Kiran More, Ambedkar Sugar
10.	Shri. V.K. Sehgal, Vayunandan Power.

### List of Abbreviations

Abbreviation	Expansion
APPC	Average Power Purchase Cost
BoS	Balance of Systems
Capex	Capital Expenditure
CEA	Central Electricity Authority
CERC	Central Electricity Regulatory Commission
COD	Commercial Operation Date
CPI	Consumer Price Index
CUF	Capacity Utilisation Factor
DSM	Deviation Settlement Mechanism
EA 2003	Electricity Act 2003
EPA	Energy Purchase Agreement
FiT	Feed in Tariff
FY	Financial Year
GCV	Gross Calorific Value
GERC	Gujarat Electricity Regulatory Commission
GSS	Grid Substation
GST	Goods and Services Tax
HVRT	High Voltage Ride-Through
IDC	Interest during Construction
InSTS	Intra State Transmission System
IoWC	Interest on Working Capital
IREDA	Indian Renewable Energy Development Agency Ltd.
JNNSM	Jawaharlal Nehru National Solar Mission
kCal	Kilo-Calorie
KERC	Karnataka Electricity Regulatory Commission
kg	Kilo Gram
kW	Kilo Watt
kWh	Kilo Watt-hour
LVRT	Low-Voltage Ride Through
MAT	Minimum Alternate Tax
MCLR	Marginal Cost based Lending Rates
MEDA	Maharashtra Energy Development Agency
MPERC	Madhya Pradesh Electricity Regulatory Commission
MSEDCL	Maharashtra State Electricity Distribution Co. Ltd
MT	Metric Ton
MU	Million Units
MW	Mega Watt
MYT	Multi Year Tariff
NPA	Non-Performing Asset
NVVNL	NTPC Vidyut Vyapar Nigam Ltd
O&M	Operation and Maintenance
OPEX	Operational Expenditure

Abbreviation	Expansion
PFC	Power Finance Corporation Ltd.
PLF	Plant Load Factor
PPA	Power Purchase Agreement
PV	Photovoltaic
QCA	Qualified Coordinating Agency
RBI	Reserve Bank of India
RE	Renewable Energy
REC	Rural Electrification Corporation
REC	Renewable Energy Certificate
RERC	Rajasthan Electricity Regulatory Commission
RoE	Return on Equity
RoW	Right of Way
RPO	Renewable Purchase Obligation
Rs	Indian Rupees
SBI	State Bank of India
SDF	Sugar Development Fund
SECI	Solar Energy Corporation of India
SERC	State Electricity Regulatory Commission
SHP	Small Hydro Power
SHR	Station Heat Rate
SSKL	Sahkari Sakhar Karkhana Limited (i.e. Cooperative Sugar Factory Limited)
TEFR	Techno Economic Feasibility Report
VGF	Viability Gap Funding
WPI	Wholesale Price Index
WTG	Wind Turbine Generator
Y-o-Y	Year-on-Year

## Form 1.1 Assumptions Parameters

S. No.	Assumption Head	Sub-Head	Sub-Head (2)	Unit	1
1	Power Generation	Capacity	Installed Power Generation Capacity	MW	1
			Capacity Utilization Factor	%	22.0%
			Deration Factor	%	0
			Useful Life	Years	25
2	Project Cost	Capital Cost/MW	Power Plant Cost	Rs Lacs/MW	525
3	Sources of Fund		Tariff Period	Years	13
		<u>Debt: Equity</u>	Debt	%	70%
			Equity	%	30%
			Total Debt Amount	Rs Lacs	367.50
			Total Equity Amount	Rs Lacs	157.50
		<u>Debt Component</u>	Loan Amount	Rs Lacs	367.50
			Moratorium Period	years	0
			Repayment Period(incl'd Moratorium)	years	12
			Interest Rate	%	11.06%
		<u>Equity Component</u>	Equity amount	Rs Lacs	157.50
			Return on Equity for first 10 years	% p.a	20.39%
			RoE Period	Year	10
			Return on Equity 11th year onwards	% p.a	22.57%
			Weighted average of ROE		21.70%
			Discount Rate		10.29%
4	Financial Assumptions	<u>Fiscal Assumptions</u>	Income Tax	%	29.12%
			MAT Rate (for first 10 years)	%	21.55%
		<u>Depreciation</u>	Depreciation Rate for first 12 years	%	5.83%
			Depreciation Rate 13th year onwards	%	1.54%
			Years for 5.83% rate		12
5	Working Capital	<u>For Fixed Charges</u>		Months	1
		O&M Charges			15.00%
		Maintenance Spare	(% of O&M exepenses)		
		Receivables for Debtors		Months	2
		<u>For Variable Charges</u>			
		Interest On Working Capital		%	11.56%
6	Operation & Maintenance	power plant (FY15-16)		Rs Lakh	8.83
		%ge escalation (FY16-17)		%	2.96%
		%ge escalation (FY17-18)		%	4.85%
		power plant (FY18-19)		Rs Lakh	7.72
		<u>Total O &amp; M Expenses Escalation</u>		%	4.27%

**Form 1.2 Form Template for (Wind Power Projects) : Determination of Tariff Component**

Units Generation	Unit	Year-->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Installed Capacity	MW		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gross/Net Generation	MU		1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93

Fixed Cost	Unit	Year-->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
O&M Expenses	Rs Lakh		7.72	8.05	8.39	8.75	9.12	9.51	9.92	10.34	10.78	11.24	11.72	12.23	12.75	13.29	13.86	14.45	15.07	15.71	16.38	17.08	17.81	18.57	19.37	20.19	21.06
Depreciation	Rs Lakh		30.61	30.61	30.61	30.61	30.61	30.61	30.61	30.61	30.61	30.61	30.61	30.61	8.09	8.09	8.09	8.09	8.09	8.09	8.09	8.09	8.09	8.09	8.09	8.09	8.09
Interest on term loan	Rs Lakh		38.96	35.57	32.19	28.80	25.41	22.02	18.63	15.25	11.86	8.47	5.08	1.69	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	Rs Lakh		1.93	1.94	1.95	1.96	1.97	1.98	1.99	2.00	2.02	2.03	2.04	2.06	2.07	2.08	2.10	2.12	2.13	2.15	2.17	2.19	2.21	2.23	2.25	2.27	2.29
Return on Equity	Rs Lakh		32.12	32.12	32.12	32.12	32.12	32.12	32.12	32.12	32.12	32.12	35.55	35.55	35.55	35.55	35.55	35.55	35.55	35.55	35.55	35.55	35.55	35.55	35.55	35.55	35.55
<b>Total Fixed Cost</b>	<b>Rs Lakh</b>		<b>111.34</b>	<b>108.29</b>	<b>105.26</b>	<b>102.24</b>	<b>99.23</b>	<b>96.25</b>	<b>93.28</b>	<b>90.32</b>	<b>87.39</b>	<b>84.47</b>	<b>85.01</b>	<b>82.14</b>	<b>58.46</b>	<b>59.02</b>	<b>59.61</b>	<b>60.21</b>	<b>60.85</b>	<b>61.51</b>	<b>62.20</b>	<b>62.92</b>	<b>63.66</b>	<b>64.45</b>	<b>65.26</b>	<b>66.11</b>	<b>67.00</b>
<b>Per unit Fixed Cost</b>	<b>Rs/kWh</b>		<b>5.78</b>	<b>5.62</b>	<b>5.46</b>	<b>5.31</b>	<b>5.15</b>	<b>4.99</b>	<b>4.84</b>	<b>4.69</b>	<b>4.53</b>	<b>4.38</b>	<b>4.41</b>	<b>4.26</b>	<b>3.03</b>	<b>3.06</b>	<b>3.09</b>	<b>3.12</b>	<b>3.16</b>	<b>3.19</b>	<b>3.23</b>	<b>3.26</b>	<b>3.30</b>	<b>3.34</b>	<b>3.39</b>	<b>3.43</b>	<b>3.48</b>

**Levallised tariff corresponding to Useful life**

Per Unit Cost of Generation	Unit	Levallised	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
O&M expn	Rs/kWh	<b>0.57</b>	0.40	0.42	0.44	0.45	0.47	0.49	0.51	0.54	0.56	0.58	0.61	0.63	0.66	0.69	0.72	0.75	0.78	0.82	0.85	0.89	0.92	0.96	1.00	1.05	1.09
Depreciation	Rs/kWh	<b>1.30</b>	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42
Int. on term loan	Rs/kWh	<b>0.95</b>	2.02	1.85	1.67	1.49	1.32	1.14	0.97	0.79	0.62	0.44	0.26	0.09	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
Int. on working capital	Rs/kWh	<b>0.10</b>	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.12	0.12	0.12	0.12
RoE	Rs/kWh	<b>1.72</b>	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.84	1.84	1.84	1.84	1.84	1.84	1.84	1.84	1.84	1.84	1.84	1.84	1.84	1.84	1.84
<b>Total COG</b>	<b>Rs/kWh</b>	<b>4.65</b>	<b>5.78</b>	<b>5.62</b>	<b>5.46</b>	<b>5.31</b>	<b>5.15</b>	<b>4.99</b>	<b>4.84</b>	<b>4.69</b>	<b>4.53</b>	<b>4.38</b>	<b>4.41</b>	<b>4.26</b>	<b>3.03</b>	<b>3.06</b>	<b>3.09</b>	<b>3.12</b>	<b>3.16</b>	<b>3.19</b>	<b>3.23</b>	<b>3.26</b>	<b>3.30</b>	<b>3.34</b>	<b>3.39</b>	<b>3.43</b>	<b>3.48</b>

Discount Factor			1	0.91	0.82	0.75	0.68	0.61	0.56	0.50	0.46	0.41	0.38	0.34	0.31	0.28	0.25	0.23	0.21	0.19	0.17	0.16	0.14	0.13	0.12	0.11	0.10
Fixed Cost	4.65		89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55
<b>Levallised Tariff</b>	<b>4.65</b>	Rs/Unit																									

**Determination of Additional Depreciation for Wind Power Projects**

Depreciation amount	90%
Book Depreciation rate	5.28%
Tax Depreciation rate	40%
Additional Depreciation	20%
Income Tax (MAT)	21.549%
Income Tax (Normal Rates)	29.12%
Capital Cost	525.00

Years ----->	Unit	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Book Depreciation	%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	0.24%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Book Depreciation	Rs Lakh	27.72	27.72	27.72	27.72	27.72	27.72	27.72	27.72	27.72	27.72	27.72	27.72	27.72	27.72	27.72	27.72	27.72	1.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00

**Accelerated Depreciation**

Opening	%	100.0%	40.0%	24.0%	14.4%	8.6%	5.2%	3.1%	1.9%	1.1%	0.7%	0.4%	0.2%	0.1%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Allowed during the year	%	60.00%	16.00%	9.60%	5.76%	3.46%	2.07%	1.24%	0.75%	0.45%	0.27%	0.16%	0.10%	0.06%	0.03%	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Closing	%	40.0%	24.0%	14.4%	8.64%	5.18%	3.11%	1.87%	1.12%	0.67%	0.40%	0.24%	0.15%	0.09%	0.05%	0.03%	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Accelerated Depn.	Rs Lakh	315.00	84.00	50.40	30.24	18.14	10.89	6.53	3.92	2.35	1.41	0.85	0.51	0.30	0.18	0.11	0.07	0.04	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00

Net Depreciation Benefit	Rs Lakh	287.28	56.28	22.68	2.52	-9.58	-16.83	-21.19	-23.80	-25.37	-26.31	-26.87	-27.21	-27.42	-27.54	-27.61	-27.65	-27.68	-1.24	0.01	0.01	0.01	0.00	0.00	0.00	0.00	
Tax Benefit	Rs Lakh	83.66	16.39	6.60	0.73	-2.79	-4.90	-6.17	-6.93	-7.39	-7.66	-7.83	-7.92	-7.98	-8.02	-8.04	-8.05	-8.06	-0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Energy generation	MU	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	
Per unit benefit	Rs/Unit	4.34	0.85	0.34	0.04	-0.14	-0.25	-0.32	-0.36	-0.38	-0.40	-0.41	-0.41	-0.41	-0.42	-0.42	-0.42	-0.42	-0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Discounting Factor		1.00	0.91	0.82	0.75	0.68	0.61	0.56	0.50	0.46	0.41	0.38	0.34	0.31	0.28	0.25	0.23	0.21	0.19	0.17	0.16	0.14	0.13	0.12	0.11	0.10	
Levelling benefit	0.37	Rs/Unit																									



