# JOINT ELECTRICITY REGULATORY COMMISSION FOR THE STATE OF GOA AND UNION TERRITORIES

## Draft Renewable Energy Tariff Regulations, 2019

_____ **2019**


**JOINT ELECTRICITY REGULATORY COMMISSION**

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# JOINT ELECTRICITY REGULATORY COMMISSION FOR THE STATE OF GOA AND UNION TERRITORIES

## (Draft Renewable Energy Tariff Regulations, 2019)

Dated: ____, 2019

## NOTIFICATION

In exercise of the powers conferred under Sub-section (1) of Section 181 read with Clauses (zd), (ze) and (zf) of the Electricity Act, 2003 (Act No. 36 of 2003) (hereinafter referred to as 'the Act'), and all other powers enabling it in this behalf including sub-ordinate legislation, rules, statutory orders, resolutions, clarifications issued by the Government in terms of the Act, the Joint Electricity Regulatory Commission for the State of Goa and Union Territories (UTs) hereby makes the following Regulations, namely:

### 1 Short Title, Scope, Extent and Commencement

1.1 These Regulations may be called the Joint Electricity Regulatory Commission (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2019 [hereinafter referred to as "Renewable Energy Tariff Regulations, 2019".

1.2 These Regulations shall extend to the State of Goa and the Union Territories of Andaman and Nicobar Islands, Chandigarh, Dadra & Nagar Haveli, Daman & Diu, Lakshadweep, and Puducherry.

1.3 These Regulations shall come into force on the date of the notification Regulations.

### 2 Definitions and Interpretations

2.1 Words, terms and expressions defined in the Electricity Act, 2003, as amended from time to time and used in the Renewable Energy Tariff Regulations, 2019 shall have and carry the same meaning as defined and assigned in the said Act.

2.2 All other expressions used herein but not specifically defined in the Act or Regulations but defined under any other law passed by a competent legislature and applicable to the electricity industry in the State of Goa and UTs shall have the meaning assigned to them in such law. Subject to the above, expressions used herein but not specifically defined in the Act or any other law passed by a

competent legislature shall have the meaning as is generally assigned in the electricity industry.

2.3 In the interpretation of this Renewable Energy Tariff Regulations, 2019, unless the context otherwise requires:

(1) Words in the singular or plural term, as the case may be, shall also be deemed to include the plural or the singular term, respectively;

(2) References to any statutes, Regulations or guidelines shall be construed as including all statutory provisions consolidating, amending or replacing such statutes, Regulations or guidelines, as the case may be, referred to;

(3) Terms "include" or "including" shall be deemed to be followed by "without limitation" or "but not limited to" regardless of whether such terms are followed by such phrases or words of like import.

2.4 In the Renewable Energy Tariff Regulations, 2019, unless it is repugnant to the context:

(1) **"Act**" means the Electricity Act, 2003 (36 of 2003) and subsequent amendments thereof;

(2) **"Auxiliary energy consumption"** or "**AUX"** in relation to a period in case of a generating station means the quantum of energy consumed by auxiliary equipment of the generating station, and transformer losses within the generating station, expressed as a percentage of the sum of gross energy generated at the generator terminals of all the units of the generating station;

(3) **"Biomass"** means wastes produced during agricultural and forestry operations (for example straws and stalks) or produced as a by-product of processing operations of agricultural produce (e.g., husks, shells, de-oiled cakes, etc); wood produced in dedicated energy plantations or recovered from wild bushes/weeds; and the wood waste produced in some industrial operations;

(4) **"Biomass gasification"** means a process of incomplete combustion of biomass resulting in production of combustible gases consisting of a mixture of Carbon monoxide (CO), Hydrogen ($H_2$) and traces of Methane ($CH_4$), which is called producer gas;

(5) **"Biogas"** means a gas created when organic matter like crop residues, sewage and manure breaks down in an oxygen-free environment (ferments);

(6) **"Capital cost"** means the capital cost as defined in Regulations 13, 26, 30, 35, 40, 45, 54, 62 and 68 (of the applicable technology);

(7) **"Capacity Utilisation Factor** (CUF in abbreviation)" means the ratio of actual gross energy generated by the project to the equivalent energy output at its rated capacity over the year;

(8) **"CERC" or "Central Commission"** means the Central Electricity Regulatory Commission;

