# MANIPUR & MIZORAM

# JOINT ELECTRICITY REGULATORY COMMISSION

## Terms and Conditions For Tariff Determination From Renewable Energy Sources – REGULATION 2010 NOTIFICATION Dated 31.05.2010 and JERC Manipur & Mizoram (Terms and Conditions for Tariff determination from Renewable Energy Sources) (First Amendment) Regulations, 2014 Dated 05.08.2014

## Order Dated 05.01.2015

| Sl. No. | Description | Summary | |
|---|---|---|---|
| 1. | **Title** | Terms and Conditions for Tariff Determination from Renewable Energy Sources – Regulation 2010 | |
| 2. | **Order** | JERC Manipur & Mizoram (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2010 Dated 31.05.2010 and JERC Manipur & Mizoram (Terms and Conditions for Tariff determination from Renewable Energy Sources) (First Amendment) Regulations, 2014 Dated 05.08.2014. | |
| 3. | **Control Period** | Five years with first year of the control period as FY 2012-13. The tariff for the RE projects commissioned during the control period shall continue to be applicable for the entire duration of the tariff period | |
| 4. | **Tariff Period** | Tariff period in respect of the RE projects is as under | |
| | | **Renewable Energy Projects** | **Years** |
| | | Wind Energy | 13 |
| | | Small Hydro below 5 MW | 35 |
| | | Small Hydro (5 MW – 25 MW) | 13 |
| | | Biomass | 13 |
| | | Non-fossil fuel co-generation | 13 |
| | | Solar PV and Solar Thermal | 25 |
| | | Biomass Gasifier and Biogas | 20 |
| | | Tariff period to be reckoned from the date of commercial operation | |
| 5. | **Tariff Structure** | Single part tariff consisting of the following fixed cost components:<br>(a) Return on equity;<br>(b) Interest on loan capital;<br>(c) Depreciation;<br>(d) Interest on working capital;<br>(e) Operation and maintenance expenses;<br>For renewable energy technologies having fuel cost component, like biomass power projects and non-fossil fuel based cogeneration, single part tariff with two components, fixed cost component and fuel cost component, is to be determined. | |
| 6. | **Tariff Design** | (1) The generic tariff shall be determined on levellised basis for the Tariff Period.Provided that for renewable energy technologies having single part tariff with two components, tariff shall be determined on levellised basis considering the year of commissioning of the project for fixed cost component while the fuel cost component shall be specified on year of operation basis.<br>(2) For the purpose of levellised tariff computation, the discount factor equivalent to Post Tax weighted average cost of capital shall be considered.<br>(3) Levellisation shall be carried out for the 'useful life' of the Renewable Energy project while Tariff shall be specified for the period equivalent to 'Tariff Period." | |