**Annexure – 1B**  
**(Wind Zone-2)**

**Form 1.1 Assumptions Parameters**

S. No.	Assumption Head	Sub-Head	Sub-Head (2)	Unit	2
1	Power Generation	Capacity	Installed Power Generation Capacity	MW	1
			Capacity Utilization Factor	%	25.0%
			Deration Factor	%	0
			Useful Life	Years	25
2	Project Cost	Capital Cost/MW	Power Plant Cost	Rs Lacs/MW	525
3	Sources of Fund		Tariff Period	Years	13
		<u>Debt: Equity</u>			
			Debt	%	70%
			Equity	%	30%
			Total Debt Amount	Rs Lacs	367.50
			Total Equity Amout	Rs Lacs	157.50
		<u>Debt Component</u>			
			Loan Amount	Rs Lacs	367.50
			Moratorium Period	years	0
			Repayment Period(incld Moratorium)	years	12
			Interest Rate	%	11.06%
		<u>Equity Component</u>			
			Equity amount	Rs Lacs	157.50
			Return on Equity for first 10 years	% p.a	20.39%
			RoE Period	Year	10
			Return on Equity 11th year onwards	% p.a	22.57%
			Weighted average of ROE		21.70%
			Discount Rate		10.29%
4	Financial Assumptions	<u>Fiscal Assumptions</u>			
			Income Tax	%	29.12%
			MAT Rate (for first 10 years)	%	21.55%
		<u>Depreciation</u>			
			Depreciation Rate for first 12 years	%	5.83%
			Depreciation Rate 13th year onwards	%	1.54%
5	Working Capital				
		<u>For Fixed Charges</u>			
		O&M Charges		Months	1
		Maintenance Spare	(% of O&M exepenses)		15.00%
		Receivables for Debtors		Months	2
6	Operation & Maintenance	<u>For Variable Charges</u>			
		Interest On Working Capital		%	11.56%
		power plant (FY15-16)		Rs Lakh	8.83
		%ge escalation (FY16-17)		%	2.96%
		%ge escalation (FY17-18)		%	4.85%
		power plant (FY18-19)		Rs Lakh	7.72
		<u>Total O &amp; M Expenses Escalation</u>		%	4.27%

**Form 1.2 Form Template for (Wind Power Projects ) : Determination of Tariff Component**

Units Generation	Unit	Year-->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Installed Capacity	MW		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gross/Net Generation	MU		2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19

Fixed Cost	Unit	Year-->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
O&M Expenses	Rs Lakh		7.72	8.05	8.39	8.75	9.12	9.51	9.92	10.34	10.78	11.24	11.72	12.23	12.75	13.29	13.86	14.45	15.07	15.71	16.38	17.08	17.81	18.57	19.37	20.19	21.06
Depreciation	Rs Lakh		30.61	30.61	30.61	30.61	30.61	30.61	30.61	30.61	30.61	30.61	30.61	30.61	8.09	8.09	8.09	8.09	8.09	8.09	8.09	8.09	8.09	8.09	8.09	8.09	8.09
Interest on term loan	Rs Lakh		38.96	35.57	32.19	28.80	25.41	22.02	18.63	15.25	11.86	8.47	5.08	1.69	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	Rs Lakh		1.93	1.94	1.95	1.96	1.97	1.98	1.99	2.00	2.02	2.03	2.04	2.06	2.07	2.08	2.10	2.12	2.13	2.15	2.17	2.19	2.21	2.23	2.25	2.27	2.29
Return on Equity	Rs Lakh		32.12	32.12	32.12	32.12	32.12	32.12	32.12	32.12	32.12	32.12	35.55	35.55	35.55	35.55	35.55	35.55	35.55	35.55	35.55	35.55	35.55	35.55	35.55	35.55	35.55
<b>Total Fixed Cost</b>	<b>Rs Lakh</b>		<b>111.34</b>	<b>108.29</b>	<b>105.26</b>	<b>102.24</b>	<b>99.23</b>	<b>96.25</b>	<b>93.28</b>	<b>90.32</b>	<b>87.39</b>	<b>84.47</b>	<b>85.01</b>	<b>82.14</b>	<b>58.46</b>	<b>59.02</b>	<b>59.61</b>	<b>60.21</b>	<b>60.85</b>	<b>61.51</b>	<b>62.20</b>	<b>62.92</b>	<b>63.66</b>	<b>64.45</b>	<b>65.26</b>	<b>66.11</b>	<b>67.00</b>
<b>Per unit Fixed Cost</b>	<b>Rs/kWh</b>		<b>5.08</b>	<b>4.94</b>	<b>4.81</b>	<b>4.67</b>	<b>4.53</b>	<b>4.39</b>	<b>4.26</b>	<b>4.12</b>	<b>3.99</b>	<b>3.86</b>	<b>3.88</b>	<b>3.75</b>	<b>2.67</b>	<b>2.70</b>	<b>2.72</b>	<b>2.75</b>	<b>2.78</b>	<b>2.81</b>	<b>2.84</b>	<b>2.87</b>	<b>2.91</b>	<b>2.94</b>	<b>2.98</b>	<b>3.02</b>	<b>3.06</b>

**Levallised tariff corresponding to Useful life**

Per Unit Cost of Generation	Unit	Levallised	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
O&M expn	Rs/kWh	<b>0.50</b>	0.35	0.37	0.38	0.40	0.42	0.43	0.45	0.47	0.49	0.51	0.54	0.56	0.58	0.61	0.63	0.66	0.69	0.72	0.75	0.78	0.81	0.85	0.88	0.92	0.96
Depreciation	Rs/kWh	<b>1.15</b>	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37
Int. on term loan	Rs/kWh	<b>0.84</b>	1.78	1.62	1.47	1.32	1.16	1.01	0.85	0.70	0.54	0.39	0.23	0.08	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
Int. on working capital	Rs/kWh	<b>0.09</b>	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
RoE	Rs/kWh	<b>1.52</b>	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62
<b>Total COG</b>	<b>Rs/kWh</b>	<b>4.09</b>	<b>5.08</b>	<b>4.94</b>	<b>4.81</b>	<b>4.67</b>	<b>4.53</b>	<b>4.39</b>	<b>4.26</b>	<b>4.12</b>	<b>3.99</b>	<b>3.86</b>	<b>3.88</b>	<b>3.75</b>	<b>2.67</b>	<b>2.70</b>	<b>2.72</b>	<b>2.75</b>	<b>2.78</b>	<b>2.81</b>	<b>2.84</b>	<b>2.87</b>	<b>2.91</b>	<b>2.94</b>	<b>2.98</b>	<b>3.02</b>	<b>3.06</b>

Discount Factor			1	0.91	0.82	0.75	0.68	0.61	0.56	0.50	0.46	0.41	0.38	0.34	0.31	0.28	0.25	0.23	0.21	0.19	0.17	0.16	0.14	0.13	0.12	0.11	0.10
Fixed Cost	4.09		89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55
<b>Levallised Tariff</b>	<b>4.09</b>	<b>Rs/Unit</b>																									

**Determination of Additional Depreciation for Wind Power Projects**

Depreciation amount	90%
Book Depreciation rate	5.28%
Tax Depreciation rate	40%
Additional Depreciation	20%
Income Tax (MAT)	21.549%
Income Tax (Normal Rates)	29.12%
Capital Cost	525.00

Years ----->	Unit	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Book Depreciation	%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	0.24%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Book Depreciation	Rs Lakh	27.72	27.72	27.72	27.72	27.72	27.72	27.72	27.72	27.72	27.72	27.72	27.72	27.72	27.72	27.72	27.72	27.72	1.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Accelerated Depreciation																									
Opening	%	100.0%	40.0%	24.0%	14.4%	8.6%	5.2%	3.1%	1.9%	1.1%	0.7%	0.4%	0.2%	0.1%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Allowed during the year	%	60.00%	16.00%	9.60%	5.76%	3.46%	2.07%	1.24%	0.75%	0.45%	0.27%	0.16%	0.10%	0.06%	0.03%	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Closing	%	40.0%	24.0%	14.4%	8.64%	5.18%	3.11%	1.87%	1.12%	0.67%	0.40%	0.24%	0.15%	0.09%	0.05%	0.03%	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Accelrated Depm.	Rs Lakh	315.00	84.00	50.40	30.24	18.14	10.89	6.53	3.92	2.35	1.41	0.85	0.51	0.30	0.18	0.11	0.07	0.04	0.02	0.01	0.01	0.01	0.00	0.00	0.00

Net Depreciation Benefit	Rs Lakh	287.28	56.28	22.68	2.52	-9.58	-16.83	-21.19	-23.80	-25.37	-26.31	-26.87	-27.21	-27.42	-27.54	-27.61	-27.65	-27.68	-1.24	0.01	0.01	0.01	0.00	0.00	0.00	0.00	
Tax Benefit	Rs Lakh	83.66	16.39	6.60	0.73	-2.79	-4.90	-6.17	-6.93	-7.39	-7.66	-7.83	-7.92	-7.98	-8.02	-8.04	-8.05	-8.06	-0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Energy generation	MU	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19		
Per unit benefit	Rs/Unit	3.82	0.75	0.30	0.03	-0.13	-0.22	-0.28	-0.32	-0.34	-0.35	-0.36	-0.36	-0.36	-0.37	-0.37	-0.37	-0.37	-0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Discounting Factor		1.00	0.91	0.82	0.75	0.68	0.61	0.56	0.50	0.46	0.41	0.38	0.34	0.31	0.28	0.25	0.23	0.21	0.19	0.17	0.16	0.14	0.13	0.12	0.11	0.10	
Levellised benefit	0.33	Rs/Unit																									

**Form 1.1 Assumptions Parameters**

S. No.	Assumption Head	Sub-Head	Sub-Head (2)	Unit	3
1	Power Generation	Capacity	Installed Power Generation Capacity	MW	1
			Capacity Utilization Factor	%	30.0%
			Deration Factor	%	0
			Useful Life	Years	25
2	Project Cost	Capital Cost/MW	Power Plant Cost	Rs Lacs/MW	525
3	Sources of Fund		Tariff Period	Years	13
		<u>Debt: Equity</u>	Debt	%	70%
			Equity	%	30%
			Total Debt Amount	Rs Lacs	367.50
			Total Equity Amout	Rs Lacs	157.50
		<u>Debt Component</u>	Loan Amount	Rs Lacs	367.50
			Moratorium Period	years	0
			Repayment Period(incld Moratorium)	years	12
			Interest Rate	%	11.06%
		<u>Equity Component</u>	Equity amount	Rs Lacs	157.50
			Return on Equity for first 10 years	% p.a	20.39%
			RoE Period	Year	10
			Return on Equity 11th year onwards	% p.a	22.57%
			Weighted average of ROE		21.70%
			Discount Rate		10.29%
4	Financial Assumptions	<u>Fiscal Assumptions</u>	Income Tax	%	29.12%
			MAT Rate (for first 10 years)	%	21.55%
		<u>Depreciation</u>	Depreciation Rate for first 12 years	%	5.83%
			Depreciation Rate 13th year onwards	%	1.54%
			Years for 5.83% rate		12
5	Working Capital	<u>For Fixed Charges</u>			
		O&M Charges		Months	1
		Maintenance Spare	(% of O&M exepenses)		15.00%
		Receivables for Debtors		Months	2
		<u>For Variable Charges</u>			
		Interest On Working Capital		%	11.56%
6	Operation & Maintenance				
		power plant (FY15-16)		Rs Lakh	8.83
		%ge escalation (FY16-17)		%	2.96%
		%ge escalation (FY17-18)		%	4.85%
		power plant (FY18-19)		Rs Lakh	7.72
		<u>Total O &amp; M Expenses Escalation</u>		%	4.27%

**Form 1.2 Form Template for (Wind Power Projects ) : Determination of Tariff Component**

Units Generation	Unit	Year→	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Installed Capacity	MW		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gross/Net Generation	MU		2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63

Fixed Cost	Unit	Year→	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
O&M Expenses	Rs Lakh		7.72	8.05	8.39	8.75	9.12	9.51	9.92	10.34	10.78	11.24	11.72	12.23	12.75	13.29	13.86	14.45	15.07	15.71	16.38	17.08	17.81	18.57	19.37	20.19	21.06
Depreciation	Rs Lakh		30.61	30.61	30.61	30.61	30.61	30.61	30.61	30.61	30.61	30.61	30.61	30.61	8.09	8.09	8.09	8.09	8.09	8.09	8.09	8.09	8.09	8.09	8.09	8.09	8.09
Interest on term loan	Rs Lakh		38.96	35.57	32.19	28.80	25.41	22.02	18.63	15.25	11.86	8.47	5.08	1.69	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	Rs Lakh		1.93	1.94	1.95	1.96	1.97	1.98	1.99	2.00	2.02	2.03	2.04	2.06	2.07	2.08	2.10	2.12	2.13	2.15	2.17	2.19	2.21	2.23	2.25	2.27	2.29
Return on Equity	Rs Lakh		32.12	32.12	32.12	32.12	32.12	32.12	32.12	32.12	32.12	32.12	35.55	35.55	35.55	35.55	35.55	35.55	35.55	35.55	35.55	35.55	35.55	35.55	35.55	35.55	35.55
<b>Total Fixed Cost</b>	<b>Rs Lakh</b>		<b>111.34</b>	<b>108.29</b>	<b>105.26</b>	<b>102.24</b>	<b>99.23</b>	<b>96.25</b>	<b>93.28</b>	<b>90.32</b>	<b>87.39</b>	<b>84.47</b>	<b>85.01</b>	<b>82.14</b>	<b>58.46</b>	<b>59.02</b>	<b>59.61</b>	<b>60.21</b>	<b>60.85</b>	<b>61.51</b>	<b>62.20</b>	<b>62.92</b>	<b>63.66</b>	<b>64.45</b>	<b>65.26</b>	<b>66.11</b>	<b>67.00</b>
<b>Per unit Fixed Cost</b>	<b>Rs/kWh</b>		<b>4.24</b>	<b>4.12</b>	<b>4.01</b>	<b>3.89</b>	<b>3.78</b>	<b>3.66</b>	<b>3.55</b>	<b>3.44</b>	<b>3.33</b>	<b>3.21</b>	<b>3.23</b>	<b>3.13</b>	<b>2.22</b>	<b>2.25</b>	<b>2.27</b>	<b>2.29</b>	<b>2.32</b>	<b>2.34</b>	<b>2.37</b>	<b>2.39</b>	<b>2.42</b>	<b>2.45</b>	<b>2.48</b>	<b>2.52</b>	<b>2.55</b>