(9) **"Check Meter"** means a meter, which shall be connected to the same core of the current transformer (CT) and voltage transformer (VT) to which main meter is connected and shall be used for accounting and billing of electricity in case of failure of main meter;

(10) **"COD" or "Commercial Operation Date"** or "Date of commercial operation" means the date on which the generating plant is synchronised with the grid system;

(11) **"Cold Plasma gasification**" is an extreme thermal process using plasma, which converts organic matter into a syngas (synthesis gas) primarily made up of hydrogen and carbon monoxide. A plasma torch powered by an electric arc is used to ionize gas and catalyse organic matter into syngas, with slag remaining as a by-product. It is used commercially as a form of waste treatment and has been tested for the gasification of municipal solid waste, biomass, industrial waste, hazardous waste, and solid hydrocarbons, such as coal, oil sands, pet-coke and oil shale.

(12) "**Commission**" means the Joint Electricity Regulatory Commission for the State of Goa and Union Territories (except Delhi);

(13) **"Conduct of Business Regulations"** means Joint Electricity Regulatory Commission (Conduct of Business) Regulations, 2009, as amended from time to time;

(14) **"Control Period" or "Review Period"** means the period during which the norms for determination of tariff specified in these Regulations shall remain in force and are subject to review after the Control Period (except Capital Cost and Statutory Changes);

(15) **"Contracted load**" or "**Contract demand**" means the maximum demand in kW, kVA or HP, agreed to be supplied by the Licensee and indicated in the agreement executed between the Licensee and the consumer;

(16) **"Distribution Company/ Distribution Licensee (Discom in brief)"** means a person granted a Licence under Section 14 (b) of the Act authorizing him to operate and maintain a distribution system and supply electricity to the consumers in its area of supply

(17) **"Energy Purchase Agreement"** means an agreement executed

between the Distribution Licensee and the Project Developer for procurement of power from Renewable Energy Projects in accordance with the provisions of these Regulations;

(18) **"Existing Renewable Energy Plants"**, means renewable generating stations, which have achieved COD prior to coming into force of these Regulations;

(19) **"Gross Calorific Value"** or 'GCV' in relation to a fuel used in generating station means the heat produced in kilocalories by complete combustion of one kilogram of solid fuel or one litre of liquid fuel or one standard cubic meter of gaseous fuel, as the case may be;

(20) **"Gross Station Heat Rate"** or 'SHR' means the heat energy input in kilocalories required to generate one kilowatt-hour (kWh) of electrical energy at generator terminals of a thermal generating station;

(21) **"High Tension (HT)"** means a voltage level above 440 Volts;

(22) **"Installed capacity'** or 'IC' means the summation of the name plate capacities of all the units of the generating station or the capacity of the generating station (reckoned at the generator terminals), approved by the Commission from time to time;

(23) "**Inter-connection Point'** shall mean interface point of renewable energy generating facility with the transmission system or distribution system, as the case may be:

i. in relation to wind energy projects and solar photovoltaic projects, inter-connection point shall be line isolator on outgoing feeder on HV side of the pooling sub-station;

ii. in relation to small hydro power, biomass power and solar thermal power projects, the inter-connection point shall be line isolator on outgoing feeder on HV side of generator transformer;

(24) **"Island area"** means Andaman and Nicobar Islands and Lakshadweep under the jurisdiction of the Commission;

(25) "**Licence**" means a licence granted under Section 14 of the Act;

(26) "**Low Tension (LT)**" means the voltage of 230 volts between the phase and neutral or 440 volts between any two phases under normal conditions subject to the percentage variation permissible from time to time;

(27) **"Mainland area**" means all areas other than Island areas falling under the jurisdiction of the Commission;

(28) "**Maximum Demand**" means the highest load measured in average

kVA or kW at the point of supply of a consumer during any consecutive period of 30 (thirty) minutes time block or as provided by the Commission, during the billing period;

(29) "**MNRE"** means the Ministry of New and Renewable Energy of the Government of India;

(30) "**Municipal Solid Waste"** or "**MSW"** means and includes commercial and residential wastes generated in a municipal or notified areas in either solid or semi-solid form excluding industrial hazardous wastes but including treated bio-medical wastes;

(31) "**Operation and Maintenance expenses"** or 'O&M expenses' means the expenditure incurred on operation and maintenance of the project, and includes the expenditure on manpower, repairs, spares, consumables, insurance and overheads;