<table>
<tr><td>7.</td><td>Levellised Tariff</td><td colspan="3">Levellised Tariff is calculated by carrying out levellisation for `useful life' of each technology considering the discount factor for time value of money</td></tr>
<tr><td>8.</td><td>Discount Factor</td><td colspan="3">10.76%</td></tr>
<tr><td>9.</td><td>Capital Cost</td><td colspan="3">The capital cost for the second year (i.e. FY 2014-15) of the control period is summarized as under:
<table>
<tr><th>Renewable Energy Projects</th><th>Capital Cost Norm for FY 2014-15 (Rs. Lakh/MW)</th></tr>
<tr><td>(1) Wind Energy Projects</td><td>603.929</td></tr>
<tr><td>(2) Small Hydro Projects</td><td></td></tr>
<tr><td>(a) Less than 5 MW</td><td>808.739</td></tr>
<tr><td>(b) 5 MW to 25 MW</td><td>735.217</td></tr>
<tr><td>(3) Biomass Power Projects<br>(a) Project [other than rice straw and juliflora (plantation) based project] with water cooled condenser</td><td>544.187</td></tr>
<tr><td>(b) Project [other than rice straw and Juliflora (plantation) based project] with air cooled condenser</td><td>584.497</td></tr>
<tr><td>(c) Rice straw and juliflora (plantation) based</td><td>594.575</td></tr>
<tr><td>(d) Rice straw and juliflora (plantation) based project with air cooled condenser</td><td>634.885</td></tr>
<tr><td>(4) Non-fossil fuel based co-generation Power Project</td><td>440.708</td></tr>
<tr><td></td><td></td></tr>
<tr><td>(5) Solar PV Power Projects</td><td>691.000</td></tr>
<tr><td>(6) Solar Thermal Power Projects</td><td>1200.00</td></tr>
<tr><td>(7) Biomass Gasifier Power Projects</td><td>427.118</td></tr>
<tr><td>(8) Biogas Power Projects</td><td>854.236</td></tr>
</table></td></tr>
<tr><td>10.</td><td>Debt Equity Ratio</td><td colspan="2">70:30</td><td></td></tr>
<tr><td>11.</td><td>Interest On Loan</td><td colspan="3">The loan tenure of 12 years is to be considered for the purpose of determination of tariff for RE projects.<br>(a) The loans arrived at in the manner indicated in the Regulation 13 shall be considered as gross normative loan for calculation for interest on loan. The normative loan outstanding as on April 1st of every year shall be worked out by deducting the cumulative repayment up to March 31st of previous year from the gross normative loan.<br>(b) For the purpose of computation of tariff, the normative interest rate shall be considered as average State Bank of India (SBI) Base rate prevalent during the first six months of the previous year plus 300 basis points.<br>(c) Notwithstanding any moratorium period availed by the generating company, 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".<br>The weighted average State Bank of India (SBI) Base rate prevalent during the first six months has been considered for the determination of tariff, as shown in the table below:
<table>
<tr><td>Period From</td><td>Period To</td><td>Base Rate</td></tr>
<tr><td>1/4/2013</td><td>30/9/2013</td><td>09.70%</td></tr>
<tr><td colspan="2">Average Base rate for first six months of FY 2013-14</td><td>09.70%</td></tr>
<tr><td colspan="3">Source: State Bank of India (www.statebankofindia.com)</td></tr>
</table></td></tr>
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| | | | |
|---|---|---|---|
| **12.** | **Depreciation** | Regulation 15 of the RE Tariff Regulations with its amendment provides for computation of depreciation in the following manner:<br>(1) The value base for the purpose of depreciation shall be the Capital Cost of the asset admitted by the Commission. The Salvage value of the asset shall be considered as 10% and depreciation shall be allowed up to maximum of 90% of the Capital Cost of the asset.<br>(2) Depreciation per annum shall be based on 'Differential Depreciation Approach' over loan period beyond loan tenure over useful life computed on 'Straight Line Method'. 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 13th year onwards.<br>(3) Depreciation shall be chargeable from the first year of commercial operation. Provided that in case of commercial operation of the asset for part of the year, depreciation shall be charged on pro rata basis". | |
| **13.** | **Interest on Working Capital** | (1) The Working Capital requirement in respect of wind energy projects, Small Hydro Power, Solar PV and Solar thermal power projects shall be computed in accordance with the following:<br>**Wind Energy / Small Hydro Power /Solar PV / Solar thermal**<br>(a) Operation & Maintenance expenses for one month;<br>(b) Receivables equivalent to 2 (two) months of energy charges for sale of electricity calculated on the normative CUF;<br>(c) Maintenance spare @ 15% of operation and maintenance expenses<br>(2) The Working Capital requirement in respect of biomass power projects and non-fossil fuel based co-generation projects shall be computed in accordance with the following clause:<br>**Biomass Power and Non- fossil fuel Co-generation**<br>(a) Fuel costs for four months equivalent to normative PLF;<br>(b) Operation & Maintenance expense for one month;<br>(c) Receivables equivalent to 2 (Two) months of fixed and variable charges for sale of electricity calculated on the target PLF;<br>d) Maintenance spare @ 15% of operation and maintenance expenses<br>(3) Interest on Working Capital shall be at interest rate equivalent to the average State Bank of India Base Rate prevalent during the first six months of the previous year plus 350 basis points". | |
| **14.** | **Operation and Maintenance Expenses** | (1) Operation and Maintenance or O&M expenses' shall comprise repair and maintenance (R&M), establishment including employee expenses and administrative & general expenses.<br>(2) Operation and maintenance expenses shall be determined for the Tariff Period based on normative O&M expenses specified by the Commission subsequently in these Regulations for the first Year of Control Period.<br>(3) Normative O&M expenses allowed during first year of the Control Period (i.e. FY 2012-13) under these Regulations shall be escalated at the rate of 5.72% per annum over the Tariff Period". | |
| | | Normative O&M expenses for various RE technologies are : | |
| **a.** | | O&M cost norm for **Wind Energy** –Rs.10.05 Lakh/MW for FY 2014-15. | |
| **b.** | | O&M Expenses for FY 2014-15<br>Small Hydro Power | |
| | | **Project Size** | **O&M Expenses Rs.(Lakh/MW)** |
| | | Below 5 MW | 27.94 |
| | | 5 MW to 25 MW | 20.12 |
| **c.** | **Biomass** | Rs.42.29 Lakh/MW | |
| **d.** | **Non-Fossil Fuel Co-Generation** | Rs.17.89 Lakh/MW | |
| **e.** | **Solar PV** | Rs.12.30 Lakh/MW | |
| **f.** | **Solar Thermal** | Rs.16.77 Lakh/MW | |