**Levallised tariff corresponding to Useful life**

Per Unit Cost of Generation	Unit	Levallised	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
O&M expn	Rs/kWh	<b>0.41</b>	0.29	0.31	0.32	0.33	0.35	0.36	0.38	0.39	0.41	0.43	0.45	0.47	0.49	0.51	0.53	0.55	0.57	0.60	0.62	0.65	0.68	0.71	0.74	0.77	0.80
Depreciation	Rs/kWh	<b>0.96</b>	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31
Int. on term loan	Rs/kWh	<b>0.70</b>	1.48	1.35	1.22	1.10	0.97	0.84	0.71	0.58	0.45	0.32	0.19	0.06	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
Int. on working capital	Rs/kWh	<b>0.08</b>	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.09	0.09	0.09
RoE	Rs/kWh	<b>1.26</b>	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35
<b>Total COG</b>	<b>Rs/kWh</b>	<b>3.41</b>	<b>4.24</b>	<b>4.12</b>	<b>4.01</b>	<b>3.89</b>	<b>3.78</b>	<b>3.66</b>	<b>3.55</b>	<b>3.44</b>	<b>3.33</b>	<b>3.21</b>	<b>3.23</b>	<b>3.13</b>	<b>2.22</b>	<b>2.25</b>	<b>2.27</b>	<b>2.29</b>	<b>2.32</b>	<b>2.34</b>	<b>2.37</b>	<b>2.39</b>	<b>2.42</b>	<b>2.45</b>	<b>2.48</b>	<b>2.52</b>	<b>2.55</b>

Discount Factor			1	0.91	0.82	0.75	0.68	0.61	0.56	0.50	0.46	0.41	0.38	0.34	0.31	0.28	0.25	0.23	0.21	0.19	0.17	0.16	0.14	0.13	0.12	0.11	0.10
Fixed Cost	3.41		89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55
<b>Levallised Tariff</b>	<b>3.41</b>	<b>Rs/Unit</b>																									

**Determination of Additional Depreciation for Wind Power Projects**

Depreciation amount	90%
Book Depreciation rate	5.28%
Tax Depreciation rate	40%
Additional Depreciation	20%
Income Tax (MAT)	21.549%
Income Tax (Normal Rates)	29.12%
Capital Cost	525.00

Years ----->	Unit	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Book Depreciation	%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	0.24%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Book Depreciation	Rs Lakh	27.72	27.72	27.72	27.72	27.72	27.72	27.72	27.72	27.72	27.72	27.72	27.72	27.72	27.72	27.72	27.72	27.72	1.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Accelerated Depreciation																											
Opening	%	100.0%	40.0%	24.0%	14.4%	8.6%	5.2%	3.1%	1.9%	1.1%	0.7%	0.4%	0.2%	0.1%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Allowed during the year	%	60.00%	16.00%	9.60%	5.76%	3.46%	2.07%	1.24%	0.75%	0.45%	0.27%	0.16%	0.10%	0.06%	0.03%	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
Closing	%	40.0%	24.0%	14.4%	8.64%	5.18%	3.11%	1.87%	1.12%	0.67%	0.40%	0.24%	0.15%	0.09%	0.05%	0.03%	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
Accelrated Depmn.	Rs Lakh	315.00	84.00	50.40	30.24	18.14	10.89	6.53	3.92	2.35	1.41	0.85	0.51	0.30	0.18	0.11	0.07	0.04	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00	

Net Depreciation Benefit	Rs Lakh	287.28	56.28	22.68	2.52	-9.58	-16.83	-21.19	-23.80	-25.37	-26.31	-26.87	-27.21	-27.42	-27.54	-27.61	-27.65	-27.68	-1.24	0.01	0.01	0.01	0.00	0.00	0.00	0.00
Tax Benefit	Rs Lakh	83.66	16.39	6.60	0.73	-2.79	-4.90	-6.17	-6.93	-7.39	-7.66	-7.83	-7.92	-7.98	-8.02	-8.04	-8.05	-8.06	-0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Energy generation	MU	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63	
Per unit benefit	Rs/Unit	3.18	0.62	0.25	0.03	-0.11	-0.19	-0.23	-0.26	-0.28	-0.29	-0.30	-0.30	-0.30	-0.31	-0.31	-0.31	-0.31	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Discounting Factor		1.00	0.91	0.82	0.75	0.68	0.61	0.56	0.50	0.46	0.41	0.38	0.34	0.31	0.28	0.25	0.23	0.21	0.19	0.17	0.16	0.14	0.13	0.12	0.11	0.10
Levellised benefit	0.27	Rs/Unit																								

**Annexure – 1D**  
**(Wind Zone-4)**

**Form 1.1 Assumptions Parameters**

S. No.	Assumption Head	Sub-Head	Sub-Head (2)	Unit	4
1	Power Generation	Capacity	Installed Power Generation Capacity	MW	1
			Capacity Utilization Factor	%	32.0%
			Deration Factor	%	0
			Useful Life	Years	25
2	Project Cost	Capital Cost/MW	Power Plant Cost	Rs Lacs/MW	525
3	Sources of Fund		Tariff Period	Years	13
		<u>Debt: Equity</u>	Debt	%	70%
			Equity	%	30%
			Total Debt Amount	Rs Lacs	367.50
			Total Equity Amout	Rs Lacs	157.50
		<u>Debt Component</u>	Loan Amount	Rs Lacs	367.50
			Moratorium Period	years	0
			Repayment Period(incld Moratorium)	years	12
			Interest Rate	%	11.06%
		<u>Equity Component</u>	Equity amount	Rs Lacs	157.50
			Return on Equity for first 10 years	% p.a	20.39%
			RoE Period	Year	10
			Return on Equity 11th year onwards	% p.a	22.57%
			Weighted average of ROE		21.70%
			Discount Rate		10.29%
4	Financial Assumptions	<u>Fiscal Assumptions</u>	Income Tax	%	29.12%
			MAT Rate (for first 10 years)	%	21.55%
		<u>Depreciation</u>	Depreciation Rate for first 12 years	%	5.83%
			Depreciation Rate 13th year onwards	%	1.54%
			Years for 5.83% rate		12
5	Working Capital	<u>For Fixed Charges</u>			
		O&M Charges		Months	1
		Maintenance Spare	(% of O&M exepenses)		15.00%
		Receivables for Debtors		Months	2
		<u>For Variable Charges</u>			
		Interest On Working Capital		%	11.56%
6	Operation & Maintenance				
		power plant (FY15-16)		Rs Lakh	8.83
		%ge escalation (FY16-17)		%	2.96%
		%ge escalation (FY17-18)		%	4.85%
		power plant (FY18-19)		Rs Lakh	7.72
		<u>Total O &amp; M Expenses Escalation</u>		%	4.27%

**Form 1.2 Form Template for (Wind Power Projects ) : Determination of Tariff Component**

Units Generation	Unit	Year-->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Installed Capacity	MW		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gross/Net Generation	MU		2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80

Fixed Cost	Unit	Year-->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
O&M Expenses	Rs Lakh		7.72	8.05	8.39	8.75	9.12	9.51	9.92	10.34	10.78	11.24	11.72	12.23	12.75	13.29	13.86	14.45	15.07	15.71	16.38	17.08	17.81	18.57	19.37	20.19	21.06
Depreciation	Rs Lakh		30.61	30.61	30.61	30.61	30.61	30.61	30.61	30.61	30.61	30.61	30.61	30.61	8.09	8.09	8.09	8.09	8.09	8.09	8.09	8.09	8.09	8.09	8.09	8.09	8.09
Interest on term loan	Rs Lakh		38.96	35.57	32.19	28.80	25.41	22.02	18.63	15.25	11.86	8.47	5.08	1.69	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	Rs Lakh		1.93	1.94	1.95	1.96	1.97	1.98	1.99	2.00	2.02	2.03	2.04	2.06	2.07	2.08	2.10	2.12	2.13	2.15	2.17	2.19	2.21	2.23	2.25	2.27	2.29
Return on Equity	Rs Lakh		32.12	32.12	32.12	32.12	32.12	32.12	32.12	32.12	32.12	32.12	35.55	35.55	35.55	35.55	35.55	35.55	35.55	35.55	35.55	35.55	35.55	35.55	35.55	35.55	35.55
<b>Total Fixed Cost</b>	<b>Rs Lakh</b>		<b>111.34</b>	<b>108.29</b>	<b>105.26</b>	<b>102.24</b>	<b>99.23</b>	<b>96.25</b>	<b>93.28</b>	<b>90.32</b>	<b>87.39</b>	<b>84.47</b>	<b>85.01</b>	<b>82.14</b>	<b>58.46</b>	<b>59.02</b>	<b>59.61</b>	<b>60.21</b>	<b>60.85</b>	<b>61.51</b>	<b>62.20</b>	<b>62.92</b>	<b>63.66</b>	<b>64.45</b>	<b>65.26</b>	<b>66.11</b>	<b>67.00</b>
<b>Per unit Fixed Cost</b>	<b>Rs/kWh</b>		<b>3.97</b>	<b>3.86</b>	<b>3.75</b>	<b>3.65</b>	<b>3.54</b>	<b>3.43</b>	<b>3.33</b>	<b>3.22</b>	<b>3.12</b>	<b>3.01</b>	<b>3.03</b>	<b>2.93</b>	<b>2.09</b>	<b>2.11</b>	<b>2.13</b>	<b>2.15</b>	<b>2.17</b>	<b>2.19</b>	<b>2.22</b>	<b>2.24</b>	<b>2.27</b>	<b>2.30</b>	<b>2.33</b>	<b>2.36</b>	<b>2.39</b>

**Levelling tariff corresponding to Useful life**

Per Unit Cost of Generation	Unit	Levelling	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
O&M expn	Rs/kWh	<b>0.39</b>	0.28	0.29	0.30	0.31	0.33	0.34	0.35	0.37	0.38	0.40	0.42	0.44	0.45	0.47	0.49	0.52	0.54	0.56	0.58	0.61	0.64	0.66	0.69	0.72	0.75
Depreciation	Rs/kWh	<b>0.90</b>	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29
Int. on term loan	Rs/kWh	<b>0.65</b>	1.39	1.27	1.15	1.03	0.91	0.79	0.66	0.54	0.42	0.30	0.18	0.06	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
Int. on working capital	Rs/kWh	<b>0.07</b>	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
RoE	Rs/kWh	<b>1.18</b>	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27
<b>Total COG</b>	<b>Rs/kWh</b>	<b>3.19</b>	<b>3.97</b>	<b>3.86</b>	<b>3.75</b>	<b>3.65</b>	<b>3.54</b>	<b>3.43</b>	<b>3.33</b>	<b>3.22</b>	<b>3.12</b>	<b>3.01</b>	<b>3.03</b>	<b>2.93</b>	<b>2.09</b>	<b>2.11</b>	<b>2.13</b>	<b>2.15</b>	<b>2.17</b>	<b>2.19</b>	<b>2.22</b>	<b>2.24</b>	<b>2.27</b>	<b>2.30</b>	<b>2.33</b>	<b>2.36</b>	<b>2.39</b>

Discount Factor			1	0.91	0.82	0.75	0.68	0.61	0.56	0.50	0.46	0.41	0.38	0.34	0.31	0.28	0.25	0.23	0.21	0.19	0.17	0.16	0.14	0.13	0.12	0.11	0.10
Fixed Cost	3.19		89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55	89.55
<b>Levelling Tariff</b>	<b>3.19</b>	<b>Rs/Unit</b>																									



### Determination of Additional Depreciation for Wind Power Projects

Depreciation amount	90%
Book Depreciation rate	5.28%
Tax Depreciation rate	40%
Additional Depreciation	20%
Income Tax (MAT)	21.549%
Income Tax (Normal Rates)	29.12%
Capital Cost	525.00