(32) **"Plant Load Factor or (PLF)"** in relation to a generating station for a given period means the total sent out energy corresponding to scheduled generation during the period, expressed as a percentage of sent out energy corresponding to installed capacity in that period and shall be computed in accordance with the following formula:

$$PLF = 10000 \times \sum_{}^{N} SG_i / \{N \times IC \times (l00\text{-}AUX_n)\}\%,$$

Where,

IC = Installed Capacity of the generating station or unit in MW,

$SG_i$ = Scheduled Generation in MWh for the $i^{th}$ time block of the period,

N = Number of time blocks during the period, and

$AUX_n$ = Normative Auxiliary Energy Consumption as a percentage of gross energy generation;

(33) **"Project"** means a generating station or the evacuation system up to inter-connection point, as the case may be, and in case of a small hydro generating station includes all components of generating facility such as dam, intake water conductor system, power generating station and generating units of the scheme, as apportioned to power generation;

(34) "**Refuse derived fuel"** or 'RDF' means segregated combustible fraction of solid waste other than chlorinated plastics in the form of pellets or fluff produced by drying, de-stoning, shredding, dehydrating, and compacting combustible components of municipal solid waste that can be used as fuel;

(35) "**Renewable Energy" or "RE"** means the grid quality electricity

generated from renewable energy sources;

(36) "**Renewable Energy Power Plants"** means the power plants other than the conventional power plants generating grid quality electricity from renewable energy sources;

(37) "**Renewable Energy Sources"** means renewable sources such as small hydro, wind, solar including its integration with combined cycle, biomass, bio fuel cogeneration, urban or municipal waste and other such sources as approved by the MNRE;

(38) **"Small Hydro"** means Hydro Power projects with a station capacity up to and including 25 MW;

(39) **"Solar PV power"** means the Solar Photo Voltaic power project that uses sunlight for direct conversion into electricity through Photo Voltaic;

(40) "**Solar Thermal power"** means the Solar Thermal power project that uses sunlight for direct conversion into electricity through Concentrated Solar Power technology based on either line focus or point focus principle;

(41) "**Tariff period"** means the period for which tariff is to be determined by the Commission on the basis of norms specified under these Regulations;

(42) "**Tariff Order**" in respect of a Licensee means the last order in force issued by the Commission for that Licensee indicating the tariff to be charged by the Licensee from various categories of consumers for supply of electricity;

Explanation: Any Distribution Licensee, Transmission Licensee and generating Units connected to the distribution system and the person availing open access in transmission or distribution system are also included in this term;

(43) "**Tidal Power**" means the Tidal power projects, which use the energy obtained from tidal waves to generate electricity;

(44) **"Useful Life"** in relation to a unit of a generating station including evacuation system shall mean the following duration from the date of commercial operation (COD) of such generation facility, namely: -

| | | |
|---|---|---|
| a) | Wind energy power project | 25 years |
| b) | Biomass power project with Rankine cycle technology | 20 years |
| c) | Small Hydro Plant | 35 years |

| | | |
|---|---|---|
| d) | Municipal Solid Waste (MSW)/ and Refuse Derived Fuel (RDF) based power project | 20 years |
| e) | Solar PV/Solar thermal power project<br>With or without Energy Storage | 25 years |
| f) | Hybrid Wind and Solar | 25 years |
| g) | Biomass Gasifier based power project | 20 years |
| h) | Biogas based power project | 20 years; |

(45) "**Year"** means a financial year.

2.5 Save as aforesaid and unless repugnant to the context or if the subject matter otherwise requires, words and expressions used in these Regulations and not defined hereunder, but defined in the Act, or other Regulations issued by the Commission shall have the meanings assigned to them respectively in the Act or any other Regulations issued by the Commission.

## 3 Scope and Extent of Application

3.1 These Regulations shall apply in all cases where tariff for power generating station or a unit thereof commissioned during the Control Period and based on renewable sources of energy, is to be determined by the Commission under Section 62 read with Section 86 of the Act.

3.2 Provided that in cases of Wind, Small Hydro project, Biomass power based on Rankine cycle, Solar PV with or without energy storage, Solar Thermal power projects, Biomass gasifier, Biogas power project, Municipal Solid Waste, Refuse derived fuel-based power projects, Cold Plasma Gasification projects and Tidal Wave power projects, these Regulations shall apply subject to the fulfilment of eligibility criteria specified in Regulation 4 of these Regulations.