| | | | |
|---|---|---|---|
| **g.** | **Biomass Gasifier** | Rs.44.71 Lakh/MW | |
| **15** | **Capacity Utilisation Factor** | **Renewable Energy Projects** | **CUF** |
| | | (A) Wind Energy<br>Annual Mean Wind Power Density ($W/m^2$)<br>Wind zone – 1 (Upto 200)<br>Wind zone – 2 (201 – 250)<br>Wind zone – 3 (251 – 300)<br>Wind zone – 4 (301 – 400)<br>Wind zone – 5 (Above 400) | <br><br>20%<br>22%<br>25%<br>30%<br>32% |
| | | (B) Small Hydro | 45% |
| | | (C) Solar PV | 19% |
| | | (D) Solar Thermal | 23% |
| **16.** | **Plant Load Factor (Plf)** | The Plant Load Factor for Biomass, Biomass Gasifier and Biogas based renewable energy generating stations as given in the table below which has been considered for determination of fixed charges component of tariff. The plant load factor for Non-fossil based co-generation projects has been computed on the basis of plant availability for number of operating days and load factor | |
| | | **Operating days** | **PLF** |
| | | 150 days (crushing) + 60 days (off-season) = 210 days | 53% |
| **17.** | **Auxiliary Power Consumption** | **Renewable Energy Projects** | **Auxiliary Consumption Factor** |
| | | Small Hydro | 1% |
| | | Biomass | |
| | | (a) the project using water cooled condenser | i. During first year of operation : 11%<br>ii. From 2nd year onward : 10% |
| | | (b) project using air cooled condenser | i. During first year of operation : 13%<br>ii. From 2nd year onward : 12% |
| | | Non-fossil fuel co-generation | 8.5% |
| | | Solar Thermal | 10% |
| | | Biomass Gasifier | 10% |
| | | Biogas | 12% |
| **18.** | **Station Heat Rate -Kcal/Kwh** | Biomass: a.- 4200(using travelling grate boilers)<br>b. - 4125(using AFBC boilers)<br>Non-fossil fuel co-generation - 3600 | |
| **19.** | **Fuel Consumption - Kg/Kwh** | Normative specific fuel consumption for Biomass Gasifier based power generating stations - 1.25 kg per kWh | |
| | | Normative specific fuel consumption shall be 3 kg of substrate mix per kWh for Biogas based power generating stations.<br>The use of fossil fuel is not allowed | |
| **20.** | **Calorific Value** | For biomass fuel - 3100 kCal/kg. | |
| | | Gross calorific value for bagasse in case of non-fossil fuel co-generation projects - 2250 kCal/kg<br>For the use of biomass fuels other than bagasse, the calorific value as specified above shall be applicable. | |
| **21.** | **Fuel Cost(Fy 2014-15)** | For biomass fuel – Rs. 2942.54 per tonne;<br>For bagasse ( non-fossil fuel based co-generation projects) - Rs. 1881.27 per tonne;<br>For biogas based power plant – Rs. 1176.54/MT (net of any cost recovery from digester effluent) | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | In case of Biomass Power Projects, non-fossil fuel based co-generation projects, Biomass Gasifier based power Projects and Biogas based power projects, variable component of tariff is calculated based on the fuel cost for FY 2014-15. This variable component will change each year based on whether a Renewable Energy Power Project developer opts for fuel price indexation or escalation factor of 5%. Hence, while calculating the total applicable tariff for Biomass Power Projects, non-fossil fuel based co-generation projects, Biomass Gasifier based power Projects and Biogas based power projects, levellisation of only fixed component is considered and the variable component for the first year of operation (i.e. 2014-15) is specified. | | | | |