Years ----->	Unit	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Book Depreciation	%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	0.24%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Book Depreciation	Rs Lakh	27.72	27.72	27.72	27.72	27.72	27.72	27.72	27.72	27.72	27.72	27.72	27.72	27.72	27.72	27.72	27.72	27.72	1.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Accelerated Depreciation																											
Opening	%	100.0%	40.0%	24.0%	14.4%	8.6%	5.2%	3.1%	1.9%	1.1%	0.7%	0.4%	0.2%	0.1%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Allowed during the year	%	60.00%	16.00%	9.60%	5.76%	3.46%	2.07%	1.24%	0.75%	0.45%	0.27%	0.16%	0.10%	0.06%	0.03%	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
Closing	%	40.0%	24.0%	14.4%	8.64%	5.18%	3.11%	1.87%	1.12%	0.67%	0.40%	0.24%	0.15%	0.09%	0.05%	0.03%	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
Accelerated Deprn.	Rs Lakh	315.00	84.00	50.40	30.24	18.14	10.89	6.53	3.92	2.35	1.41	0.85	0.51	0.30	0.18	0.11	0.07	0.04	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00	

Net Depreciation Benefit	Rs Lakh	287.28	56.28	22.68	2.52	-9.58	-16.83	-21.19	-23.80	-25.37	-26.31	-26.87	-27.21	-27.42	-27.54	-27.61	-27.65	-27.68	-1.24	0.01	0.01	0.01	0.00	0.00	0.00	0.00	
Tax Benefit	Rs Lakh	83.66	16.39	6.60	0.73	-2.79	-4.90	-6.17	-6.93	-7.39	-7.66	-7.83	-7.92	-7.98	-8.02	-8.04	-8.05	-8.06	-0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Energy generation	MU	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	
Per unit benefit	Rs/Unit	2.98	0.58	0.24	0.03	-0.10	-0.17	-0.22	-0.25	-0.26	-0.27	-0.28	-0.28	-0.28	-0.29	-0.29	-0.29	-0.29	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Discounting Factor		1.00	0.91	0.82	0.75	0.68	0.61	0.56	0.50	0.46	0.41	0.38	0.34	0.31	0.28	0.25	0.23	0.21	0.19	0.17	0.16	0.14	0.13	0.12	0.11	0.10	
Levellised benefit	0.26	Rs/Unit																									

**Annexure – 2A**  
**(SHP above 1 MW and up to and including 5 MW)**

**Form 1.1 Assumptions Parameters**

S. No.	Assumption Head	Sub-Head	Sub-Head (2)	Unit	<=5 MW
1	Power Generation	Capacity	Installed Power Generation Capacity	MW	1
			Capacity Utilization Factor	%	30%
			Auxilliary Consumption		1%
			Useful Life	Years	35
2	Project Cost	Capital Cost/MW	Power Plant Cost	Rs Lacs/MW	570.49
3	Sources of Fund		Tariff Period	Years	35
		<u>Debt: Equity</u>			
			Debt	%	70%
			Equity	%	30%
			Total Debt Amount	Rs Lacs	399.34
			Total Equity Amout	Rs Lacs	171.15
		<u>Debt Component</u>			
			Loan Amount	Rs Lacs	399.34
			Repayment Period(incld Moratorium)	years	12
			Interest Rate	%	11.06%
		<u>Equity Component</u>			
			Equity amount	Rs Lacs	171.15
			Return on Equity for first 10 years	% p.a	20.39%
			RoE Period	Year	10
			Return on Equity 11th year onwards	% p.a	22.57%
			Weighted average of ROE		21.95%
			Discount Rate		10.29%
4	Financial Assumptions	<u>Fiscal Assumptions</u>			
			Income Tax	%	29.120%
			MAT Rate (for first 10 years)	%	21.549%
		<u>Depreciation</u>			
			Depreciation Rate for first 12 years	%	5.83%
			Depreciation Rate 13th year onwards	%	0.87%
			Years for 5.83% rate		12
5	Working Capital	<u>For Fixed Charges</u>			
		O&M Charges		Months	1
		Maintenance Spare	(% of O&M exepenses)		15%
		Receivables for Debtors		Months	2
		<u>For Variable Charges</u>			0
		Interest On Working Capital		%	11.56%
6	Operation & Maintenance				
		power plant (FY15-16)		Rs Lakh	21.79
		power plant (FY16-17)			22.44
		power plant (FY17-18)			23.52
		power plant (FY18-19)		Rs Lakh	24.53
		<u>Total O &amp; M Expenses Escalation</u>		%	4.27%

**Form 1.2 Form Template for (Small Hydro Projects) : Determination of Tariff Component**

Units Generation	Unit	Year-->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Installed Capacity	MW		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Net Generation	MU		2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	

Fixed Cost	Unit	Year-->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
O&M Expenses	Rs Lakh		24.53	25.58	26.67	27.81	28.99	30.23	31.52	32.87	34.27	35.74	37.26	38.85	40.51	42.24	44.05	45.93	47.89	49.94	52.07	54.29	56.61	59.03	61.55	64.18	66.92	69.78	72.76	75.86	79.10	82.48	86.00	89.68	93.51	97.50	101.66
Depreciation	Rs Lakh		33.26	33.26	33.26	33.26	33.26	33.26	33.26	33.26	33.26	33.26	33.26	33.26	4.97	4.97	4.97	4.97	4.97	4.97	4.97	4.97	4.97	4.97	4.97	4.97	4.97	4.97	4.97	4.97	4.97	4.97	4.97	4.97	4.97	4.97	4.97
Interest on term loan	Rs Lakh		42.34	38.66	34.98	31.29	27.61	23.93	20.25	16.57	12.89	9.20	5.52	1.84	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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interest on working Capital	Rs Lakh		2.99	3.02	3.05	3.08	3.11	3.14	3.18	3.21	3.25	3.29	3.33	3.38	3.42	3.47	3.52	3.57	3.62	3.68	3.73	3.79	3.86	3.92	3.99	4.06	4.13	4.21	4.29	4.37	4.46	4.55	4.65	4.75	4.85	4.96	5.07
Return on Equity	Rs Lakh		34.91	34.91	34.91	34.91	34.91	34.91	34.91	34.91	34.91	34.91	38.63	38.63	38.63	38.63	38.63	38.63	38.63	38.63	38.63	38.63	38.63	38.63	38.63	38.63	38.63	38.63	38.63	38.63	38.63	38.63	38.63	38.63	38.63	38.63	
Total Fixed Cost	Rs Lakh		138.02	135.41	132.85	130.34	127.88	125.47	123.12	120.82	118.58	116.40	118.01	115.96	87.54	89.32	91.17	93.10	95.11	97.21	99.40	101.69	104.07	106.55	109.14	111.84	114.66	117.59	120.65	123.84	127.17	130.64	134.26	138.03	141.96	146.06	150.34
Per unit Fixed Cost	Rs/kWh		5.30	5.20	5.11	5.01	4.92	4.82	4.73	4.64	4.56	4.47	4.54	4.46	3.36	3.43	3.50	3.58	3.66	3.74	3.82	3.91	4.00	4.10	4.19	4.30	4.41	4.52	4.64	4.76	4.89	5.02	5.16	5.31	5.46	5.61	

**Levallised tariff corresponding to Useful life**

Per Unit Cost of Generation	Unit	Levelised	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
O&M expn	Rs/kWh	1.43	0.94	0.98	1.02	1.07	1.11	1.16	1.21	1.26	1.32	1.37	1.43	1.49	1.56	1.62	1.69	1.77	1.84	1.92	2.00	2.09	2.18	2.27	2.37	2.47	2.57	2.68	2.80	2.92	3.04	3.17	3.31	3.45	3.59	3.75	3.91
Depreciation	Rs/kWh	0.97	1.28	1.28	1.28	1.28	1.28	1.28	1.28	1.28	1.28	1.28	1.28	1.28	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
Int. on term loan	Rs/kWh	0.72	1.63	1.49	1.34	1.20	1.06	0.92	0.78	0.64	0.50	0.35	0.21	0.07	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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Int. on working capital	Rs/kWh	0.13	0.11	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.13	0.13	0.13	0.13	0.13	0.13	0.14	0.14	0.14	0.14	0.14	0.15	0.15	0.15	0.15	0.16	0.16	0.16	0.16	0.17	0.17	0.18	0.18	0.18	0.19	0.19	0.19
RoE	Rs/kWh	1.39	1.34	1.34	1.34	1.34	1.34	1.34	1.34	1.34	1.34	1.34	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48
Total COG	Rs/kWh	4.64	5.30	5.20	5.11	5.01	4.92	4.82	4.73	4.64	4.56	4.47	4.54	4.46	3.36	3.43	3.50	3.58	3.66	3.74	3.82	3.91	4.00	4.10	4.19	4.30	4.41	4.52	4.64	4.76	4.89	5.02	5.16	5.31	5.46	5.61	5.78

Levllised Tariff	Unit	Year-->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Discount Factor			1	0.91	0.82	0.75	0.68	0.61	0.56	0.50	0.46	0.41	0.38	0.34	0.31	0.28	0.25	0.23	0.21	0.19	0.17	0.16	0.14	0.13	0.12	0.11	0.10	0.09	0.08	0.07	0.06	0.06	0.05	0.05	0.04	0.04	0.04
Fixed Cost			120.78	120.78	120.78	120.78	120.78	120.78	120.78	120.78	120.78	120.78	120.78	120.78	120.78	120.78	120.78	120.78	120.78	120.78	120.78	120.78	120.78	120.78	120.78	120.78	120.78	120.78	120.78	120.78	120.78	120.78	120.78	120.78	120.78	120.78	120.78
<b>Levllised Tariff</b>	<b>4.64</b>	<b>Rs/Unit</b>																																			

**Determination of Additional Depreciation for Small Hydro Power Projects**

Depreciation amount	90%
Book Depreciation rate	5.28%
Tax Depreciation rate	40%
Additional Depreciation	20%
Income Tax (MAT)	21.549%
Income Tax (Normal Rates)	29.12%
Capital Cost	570.49

Years ----->	Unit	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Book Depreciation	%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	0.24%	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%	0.00%	0.00%	0.00%	
Book Depreciation	Rs Lakh	30.12	30.12	30.12	30.12	30.12	30.12	30.12	30.12	30.12	30.12	30.12	30.12	30.12	30.12	30.12	30.12	30.12	1.37	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	0.00	0.00	0.00	0.00

Accelerated Depreciation																																		
Opening	%	100%	40%	24%	14%	9%	5%	3%	2%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Allowed during the year	%	60.00%	16.00%	9.60%	5.76%	3.46%	2.07%	1.24%	0.75%	0.45%	0.27%	0.16%	0.10%	0.06%	0.03%	0.02%	0.01%	0.01%	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%	0.00%	0.00%	0.00%
Closing	%	40.0%	24.0%	14.4%	8.64%	5.18%	3.11%	1.87%	1.12%	0.67%	0.40%	0.24%	0.15%	0.09%	0.05%	0.03%	0.02%	0.01%	0.01%	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%	0.00%	0.00%
Accelerated Depm.	Rs Lakh	342.29	91.28	54.77	32.86	19.72	11.83	7.10	4.26	2.56	1.53	0.92	0.55	0.33	0.20	0.12	0.07	0.04	0.03	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Net Depreciation Benefit	Rs Lakh	312.17	61.16	24.65	2.74	-10.41	-18.29	-23.02	-25.86	-27.57	-28.59	-29.20	-29.57	-29.79	-29.92	-30.00	-30.05	-30.08	-1.34	0.02	0.01	0.01	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	
Tax Benefit	Rs Lakh	90.90	17.81	7.18	0.80	-3.03	-5.33	-6.70	-7.53	-8.03	-8.33	-8.50	-8.61	-8.68	-8.71	-8.74	-8.75	-8.76	-0.39	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	0.00	0.00	0.00	
Energy generation	MU	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60		
Per unit benefit	Rs/Unit	3.49	0.68	0.28	0.03	-0.12	-0.20	-0.26	-0.29	-0.31	-0.32	-0.33	-0.33	-0.33	-0.33	-0.34	-0.34	-0.34	-0.02	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	0.00	0.00	0.00	
Discounting Factor		1.00	0.91	0.82	0.75	0.68	0.61	0.56	0.50	0.46	0.41	0.38	0.34	0.31	0.28	0.25	0.23	0.21	0.19	0.17	0.16	0.14	0.13	0.12	0.11	0.10	0.09	0.08	0.07	0.06	0.06	0.05	0.05	0.04	0.04	
Applicable Discounting Factor		1.00	0.95	0.86	0.78	0.71	0.64	0.58	0.53	0.48	0.43	0.39	0.36	0.32	0.29	0.27	0.24	0.22	0.20	0.18	0.16	0.15	0.13	0.12	0.11	0.10	0.09	0.08	0.07	0.07	0.06	0.06	0.05	0.05	0.04	0.04

Levellised benefit	0.28	Rs/Unit
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**Annexure – 2B**  
**(SHP above 5 MW and upto and including 25 MW)**

**Form 1.1 Assumptions Parameters**

S. No.	Assumption Head	Sub-Head	Sub-Head (2)	Unit	up to 25 M
1	Power Generation	<u>Capacity</u>	Installed Power Generation Capacity	MW	1
			Capacity Utilization Factor	%	30%
			Auxilliary Consumption		1%
			Useful Life	Years	35
2	Project Cost	Capital Cost/MW	Power Plant Cost	Rs Lacs/MW	519.05
3	Sources of Fund	<u>Debt: Equity</u>	Tariff Period	Years	13
			Debt	%	70%
			Equity	%	30%
			Total Debt Amount	Rs Lacs	363.33
			Total Equity Amout	Rs Lacs	155.71
		<u>Debt Component</u>	Loan Amount	Rs Lacs	363.33
			Repayment Period(incld Moratorium)	years	12
			Interest Rate	%	11.06%
		<u>Equity Component</u>	Equity amount	Rs Lacs	155.71
			Return on Equity for first 10 years	% p.a	20.39%
			RoE Period	Year	10
			Return on Equity 11th year onwards	% p.a	22.57%
			Weighted average of ROE		21.95%
			Discount Rate		10.29%
4	Financial Assumptions	<u>Fiscal Assumptions</u>	Income Tax	%	29.120%
			MAT Rate (for first 10 years)	%	21.549%
		<u>Depreciation</u>	Depreciation Rate for first 12 years	%	5.83%
			Depreciation Rate 13th year onwards	%	0.87%
			Years for 5.83% rate		12
5	Working Capital	<u>For Fixed Charges</u>			
		O&M Charges		Months	1
		Maintenance Spare	(% of O&M exepenses)		15%
		Receivables for Debtors		Months	2
		<u>For Variable Charges</u>			0
		Interest On Working Capital		%	11.56%
6	Operation & Maintenance	power plant (FY15-16)		Rs Lakh	15.42
		power plant (FY16-17)			15.88
		power plant (FY17-18)			16.65
		power plant (FY18-19)		Rs Lakh	17.36
		<u>Total O &amp; M Expenses Escalation</u>		%	4.27%

**Form 1.2 Form Template for (Small Hydro Projects) : Determination of Tariff Component**

Units Generation	Unit	Year-->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Installed Capacity	MW		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Net Generation	MU		2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60

Fixed Cost	Unit	Year-->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
O&M Expenses	Rs Lakh		17.36	18.10	18.87	19.68	20.52	21.39	22.31	23.26	24.25	25.29	26.37	27.49	28.67	29.89	31.17	32.50	33.89	35.34	36.85	38.42	40.06	41.77	43.55	45.41	47.35	49.38	51.48	53.68	55.98	58.37	60.86	63.46	66.17	68.99	71.94
Depreciation	Rs Lakh		30.26	30.26	30.26	30.26	30.26	30.26	30.26	30.26	30.26	30.26	30.26	30.26	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52
Interest on term loan	Rs Lakh		38.52	35.17	31.82	28.47	25.12	21.77	18.42	15.07	11.72	8.37	5.02	1.67	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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interest on working Capital	Rs Lakh		2.43	2.45	2.47	2.50	2.52	2.54	2.57	2.59	2.62	2.65	2.68	2.71	2.74	2.77	2.81	2.84	2.88	2.92	2.96	3.00	3.05	3.09	3.14	3.19	3.24	3.30	3.35	3.41	3.48	3.54	3.61	3.68	3.75	3.83	3.91
Return on Equity	Rs Lakh		31.76	31.76	31.76	31.76	31.76	31.76	31.76	31.76	31.76	31.76	35.15	35.15	35.15	35.15	35.15	35.15	35.15	35.15	35.15	35.15	35.15	35.15	35.15	35.15	35.15	35.15	35.15	35.15	35.15	35.15	35.15	35.15	35.15	35.15	35.15
<b>Total Fixed Cost</b>	<b>Rs Lakh</b>		<b>120.33</b>	<b>117.74</b>	<b>115.19</b>	<b>112.66</b>	<b>110.18</b>	<b>107.73</b>	<b>105.32</b>	<b>102.94</b>	<b>100.62</b>	<b>98.33</b>	<b>99.48</b>	<b>97.29</b>	<b>71.08</b>	<b>72.34</b>	<b>73.65</b>	<b>75.02</b>	<b>76.44</b>	<b>77.93</b>	<b>79.48</b>	<b>81.09</b>	<b>82.78</b>	<b>84.54</b>	<b>86.37</b>	<b>88.28</b>	<b>90.27</b>	<b>92.35</b>	<b>94.51</b>	<b>96.77</b>	<b>99.12</b>	<b>101.58</b>	<b>104.14</b>	<b>106.81</b>	<b>109.59</b>	<b>112.49</b>	<b>115.52</b>
<b>Per unit Fixed Cost</b>	<b>Rs/kWh</b>		<b>4.63</b>	<b>4.53</b>	<b>4.43</b>	<b>4.33</b>	<b>4.23</b>	<b>4.14</b>	<b>4.05</b>	<b>3.96</b>	<b>3.87</b>	<b>3.78</b>	<b>3.82</b>	<b>3.74</b>	<b>2.73</b>	<b>2.78</b>	<b>2.83</b>	<b>2.88</b>	<b>2.94</b>	<b>3.00</b>	<b>3.05</b>	<b>3.12</b>	<b>3.18</b>	<b>3.25</b>	<b>3.32</b>	<b>3.39</b>	<b>3.47</b>	<b>3.55</b>	<b>3.63</b>	<b>3.72</b>	<b>3.81</b>	<b>3.90</b>	<b>4.00</b>	<b>4.11</b>	<b>4.21</b>	<b>4.32</b>	<b>4.44</b>

**Levallised tariff corresponding to Useful life**

Per Unit Cost of Generation	Unit	Levelised	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
O&M expn	Rs/kWh	1.01	0.67	0.70	0.73	0.76	0.79	0.82	0.86	0.89	0.93	0.97	1.01	1.06	1.10	1.15	1.20	1.25	1.30	1.36	1.42	1.48	1.54	1.61	1.67	1.75	1.82	1.90	1.98	2.06	2.15	2.24	2.34	2.44	2.54	2.65	2.77
Depreciation	Rs/kWh	0.88	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
Int. on term loan	Rs/kWh	0.66	1.48	1.35	1.22	1.09	0.97	0.84	0.71	0.58	0.45	0.32	0.19	0.06	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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Int. on working capital	Rs/kWh	0.10	0.09	0.09	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.12	0.12	0.12	0.12	0.12	0.12	0.13	0.13	0.13	0.13	0.14	0.14	0.14	0.14	0.15	0.15
RoE	Rs/kWh	1.27	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35
Total COG	Rs/kWh	3.92	4.63	4.53	4.43	4.33	4.23	4.14	4.05	3.96	3.87	3.78	3.82	3.74	2.73	2.78	2.83	2.88	2.94	3.00	3.05	3.12	3.18	3.25	3.32	3.39	3.47	3.55	3.63	3.72	3.81	3.90	4.00	4.11	4.21	4.32	4.44

Levellised Tariff	Unit	Year-->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	
Discount Factor			1	0.91	0.82	0.75	0.68	0.61	0.56	0.50	0.46	0.41	0.38	0.34	0.31	0.28	0.25	0.23	0.21	0.19	0.17	0.16	0.14	0.13	0.12	0.11	0.10	0.09	0.08	0.07	0.06	0.06	0.05	0.05	0.04	0.04	0.04	
Fixed Cost			102.00	102.00	102.00	102.00	102.00	102.00	102.00	102.00	102.00	102.00	102.00	102.00	102.00	102.00	102.00	102.00	102.00	102.00	102.00	102.00	102.00	102.00	102.00	102.00	102.00	102.00	102.00	102.00	102.00	102.00	102.00	102.00	102.00	102.00	102.00	102.00
Levellised Tariff	3.92	Rs/Unit																																				

Determination of Additional Depreciation for Small Hydro Power Projects

Depreciation amount	90%
Book Depreciation rate	5.28%
Tax Depreciation rate	40%
Additional Depreciation	20%
Income Tax (MAT)	21.549%
Income Tax (Normal Rates)	29.12%
Capital Cost	519.05

Years ----->	Unit	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Book Depreciation	%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	0.24%	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%	0.00%	0.00%	0.00%	
Book Depreciation	Rs Lakh	27.41	27.41	27.41	27.41	27.41	27.41	27.41	27.41	27.41	27.41	27.41	27.41	27.41	27.41	27.41	27.41	27.41	1.25	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	0.00	0.00	0.00	

Accelerated Depreciation																																				
Opening	%	100%	40%	24%	14%	9%	5%	3%	2%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Allowed during the year	%	60.00%	16.00%	9.60%	5.76%	3.46%	2.07%	1.24%	0.75%	0.45%	0.27%	0.16%	0.10%	0.06%	0.03%	0.02%	0.01%	0.01%	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%	0.00%	0.00%	0.00%	0.00%	0.00%
Closing	%	40.0%	24.0%	14.4%	8.64%	5.18%	3.11%	1.87%	1.12%	0.67%	0.40%	0.24%	0.15%	0.09%	0.05%	0.03%	0.02%	0.01%	0.01%	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%	0.00%	0.00%	0.00%	0.00%
Accelrated Depm.	Rs Lakh	311.43	83.05	49.83	29.90	17.94	10.76	6.46	3.87	2.32	1.39	0.84	0.50	0.30	0.18	0.11	0.07	0.04	0.02	0.01	0.01	0.01	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	0.00

Net Depreciation Benefit	Rs Lakh	284.02	55.64	22.42	2.49	-9.47	-16.64	-20.95	-23.53	-25.08	-26.01	-26.57	-26.90	-27.10	-27.22	-27.30	-27.34	-27.37	-1.22	0.01	0.01	0.01	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	
Tax Benefit	Rs Lakh	82.71	16.20	6.53	0.73	-2.76	-4.85	-6.10	-6.85	-7.30	-7.57	-7.74	-7.83	-7.89	-7.93	-7.95	-7.96	-7.97	-0.36	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	0.00	0.00	0.00	
Energy generation	MU	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60		
Per unit benefit	Rs/Unit	3.18	0.62	0.25	0.03	-0.11	-0.19	-0.23	-0.26	-0.28	-0.29	-0.30	-0.30	-0.30	-0.30	-0.31	-0.31	-0.31	-0.01	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	0.00	0.00	0.00	
Discounting Factor		1.00	0.91	0.82	0.75	0.68	0.61	0.56	0.50	0.46	0.41	0.38	0.34	0.31	0.28	0.25	0.23	0.21	0.19	0.17	0.16	0.14	0.13	0.12	0.11	0.10	0.09	0.08	0.07	0.06	0.06	0.05	0.05	0.04	0.04	
Applicable Discounting Factor		1.00	0.95	0.86	0.78	0.71	0.64	0.58	0.53	0.48	0.43	0.39	0.36	0.32	0.29	0.27	0.24	0.22	0.20	0.18	0.16	0.15	0.13	0.12	0.11	0.10	0.09	0.08	0.07	0.07	0.06	0.06	0.05	0.05	0.04	0.04

Levellised benefit	0.26	Rs/Unit
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**Annexure – 3**  
**(Biomass Power Project)**

**Form 1.1 Assumptions Parameters**

S. No.	Assumption Head	Sub-Head	Sub-Head (2)	Unit	MERC
1	Power Generation	<u>Capacity</u>	Installed Power Generation Capacity	MW	1
			Auxillary Consumption during stabilisation	%	10%
			Auxillary Consumption after stabilisation	%	10%
			PLF(Stablization for 6 months)	%	60%
			PLF(during first year after Stablization)	%	70%
			PLF(second year onwards)	%	80%
			Useful Life	Years	20.00
			Tariff Period	Years	13
2	Project Cost	Capital Cost/MW	Power Plant Cost	Rs Lacs/MW	460.96
3	Financial Assumptions	<u>Debt: Equity</u>	Debt	%	70%
			Equity	%	30%
			Total Debt Amount	Rs Lacs	322.67
			Total Equity Amout	Rs Lacs	138.29
		<u>Debt Component</u>	Loan Amount	Rs Lacs	322.67
			Moratorium Period	years	0
			Repayment Period(incld Moratorium)	years	12
			Interest Rate	%	11.06%
		<u>Equity Component</u>	Equity amount	Rs Lacs	138.29
			Return on Equity for first 10 years	% p.a	20.39%
			RoE Period	Year	10
			Return on Equity after 10 years		22.57%
			Weighted average of ROE		21.48%
			Discount Rate (equiv. to WACC)		10.29%
4	Financial Assumptions	<u>Fiscal Assumptions</u>	Income Tax	%	29.12%
			MAT Rate (for first 10 years)	%	21.55%
		<u>Depreciation</u>	Depreciation Rate(power plant)	%	5.83%
			Depreciation Rate 13th year onwards	%	2.505%
			Years for 5.83% depreciation rate		12
5	Working Capital	<u>For Fixed Charges</u>			
		O&M Charges		Months	1
		Maintenance Spare	(% of O&M exepenses)		15%
		Receivables for Debtors		Months	2
		<u>For Variable Charges</u>			
		Biomass Stock		Months	4
6	Fuel Related Assumptions		Interest On Working Capital	%	11.56%
		<u>Heat Rate</u>	During/After Stabilisation period	Kcal/kwh	4200
			During Stablization Period	Kcal/kwh	4200
		<u>Biomass</u>			
			Base Price(FY15-16)	Rs/T	3987
			GCV - Biomass	Kcal/kg	3611
7	Operation & Maintenance		Biomass Price Escalation Factor		5%
			Price (FY 18-19)	Rs/T	4091.02
		power plant (FY15-16)		Rs Lakh	26.30
		power plant (FY16-17)		Rs Lakh	27.08
		power plant (FY17-18)		Rs Lakh	28.39
		power plant (FY 2018-19)		Rs Lakh	29.60
8	Generation and Sale Of Energy	<u>Total O &amp; M Expenses Escalation</u>		%	4.27%
		<u>Working Hours/Day</u>		Hrs	24
		<u>No. of Days</u>		Days	365
		Total No. of Hours		Hrs	8760