| **22.** | **Subsidy or Incentive by the Central / State Government** | The Commission shall take into consideration any incentive or subsidy offered by the Central or State Government, including accelerated depreciation benefit if availed by the generating company, for the renewable energy power plants while determining the tariff under these Regulations. | | | | |
| **23.** | **Generic Tariff for FY 2014-15** | | | | | |
| | **Particular** | **Levellised Total Tariff** | Benefit of Accelerated Depreciation (if availed) | | Net Levellised Tariff (upon adjusting for Accelerated Depreciation benefit (if availed) | |
| | | **WIND ENERGY** | | | | |
| | **Wind Zone-1 (Cuf 20%)** | **6.34** | **0.68** | | **5.66** | |
| | **Wind Zone-2 (Cuf 22%)** | **5.76** | **0.62** | | **5.14** | |
| | **Wind Zone-3 (Cuf 25%)** | **5.07** | **0.55** | | **4.52** | |
| | **Wind Zone-4 (Cuf 30%)** | **4.23** | **0.46** | | **3.77** | |
| | **Wind Zone-5 (Cuf 32%)** | **3.96** | **0.43** | | **3.53** | |
| | | **Small Hydro Power Project** | | | | |
| | **Below 5 MW** | **4.46** | **0.36** | | **4.10** | |
| | **5mw To 25 mw** | **3.80** | **0.33** | | **3.47** | |
| | | **Levellised Fixed Cost** | **Variable Cost (FY 2014-15)** | **Applicable Tariff Rate (FY 2014-15** | **Benefit of Accelerated Depreciation (if availed)** | **Net Levelised Tariff (upon Adjusting for Accelerated Depreciation benefit)(if availed)** |
| | | Rs./kwh) | Rs/kwh | Rs./kwh | Rs./kwh | Rs./kwh |
| | | **Biomass power projects (other than rice straw and juliflora (plantation) based project with water cooled condenser and using travelling grate boiler** | | | | |
| | | 2.94 | 4.48 | 7.42 | 0.17 | 7.25 |
| | | **Bagasse Based Co-generation Project** | | | | |
| | | 2.65 | 3.29 | 5.94 | 0.21 | 5.73 |
| | | **Solar PV and Solar Thermal** | | | | |
| | | **Particular** | **Levellised Total Tariff (FY 2014-15)** | **Benefit of Accelerated Depreciation (if availed)** | **Net Levellised Tariff (upon adjusting for Accelerated Depreciation benefit) (if availed)** | |
| | | | (Rs./kWh) | (Rs./kWh) | (Rs./kWh) | |
| | | Solar PV | 7.72 | 0.77 | 6.95 | |
| | | Solar Thermal | 11.88 | 1.23 | 10.65 | |

| | | Levellised Fixed Cost | Variable Cost (FY 2014-15) | Applicable Tariff Rate (FY 2014-15) | Benefit of Accelerated Depreciation (if availed) | Net Levallised Tariff (upon adjusting for Accelerated Depreciation benefit) (if availed) |
|---|---|---|---|---|---|---|
| | | (Rs./kWh) | (Rs./ kWh) | (Rs./kWh) | (Rs./kWh) | (Rs./kWh) |
| | | **Biomass Gasifier Power Project** | | | | |
| | | 2.47 | 4.09 | 6.55 | 0.13 | 6.42 |
| | | **Biogas based Generation** | | | | |
| | | 3.39 | 4.01 | 7.40 | 0.24 | 7.16 |