## 2.2 Form Template for (Biomass Power Projects) : Determination of Tariff Component

Units Generation	Unit	Year-->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Installed Capacity	MW		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gross Generation	MU		5.69	7.01	7.01	7.01	7.01	7.01	7.01	7.01	7.01	7.01	7.01	7.01	7.01	7.01	7.01	7.01	7.01	7.01	7.01	7.01
Auxiliary Consumption	MU		0.57	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Net Generation	MU		5.12	6.31	6.31	6.31	6.31	6.31	6.31	6.31	6.31	6.31	6.31	6.31	6.31	6.31	6.31	6.31	6.31	6.31	6.31	6.31

Variable Cost	Unit	Year-->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Biomass Cost	Rs Lakh		270.94	333.46	333.46	333.46	333.46	333.46	333.46	333.46	333.46	333.46	333.46	333.46	333.46	333.46	333.46	333.46	333.46	333.46	333.46	333.46
<b>Per unit Var Cost</b>	<b>Rs/kWh</b>		<b>5.29</b>	<b>5.29</b>	<b>5.29</b>	<b>5.29</b>	<b>5.29</b>	<b>5.29</b>	<b>5.29</b>	<b>5.29</b>	<b>5.29</b>	<b>5.29</b>	<b>5.29</b>	<b>5.29</b>	<b>5.29</b>	<b>5.29</b>	<b>5.29</b>	<b>5.29</b>	<b>5.29</b>	<b>5.29</b>	<b>5.29</b>	<b>5.29</b>

Fixed Cost	Unit	Year-->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
O&M Expenses	Rs Lakh		29.60	30.87	32.18	33.56	34.99	36.49	38.04	39.67	41.36	43.13	44.97	46.89	48.89	50.98	53.16	55.43	57.80	60.27	62.84	65.52
Depreciation	Rs Lakh		26.87	26.87	26.87	26.87	26.87	26.87	26.87	26.87	26.87	26.87	26.87	26.87	11.55	11.55	11.55	11.55	11.55	11.55	11.55	11.55
Interest on term loan	Rs Lakh		34.21	31.24	28.26	25.29	22.31	19.34	16.36	13.39	10.41	7.44	4.46	1.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interest on working Capital	Rs Lakh		18.59	22.73	22.76	22.80	22.84	22.88	22.92	22.97	23.01	23.06	23.11	23.16	23.22	23.27	23.33	23.39	23.46	23.52	23.59	23.66
Return on Equity	Rs Lakh		28.20	28.20	28.20	28.20	28.20	28.20	28.20	28.20	28.20	28.20	31.22	31.22	31.22	31.22	31.22	31.22	31.22	31.22	31.22	31.22
<b>Total Fixed Cost</b>	<b>Rs Lakh</b>		<b>137.48</b>	<b>139.91</b>	<b>138.29</b>	<b>136.72</b>	<b>135.22</b>	<b>133.78</b>	<b>132.41</b>	<b>131.10</b>	<b>129.86</b>	<b>128.70</b>	<b>130.63</b>	<b>129.63</b>	<b>114.87</b>	<b>117.02</b>	<b>119.25</b>	<b>121.59</b>	<b>124.02</b>	<b>126.55</b>	<b>129.19</b>	<b>131.95</b>
<b>Per unit Fixed Cost</b>	<b>Rs/kWh</b>		<b>2.68</b>	<b>2.22</b>	<b>2.19</b>	<b>2.17</b>	<b>2.14</b>	<b>2.12</b>	<b>2.10</b>	<b>2.08</b>	<b>2.06</b>	<b>2.04</b>	<b>2.07</b>	<b>2.06</b>	<b>1.82</b>	<b>1.86</b>	<b>1.89</b>	<b>1.93</b>	<b>1.97</b>	<b>2.01</b>	<b>2.05</b>	<b>2.09</b>

### Levallised tariff corresponding to Useful life

Per Unit Cost of Generation	Unit	Levallised	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Variable COG	Rs/kWh	<b>5.29</b>	5.29	5.29	5.29	5.29	5.29	5.29	5.29	5.29	5.29	5.29	5.29	5.29	5.29	5.29	5.29	5.29	5.29	5.29	5.29	5.29
O&M expn	Rs/kWh	<b>0.64</b>	0.58	0.49	0.51	0.53	0.55	0.58	0.60	0.63	0.66	0.68	0.71	0.74	0.78	0.81	0.84	0.88	0.92	0.96	1.00	1.04
Depreciation	Rs/kWh	<b>0.39</b>	0.52	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18
Int. on term loan	Rs/kWh	<b>0.28</b>	0.67	0.50	0.45	0.40	0.35	0.31	0.26	0.21	0.17	0.12	0.07	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Int. on working capital	Rs/kWh	<b>0.36</b>	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.38
RoE	Rs/kWh	<b>0.47</b>	0.55	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49
<b>Total COG</b>	<b>Rs/kWh</b>	<b>7.44</b>	<b>7.97</b>	<b>7.51</b>	<b>7.48</b>	<b>7.45</b>	<b>7.43</b>	<b>7.41</b>	<b>7.39</b>	<b>7.37</b>	<b>7.35</b>	<b>7.33</b>	<b>7.36</b>	<b>7.34</b>	<b>7.11</b>	<b>7.14</b>	<b>7.18</b>	<b>7.21</b>	<b>7.25</b>	<b>7.29</b>	<b>7.34</b>	<b>7.38</b>

Levallised Tariff	Unit	Year -->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Discount Factor			1	0.91	0.82	0.75	0.68	0.61	0.56	0.50	0.46	0.41	0.38	0.34	0.31	0.28	0.25	0.23	0.21	0.19	0.17	0.16
Variable Cost			271.1	333.7	333.7	333.7	333.7	333.7	333.7	333.7	333.7	333.7	333.7	333.7	333.7	333.7	333.7	333.7	333.7	333.7	333.7	333.7
Fixed Cost			110.2	135.6	135.6	135.6	135.6	135.6	135.6	135.6	135.6	135.6	135.6	135.6	135.6	135.6	135.6	135.6	135.6	135.6	135.6	135.6

Levallised Tariff (Variable)	5.29
Levallised Tariff (Fixed)	2.15
<b>Levallised Tariff (Rs/Unit)</b>	<b>7.44</b>

### Determination of Accelerated Depreciation for Biomass Power Project

Depreciation amount	90%
Book Depreciation rate	5.28%
Tax Depreciation rate	40%
Additional Depreciation	20%
Income Tax (MAT)	21.549%
Income Tax (Normal Rates)	29.12%
Capital Cost	461.0

Years ----->	Unit	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Book Depreciation	%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	0.24%	0.00%	0.00%
Book Depreciation	Rs Lakh	24.34	24.34	24.34	24.34	24.34	24.34	24.34	24.34	24.34	24.34	24.34	24.34	24.34	24.34	24.34	24.34	24.34	1.11	0.00	0.00

Accelerated Depreciation																					
Opening	%	100%	40%	24%	14%	9%	5%	3%	2%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Allowed during the year	%	60%	16.00%	9.60%	5.76%	3.46%	2.07%	1.24%	0.75%	0.45%	0.27%	0.16%	0.10%	0.06%	0.03%	0.02%	0.01%	0.01%	0.00%	0.00%	
Closing	%	40%	24%	14.40%	8.64%	5.18%	3.11%	1.87%	1.12%	0.67%	0.40%	0.24%	0.15%	0.09%	0.05%	0.03%	0.02%	0.01%	0.01%	0.00%	
Accelrated Deprn.	Rs Lakh	276.57	73.75	44.25	26.55	15.93	9.56	5.74	3.44	2.06	1.24	0.74	0.45	0.27	0.16	0.10	0.06	0.03	0.02	0.01	

Net Depreciation Benefit	Rs Lakh	252.24	49.41	19.91	2.21	-8.41	-14.78	-18.60	-20.90	-22.27	-23.10	-23.60	-23.89	-24.07	-24.18	-24.24	-24.28	-24.30	-1.09	0.01	0.01
Tax Benefit	Rs Lakh	73.45	14.39	5.80	0.64	-2.45	-4.30	-5.42	-6.09	-6.49	-6.73	-6.87	-6.96	-7.01	-7.04	-7.06	-7.07	-7.08	-0.32	0.00	0.00
Net Energy generation	MU	5.12	6.31	6.31	6.31	6.31	6.31	6.31	6.31	6.31	6.31	6.31	6.31	6.31	6.31	6.31	6.31	6.31	6.31	6.31	6.31
Per unit benefit	Rs/Unit	1.43	0.23	0.09	0.01	-0.04	-0.07	-0.09	-0.10	-0.10	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.01	0.00	0.00
Discounting Factor		1.00	0.907	0.82	0.75	0.68	0.61	0.56	0.50	0.46	0.41	0.38	0.34	0.31	0.28	0.25	0.23	0.21	0.19	0.17	0.16

Levellised Benefit	0.14	Rs/ Unit
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**Annexure – 4**  
**(Non-fossil fuel based cogeneration project)**

**Form 1.1 Assumptions Parameters**

S. No.	Assumption Head	Sub-Head	Sub-Head (2)	Unit	MERC
1	Power Generation	Capacity	Installed Power Generation Capacity	MW	1
			Auxiliary Consumption during stabilisation	%	8.5%
			Auxiliary Consumption after stabilisation	%	8.5%
			PLF(Stablization for 6 months)	%	60%
			PLF(during first year after Stablization)	%	60%
			PLF(second year onwards)	%	60%
			Useful Life	Years	20.00
			Tariff Period	Years	13
2	Project Cost	Capital Cost/MW	Power Plant Cost	Rs Lacs/MW	456.01
3	Financial Assumptions	<u>Debt: Equity</u>	Debt	%	70%
			Equity	%	30%
			Total Debt Amount	Rs Lacs	319.21
			Total Equity Amount	Rs Lacs	136.80
		<u>Debt Component</u>	Loan Amount	Rs Lacs	319.21
			Repayment Period(incl'd Moratorium)	years	12
			Interest Rate	%	11.06%
		<u>Equity Component</u>	Equity amount	Rs Lacs	136.80
			Return on Equity for first 10 years	% p.a	20.39%
			RoE Period	Year	10.00
			Return on Equity after 10 years		22.57%
			Weighted average of ROE		20.90%
			Discount Rate (equiv. to WACC)		10.29%
4	Financial Assumptions	<u>Fiscal Assumptions</u>	Income Tax	%	29.12%
			MAT Rate (for first 10 years)	%	21.55%
		<u>Depreciation</u>	Depreciation Rate(power plant)	%	5.83%
			Depreciation Rate 13th year onwards	%	2.51%
			Years for 5.83%% depreciation rate		12
5	Working Capital	<u>For Fixed Charges</u>			
		O&M Charges		Months	1
		Maintenance Spare	(% of O&M exepenses)		15%
		Receivables for Debtors		Months	2
		<u>For Variable Charges</u>			
		Biomass Stock		Months	4
		Interest On Working Capital		%	11.56%
6	Fuel Related Assumptions	<u>Heat Rate</u>	After Stabilisation period	Kcal/kwh	3600
		<u>Biomass</u>			
			CERC Price - Bagasse (FY17-18)	Rs/T	2273.75
			GCV - Bagasse	Kcal/kg	2,250.00
			Biomass Price Escalation Factor		5%
			Bagasse (FY 18-19)	Rs/T	2387.44
7	Operation & Maintenance	power plant (FY15-16)		Rs Lakh	17.31
		power plant (FY16-17)		Rs Lakh	17.82
		power plant (FY17-18)			18.69
		power plant (FY 18-19)			19.49
		<u>Total O &amp; M Expenses Escalation</u>		%	4.27%

## 2.2 Form Template for (Cogen and Bagasse based Power Projects) : Determination of Tariff Component

Units Generation	Unit	Year-->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Installed Capacity	MW		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gross Generation	MU		5.26	5.26	5.26	5.26	5.26	5.26	5.26	5.26	5.26	5.26	5.26	5.26	5.26	5.26	5.26	5.26	5.26	5.26	5.26	5.26
Auxiliary Consumption	MU		0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Net Generation	MU		4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81

Variable Cost	Unit	Year-->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Biomass Cost	Rs Lakh		200.77	200.77	200.77	200.77	200.77	200.77	200.77	200.77	200.77	200.77	200.77	200.77	200.77	200.77	200.77	200.77	200.77	200.77	200.77	200.77
Per unit Var Cost	Rs/kWh		4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17

Fixed Cost	Unit	Year-->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
O&M Expenses	Rs Lakh		19.49	20.32	21.19	22.09	23.03	24.02	25.04	26.11	27.23	28.39	29.60	30.87	32.19	33.56	34.99	36.49	38.05	39.67	41.37	43.13
Depreciation	Rs Lakh		26.59	26.59	26.59	26.59	26.59	26.59	26.59	26.59	26.59	26.59	26.59	26.59	11.42	11.42	11.42	11.42	11.42	11.42	11.42	11.42
Interest on term loan	Rs Lakh		33.84	30.90	27.96	25.01	22.07	19.13	16.19	13.24	10.30	7.36	4.41	1.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interest on working Capital	Rs Lakh		14.24	14.26	14.29	14.31	14.34	14.36	14.39	14.42	14.45	14.48	14.52	14.55	14.59	14.62	14.66	14.70	14.74	14.79	14.83	14.88
Return on Equity	Rs Lakh		27.90	27.90	27.90	27.90	27.90	27.90	27.90	27.90	27.90	27.90	30.88	30.88	30.88	30.88	30.88	30.88	30.88	30.88	30.88	30.88
Total Fixed Cost	Rs Lakh		122.06	119.97	117.92	115.90	113.93	112.00	110.11	108.26	106.47	104.72	106.00	104.36	89.08	90.49	91.96	93.49	95.09	96.76	98.50	100.32
Per unit Fixed Cost	Rs/kWh		2.54	2.49	2.45	2.41	2.37	2.33	2.29	2.25	2.21	2.18	2.20	2.17	1.85	1.88	1.91	1.94	1.98	2.01	2.05	2.09

### Levallised tariff corresponding to Useful life

Per Unit Cost of Generatio	Unit	Levelised	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Variable COG	Rs/kWh	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17	4.17
O&M expn	Rs/kWh	0.54	0.41	0.42	0.44	0.46	0.48	0.50	0.52	0.54	0.57	0.59	0.62	0.64	0.67	0.70	0.73	0.76	0.79	0.82	0.86	0.90
Depreciation	Rs/kWh	0.49	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24
Int. on term loan	Rs/kWh	0.35	0.70	0.64	0.58	0.52	0.46	0.40	0.34	0.28	0.21	0.15	0.09	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Int. on working capital	Rs/kWh	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.31	0.31	0.31	0.31	0.31
RoE	Rs/kWh	0.60	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64
Total COG	Rs/kWh	6.46	6.71	6.67	6.63	6.58	6.54	6.50	6.46	6.43	6.39	6.35	6.38	6.34	6.03	6.06	6.09	6.12	6.15	6.19	6.22	6.26

Levelling Tariff	Unit	Year -->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Discount Factor			1	0.907	0.822	0.745	0.676	0.613	0.556	0.504	0.457	0.414	0.376	0.341	0.309	0.280	0.254	0.230	0.209	0.189	0.172	0.156
Variable Cost			200.5	200.5	200.5	200.5	200.5	200.5	200.5	200.5	200.5	200.5	200.5	200.5	200.5	200.5	200.5	200.5	200.5	200.5	200.5	200.5
Fixed Cost			109.7	109.7	109.7	109.7	109.7	109.7	109.7	109.7	109.7	109.7	109.7	109.7	109.7	109.7	109.7	109.7	109.7	109.7	109.7	109.7

Levelling Tariff (Variable)	4.17
Levelling Tariff (Fixed)	2.28
Levelling Tariff (Rs/Unit)	6.45

### Determination of Accelerated Depreciation for Cogen and Bagasse based Power Project

Depreciation amount	90%
Book Depreciation rate	5.28%
Tax Depreciation rate	40%
Additional Depreciation	20%
Income Tax (MAT)	21.549%
Income Tax (Normal Rates)	29.12%
Capital Cost	456.0

Years ----->	Unit	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Book Depreciation	%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	0.24%	0.00%	0.00%
Book Depreciation	Rs Lakh	24.08	24.08	24.08	24.08	24.08	24.08	24.08	24.08	24.08	24.08	24.08	24.08	24.08	24.08	24.08	24.08	24.08	1.09	0.00	0.00

Accelerated Depreciation																					
Opening	%	100%	40%	24%	14%	9%	5%	3%	2%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Allowed during the year	%	60%	16.00%	9.60%	5.76%	3.46%	2.07%	1.24%	0.75%	0.45%	0.27%	0.16%	0.10%	0.06%	0.03%	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%
Closing	%	40%	24%	14.40%	8.64%	5.18%	3.11%	1.87%	1.12%	0.67%	0.40%	0.24%	0.15%	0.09%	0.05%	0.03%	0.02%	0.01%	0.01%	0.00%	0.00%
Accelrated Deprn.	Rs Lakh	273.61	72.96	43.78	26.27	15.76	9.46	5.67	3.40	2.04	1.23	0.74	0.44	0.26	0.16	0.10	0.06	0.03	0.02	0.01	0.01

Net Depreciation Benefit	Rs Lakh	249.53	48.88	19.70	2.19	-8.32	-14.62	-18.40	-20.67	-22.04	-22.85	-23.34	-23.64	-23.81	-23.92	-23.98	-24.02	-24.04	-1.07	0.01	0.01
Tax Benefit	Rs Lakh	72.66	14.24	5.74	0.64	-2.42	-4.26	-5.36	-6.02	-6.42	-6.65	-6.80	-6.88	-6.93	-6.97	-6.98	-6.99	-7.00	-0.31	0.00	0.00
Net Energy generation	MU	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81
Per unit benefit	Rs/Unit	1.51	0.30	0.12	0.01	-0.05	-0.09	-0.11	-0.13	-0.13	-0.14	-0.14	-0.14	-0.14	-0.14	-0.15	-0.15	-0.15	-0.01	0.00	0.00
Discounting Factor		1.00	0.91	0.82	0.75	0.68	0.61	0.56	0.50	0.46	0.41	0.38	0.34	0.31	0.28	0.25	0.23	0.21	0.19	0.17	0.16

Levellised Benefit	0.14	Rs/ Unit
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**Annexure – 5A**  
**(Solar PV Projects)**

**Form 1.1 Assumptions Parameters**

S. No.	Assumption Head	Sub-Head	Sub-Head (2)	Unit	PV
1	Power Generation	<u>Capacity</u>	Installed Power Generation Capacity	MW	1
			Capacity Utilization Factor	%	19%
			Auxilliary Consumption		0%
			Useful Life	Years	25
2	Project Cost	Capital Cost/MW	Power Plant Cost	Rs Lacs/MW	262.00
3	Sources of Fund	<u>Debt: Equity</u>	Tariff Period	Years	13
			Debt	%	70%
			Equity	%	30%
			Total Debt Amount	Rs Lacs	183.40
			Total Equity Amout	Rs Lacs	78.60
		<u>Debt Component</u>	Loan Amount	Rs Lacs	183.40
			Moratorium Period	years	0
			Repayment Period(incld Moratorium)	years	12
			Interest Rate	%	11.06%
		<u>Equity Component</u>	Equity amount	Rs Lacs	78.60
			Return on Equity for first 10 years	% p.a	20.39%
			RoE Period	Year	10
			Return on Equity 11th year onwards	% p.a	22.57%
			Weighted average of ROE		21.70%
			Discount Rate		10.29%
4	Financial Assumptions	<u>Fiscal Assumptions</u>	Income Tax	%	29.12%
			MAT Rate (for first 10 years)	%	21.55%
		<u>Depreciation</u>	Depreciation Rate for first 12 years	%	5.83%
			Depreciation Rate 13th year onwards	%	1.54%
			Years for 5.83% rate		12
5	Working Capital	<u>For Fixed Charges</u>			
		O&M Charges		Months	1
		Maintenance Spare	(% of O&M exepenses)		15%
		Receivables for Debtors		Months	2
		<u>For Variable Charges</u>			
		Interest On Working Capital		%	11.56%
6	Operation & Maintenance	Operation & Maintenance (2015-16)			
		Operation & Maintenance (2016-17)			
		Operation & Maintenance (2017-18)		Rs Lakh	
		Operation & Maintenance (2018-19)		Rs Lakh	7.65
		<u>Total O &amp; M Expenses Escalation</u>		%	4.27%

**Form 1.2 Form Template for (Solar PV Projects of Capacity - ) : Determination of Tariff Component**

Units Generation	Unit	Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Installed Capacity	MW		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Net Generation	MU		1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66

Fixed Cost	Unit	Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
O&M Expenses	Rs Lakh		7.65	7.98	8.32	8.68	9.05	9.43	9.84	10.26	10.69	11.15	11.63	12.12	12.64	13.18	13.74	14.33	14.94	15.58	16.25	16.94	17.66	18.42	19.20	20.02	20.88
Depreciation	Rs Lakh		15.27	15.27	15.27	15.27	15.27	15.27	15.27	15.27	15.27	15.27	15.27	15.27	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04
Interest on term loan	Rs Lakh		19.44	17.75	16.06	14.37	12.68	10.99	9.30	7.61	5.92	4.23	2.54	0.85	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	Rs Lakh		1.18	1.18	1.19	1.20	1.21	1.22	1.23	1.25	1.26	1.27	1.28	1.30	1.31	1.33	1.34	1.36	1.37	1.39	1.41	1.43	1.45	1.47	1.49	1.51	1.53
Return on Equity	Rs Lakh		16.03	16.03	16.03	16.03	16.03	16.03	16.03	16.03	16.03	16.03	16.03	17.74	17.74	17.74	17.74	17.74	17.74	17.74	17.74	17.74	17.74	17.74	17.74	17.74	17.74
<b>Total Fixed Cost</b>	<b>Rs Lakh</b>		<b>59.58</b>	<b>58.22</b>	<b>56.88</b>	<b>55.56</b>	<b>54.25</b>	<b>52.95</b>	<b>51.67</b>	<b>50.42</b>	<b>49.17</b>	<b>47.95</b>	<b>48.46</b>	<b>47.28</b>	<b>35.73</b>	<b>36.29</b>	<b>36.87</b>	<b>37.47</b>	<b>38.10</b>	<b>38.75</b>	<b>39.44</b>	<b>40.15</b>	<b>40.89</b>	<b>41.67</b>	<b>42.47</b>	<b>43.32</b>	<b>44.19</b>
<b>Per unit Fixed Cost</b>	<b>Rs/kWh</b>		<b>3.58</b>	<b>3.50</b>	<b>3.42</b>	<b>3.34</b>	<b>3.26</b>	<b>3.18</b>	<b>3.10</b>	<b>3.03</b>	<b>2.95</b>	<b>2.88</b>	<b>2.91</b>	<b>2.84</b>	<b>2.15</b>	<b>2.18</b>	<b>2.21</b>	<b>2.25</b>	<b>2.29</b>	<b>2.33</b>	<b>2.37</b>	<b>2.41</b>	<b>2.46</b>	<b>2.50</b>	<b>2.55</b>	<b>2.60</b>	<b>2.66</b>

**Levallised tariff corresponding to Useful life**

Per Unit Cost of Generation	Unit	Levelised	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
O&M expn	Rs/kWh	<b>0.65</b>	0.46	0.48	0.50	0.52	0.54	0.57	0.59	0.62	0.64	0.67	0.70	0.73	0.76	0.79	0.83	0.86	0.90	0.94	0.98	1.02	1.06	1.11	1.15	1.20	1.25
Depreciation	Rs/kWh	<b>0.75</b>	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24
Int. on term loan	Rs/kWh	<b>0.55</b>	1.17	1.07	0.97	0.86	0.76	0.66	0.56	0.46	0.36	0.25	0.15	0.05	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
Int. on working capital	Rs/kWh	<b>0.08</b>	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.09	0.09	0.09	0.09	0.09	0.09
RoE	Rs/kWh	<b>1.00</b>	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
<b>Total COG</b>	<b>Rs/kWh</b>	<b>3.02</b>	<b>3.58</b>	<b>3.50</b>	<b>3.42</b>	<b>3.34</b>	<b>3.26</b>	<b>3.18</b>	<b>3.10</b>	<b>3.03</b>	<b>2.95</b>	<b>2.88</b>	<b>2.91</b>	<b>2.84</b>	<b>2.15</b>	<b>2.18</b>	<b>2.21</b>	<b>2.25</b>	<b>2.29</b>	<b>2.33</b>	<b>2.37</b>	<b>2.41</b>	<b>2.46</b>	<b>2.50</b>	<b>2.55</b>	<b>2.60</b>	<b>2.66</b>

Levallised Tariff	Unit	Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Discount Factor			1	0.91	0.82	0.75	0.68	0.61	0.56	0.50	0.46	0.41	0.38	0.34	0.31	0.28	0.25	0.23	0.21	0.19	0.17	0.16	0.14	0.13	0.12	0.11	0.10
Fixed Cost			50.31	50.31	50.31	50.31	50.31	50.31	50.31	50.31	50.31	50.31	50.31	50.31	50.31	50.31	50.31	50.31	50.31	50.31	50.31	50.31	50.31	50.31	50.31	50.31	50.31
<b>Levallised Tariff</b>	<b>3.02</b>	<b>Rs/Unit</b>																									

### Determination of Additional Depreciation for Solar PV Power Projects

Depreciation amount	90%
Book Depreciation rate	5.28%
Tax Depreciation rate	40%
Additional Depreciation	20%
Income Tax (MAT)	21.549%
Income Tax (Normal Rates)	29.120%
Capital Cost	262.00

Years ----->	Unit	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Book Depreciation	%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	0.24%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Book Depreciation	Rs Lakh	13.83	13.83	13.83	13.83	13.83	13.83	13.83	13.83	13.83	13.83	13.83	13.83	13.83	13.83	13.83	13.83	13.83	0.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Accelerated Depreciation																									
Opening	%	100%	40%	24%	14%	9%	5%	3%	2%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Allowed during the year	%	60.00%	16.00%	9.60%	5.76%	3.46%	2.07%	1.24%	0.75%	0.45%	0.27%	0.16%	0.10%	0.06%	0.03%	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Closing	%	40.0%	24.0%	14.4%	8.64%	5.18%	3.11%	1.87%	1.12%	0.67%	0.40%	0.24%	0.15%	0.09%	0.05%	0.03%	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Accelrated Depm.	Rs Lakh	157.20	41.92	25.15	15.09	9.05	5.43	3.26	1.96	1.17	0.70	0.42	0.25	0.15	0.09	0.05	0.03	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00

Net Depreciation Benefit	Rs Lakh	143.37	28.09	11.32	1.26	-4.78	-8.40	-10.57	-11.88	-12.66	-13.13	-13.41	-13.58	-13.68	-13.74	-13.78	-13.80	-13.81	-0.62	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Tax Benefit	Rs Lakh	41.75	8.18	3.30	0.37	-1.39	-2.45	-3.08	-3.46	-3.69	-3.82	-3.91	-3.95	-3.98	-4.00	-4.01	-4.02	-4.02	-0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Energy generation	MU	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66
Per unit benefit	Rs/Unit	2.51	0.49	0.20	0.02	-0.08	-0.15	-0.18	-0.21	-0.22	-0.23	-0.23	-0.24	-0.24	-0.24	-0.24	-0.24	-0.24	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Discounting Factor		1.00	0.91	0.82	0.75	0.68	0.61	0.56	0.50	0.46	0.41	0.38	0.34	0.31	0.28	0.25	0.23	0.21	0.19	0.17	0.16	0.14	0.13	0.12	0.11	0.10

Levellised benefit	0.21	Rs/Unit
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## **Annexure – 5B**

### **(Solar Thermal Projects)**

### Form 1.1 Assumptions Parameters

S. No.	Assumption Head	Sub-Head	Sub-Head (2)	Unit	olar thermal
1	Power Generation	Capacity	Installed Power Generation Capacity	MW	1
			Capacity Utilization Factor	%	23%
			Auxilliary Consumption		10%
			Useful Life	Years	25
2	Project Cost	Capital Cost/MW	Power Plant Cost	Rs Lacs/MW	1,200.00
3	Sources of Fund	Debt: Equity	Tariff Period	Years	25
			Debt	%	70%
			Equity	%	30%
			Total Debt Amount	Rs Lacs	840.00
			Total Equity Amout	Rs Lacs	360.00
		Debt Component	Loan Amount	Rs Lacs	840.00
			Moratorium Period	years	0
			Repayment Period(incl'd Moratorium)	years	12
			Interest Rate	%	11.06%
		Equity Component	Equity amount	Rs Lacs	360.00
			Return on Equity for first 10 years	% p.a	20.39%
			RoE Period	Year	10
			Return on Equity 11th year onwards	% p.a	22.57%
			Weighted average of ROE		21.70%
			Discount Rate		10.29%
4	Financial Assumptions	Fiscal Assumptions	Income Tax	%	29.120%
			MAT Rate (for first 10 years)	%	21.549%
		Depreciation	Depreciation Rate for first 12 years	%	5.83%
			Depreciation Rate 13th year onwards	%	1.54%
			Years for 5.83% rate		12
5	Working Capital	For Fixed Charges			
		O&M Charges		Months	1
		Maintenance Spare	(% of O&M exepenses)		15%
		Receivables for Debtors		Months	2
		For Variable Charges			
		Interest On Working Capital		%	11.56%
6	Operation & Maintenance	Operation & Maintenance (2015-16)			
		%ge escalation (FY16-17)		%	2.96%
		%ge escalation (FY17-18)		%	4.85%
		Operation & Maintenance (2018-19)		Rs Lakh	16.88
		Total O & M Expenses Escalation		%	4.27%

**Form 1.2 Form Template for (Solar Thermal Projects of Capacity - ) : Determination of Tariff Component**

Units Generation	Unit	Year→	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Installed Capacity	MW		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Net Generation	MU		1.81	1.81	1.81	1.81	1.81	1.81	1.81	1.81	1.81	1.81	1.81	1.81	1.81	1.81	1.81	1.81	1.81	1.81	1.81	1.81	1.81	1.81	1.81	1.81	1.81
Fixed Cost	Unit	Year→	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
O&M Expenses	Rs Lakh		16.88	17.61	18.36	19.14	19.96	20.81	21.70	22.63	23.59	24.60	25.65	26.75	27.89	29.08	30.32	31.62	32.97	34.37	35.84	37.37	38.97	40.63	42.37	44.18	46.07
Depreciation	Rs Lakh		69.96	69.96	69.96	69.96	69.96	69.96	69.96	69.96	69.96	69.96	69.96	69.96	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50
Interest on term loan	Rs Lakh		89.06	81.31	73.57	65.83	58.08	50.34	42.59	34.85	27.10	19.36	11.62	3.87	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	Rs Lakh		4.38	4.40	4.42	4.44	4.46	4.48	4.51	4.53	4.56	4.59	4.62	4.64	4.68	4.71	4.74	4.78	4.81	4.85	4.89	4.93	4.97	5.02	5.07	5.12	5.17
Return on Equity	Rs Lakh		73.42	73.42	73.42	73.42	73.42	73.42	73.42	73.42	73.42	73.42	81.26	81.26	81.26	81.26	81.26	81.26	81.26	81.26	81.26	81.26	81.26	81.26	81.26	81.26	81.26
<b>Total Fixed Cost</b>	<b>Rs Lakh</b>		<b>253.70</b>	<b>246.70</b>	<b>239.73</b>	<b>232.79</b>	<b>225.88</b>	<b>219.01</b>	<b>212.18</b>	<b>205.39</b>	<b>198.64</b>	<b>191.93</b>	<b>193.11</b>	<b>186.49</b>	<b>132.33</b>	<b>133.55</b>	<b>134.83</b>	<b>136.16</b>	<b>137.54</b>	<b>138.99</b>	<b>140.50</b>	<b>142.07</b>	<b>143.71</b>	<b>145.42</b>	<b>147.20</b>	<b>149.06</b>	<b>150.99</b>
<b>Per unit Fixed Cost</b>	<b>Rs/kWh</b>		<b>13.99</b>	<b>13.60</b>	<b>13.22</b>	<b>12.84</b>	<b>12.46</b>	<b>12.08</b>	<b>11.70</b>	<b>11.33</b>	<b>10.95</b>	<b>10.58</b>	<b>10.65</b>	<b>10.28</b>	<b>7.30</b>	<b>7.36</b>	<b>7.44</b>	<b>7.51</b>	<b>7.59</b>	<b>7.66</b>	<b>7.75</b>	<b>7.83</b>	<b>7.93</b>	<b>8.02</b>	<b>8.12</b>	<b>8.22</b>	<b>8.33</b>

**Levallised tariff corresponding to Useful life**

Per Unit Cost of Generation	Unit	Levelised	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
O&M expn	Rs/kWh	<b>1.31</b>	0.93	0.97	1.01	1.06	1.10	1.15	1.20	1.25	1.30	1.36	1.41	1.48	1.54	1.60	1.67	1.74	1.82	1.90	1.98	2.06	2.15	2.24	2.34	2.44	2.54
Depreciation	Rs/kWh	<b>3.17</b>	3.86	3.86	3.86	3.86	3.86	3.86	3.86	3.86	3.86	3.86	3.86	3.86	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Int. on term loan	Rs/kWh	<b>2.31</b>	4.91	4.48	4.06	3.63	3.20	2.78	2.35	1.92	1.49	1.07	0.64	0.21	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
Int. on working capital	Rs/kWh	<b>0.25</b>	0.24	0.24	0.24	0.24	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.26	0.26	0.26	0.26	0.27	0.27	0.27	0.27	0.27	0.28	0.28	0.28	0.28
RoE	Rs/kWh	<b>4.19</b>	4.05	4.05	4.05	4.05	4.05	4.05	4.05	4.05	4.05	4.05	4.48	4.48	4.48	4.48	4.48	4.48	4.48	4.48	4.48	4.48	4.48	4.48	4.48	4.48	4.48
<b>Total COG</b>	<b>Rs/kWh</b>	<b>11.23</b>	<b>13.99</b>	<b>13.60</b>	<b>13.22</b>	<b>12.84</b>	<b>12.46</b>	<b>12.08</b>	<b>11.70</b>	<b>11.33</b>	<b>10.95</b>	<b>10.58</b>	<b>10.65</b>	<b>10.28</b>	<b>7.30</b>	<b>7.36</b>	<b>7.44</b>	<b>7.51</b>	<b>7.59</b>	<b>7.66</b>	<b>7.75</b>	<b>7.83</b>	<b>7.93</b>	<b>8.02</b>	<b>8.12</b>	<b>8.22</b>	<b>8.33</b>

Discount Factor			1	0.91	0.82	0.75	0.68	0.61	0.56	0.50	0.46	0.41	0.38	0.34	0.31	0.28	0.25	0.23	0.21	0.19	0.17	0.16	0.14	0.13	0.12	0.11	0.10
Fixed Cost			203.58	203.58	203.58	203.58	203.58	203.58	203.58	203.58	203.58	203.58	203.58	203.58	203.58	203.58	203.58	203.58	203.58	203.58	203.58	203.58	203.58	203.58	203.58	203.58	203.58
<b>Levellised Tariff</b>	<b>11.23</b>	Rs/Unit																									

**Determination of Additional Depreciation for Solar Thermal Projects**

Depreciation amount	90%
Book Depreciation rate	5.28%
Tax Depreciation rate	40%
Additional Depreciation	20%
Income Tax (MAT)	21.549%
Income Tax (Normal Rates)	29.120%
Capital Cost	1200.00

Years ----->	Unit	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Book Depreciation	%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	5.28%	0.24%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Book Depreciation	Rs Lakh	63.36	63.36	63.36	63.36	63.36	63.36	63.36	63.36	63.36	63.36	63.36	63.36	63.36	63.36	63.36	63.36	63.36	2.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Accelerated Depreciation																									
Opening	%	100%	40%	24%	14%	9%	5%	3%	2%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Allowed during the year	%	60.00%	16.00%	9.60%	5.76%	3.46%	2.07%	1.24%	0.75%	0.45%	0.27%	0.16%	0.10%	0.06%	0.03%	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Closing	%	40.0%	24.0%	14.4%	8.64%	5.18%	3.11%	1.87%	1.12%	0.67%	0.40%	0.24%	0.15%	0.09%	0.05%	0.03%	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Accelrated Depn.	Rs Lakh	720.00	192.00	115.20	69.12	41.47	24.88	14.93	8.96	5.37	3.22	1.93	1.16	0.70	0.42	0.25	0.15	0.09	0.05	0.03	0.02	0.01	0.01	0.00	0.00

Net Depreciation Benefit	Rs Lakh	656.64	128.64	51.84	5.76	-21.89	-38.48	-48.43	-54.40	-57.99	-60.14	-61.43	-62.20	-62.66	-62.94	-63.11	-63.21	-63.27	-2.83	0.03	0.02	0.01	0.01	0.00	0.00	0.00
Tax Benefit	Rs Lakh	191.21	37.46	15.10	1.68	-6.37	-11.20	-14.10	-15.84	-16.89	-17.51	-17.89	-18.11	-18.25	-18.33	-18.38	-18.41	-18.42	-0.82	0.01	0.01	0.00	0.00	0.00	0.00	0.00
Energy generation	MU	1.81	1.81	1.81	1.81	1.81	1.81	1.81	1.81	1.81	1.81	1.81	1.81	1.81	1.81	1.81	1.81	1.81	1.81	1.81	1.81	1.81	1.81	1.81	1.81	1.81
Per unit benefit	Rs/Unit	10.54	2.07	0.83	0.09	-0.35	-0.62	-0.78	-0.87	-0.93	-0.97	-0.99	-1.00	-1.01	-1.01	-1.01	-1.02	-1.02	-0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Discounting Factor		1.00	0.91	0.82	0.75	0.68	0.61	0.56	0.50	0.46	0.41	0.38	0.34	0.31	0.28	0.25	0.23	0.21	0.19	0.17	0.16	0.14	0.13	0.12	0.11	0.10

Levellised benefit	0.90	Rs/Unit
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