## 4 Eligibility Criteria

(1) **Wind power project** – using new wind turbine generators, located at the sites approved by State Nodal Agency/State Government;

(2) **Small hydro project** – located at the sites approved by State Nodal Agency/ State Government using new plant and machinery, and installed power plant capacity to be lower than or equal to 25 MW at single location;

(3) **Solar PV and Solar Thermal Power Project** – Based on technologies approved by MNRE;

(4) **Biomass Gasifier based Power Project** – The project shall qualify to be

termed as a biomass gasifier-based power project, if it is using new plant and machinery and having a Grid connected system that uses 100% producer gas engine, coupled with gasifier technologies approved by MNRE;

(5) **Biomass power project based on Rankine cycle technology**- Biomass power projects using new plant and machinery based on Rankine cycle technology and using biomass fuel sources, without use of fossil fuel;

(6) **Biogas based Power Project** – The project shall qualify to be termed as a biogas-based power project, if it is using new plant and machinery and having grid connected system that uses 100% Biogas fired engine, coupled with Biogas technology for co-digesting agriculture residues, manure and any other biowaste as may be approved by MNRE;

(7) **Municipal Solid Waste (MSW) based power projects** – The project shall qualify to be termed as a Municipal Solid Waste (MSW) based power project if it is using new plant and machinery based on Rankine cycle technology and using Municipal Solid Waste (MSW) as fuel sources;

(8) **Refuse derived fuel (RDF) based power projects** – The project shall qualify to be termed as a Refuse derived fuel (RDF) based power project, if it is using new plant and machinery based on Rankine cycle technology and using Refuse derived fuel (RDF) as fuel sources;

(9) **Cold Plasma Gasification based Power projects**- The project shall qualify to be termed as “Cold Plasma Gasification based power project” if it is using new plant and machinery based on the cold plasma gasification technology and it is used commercially as a form of waste treatment and has been tested for the gasification of municipal solid waste, biomass, industrial waste, hazardous waste and solid hydrocarbons, such as coal, oil sands, pet coke and oil shale.

(10) **Tidal wave power projects** – The project shall qualify to be termed as Tidal wave power projects, which uses the energy obtained from tidal waves to generate electricity.

## 5 Control Period

5.1 The Control Period or Review Period under these Regulations shall be of three (3) years starting from the date of the notification of these Regulations, of which the first year shall be the financial year 2019-20 and the last year shall be the financial year 2021-22:

Provided that the tariff determined as per these Regulations for the RE projects commissioned during the Control Period, shall continue to be applicable for the entire duration of the Tariff Period as specified in Regulation 6 below:

Provided further that the revision in Regulations for the next Control Period shall be undertaken prior to the end of the first Control Period and in case Regulations for the next Control Period are not notified until commencement of next Control Period, the tariff norms as per these Regulations shall continue to remain applicable until notification of the revised Regulations subject to adjustments as per revised Regulations.

## 6 Tariff Period

6.1 The Tariff Period for Renewable Energy power projects will be as per their Useful Life as defined in Regulation 2.4 (43).

6.2 Tariff Period under these Regulations shall be considered from the date of commercial operation of the respective Renewable Energy generating plants.

6.3 Tariff determined as per these Regulations shall be applicable for Renewable Energy power projects for the entire duration of the Tariff Period as stipulated under Clause (6.1) and (6.2).

## 7 Generic Tariff

7.1 The Generic Tariff shall be determined by the Commission in accordance with these Regulations for the following types of projects:

(1) Solar PV (for Gross Metering);

(2) Wind Energy based projects;

(3) Small hydro based projects:

Provided that, in case of special circumstances, the Project Developer may approach the Commission for determination of Project Specific Tariff for above types of projects:

Provided further that the Generic Tariff determined by the Commission through a Generic Tariff Order shall be excluding the impact of Capital Subsidy:

Provided also that in case any Project under the above types of Projects avails Government Subsidy, the Project Developer shall approach the Commission for determination of Project Specific Tariff:

Provided also that Financial and Operational norms except Capital Cost, O&M Expenses and Capacity Utilisation Factor or Plant Load Factor (as applicable) as specified in these Regulations would be the ceiling norms while determining the Project Specific Tariff.

## 8 Project Specific Tariff

8.1 Project Specific Tariff, on case to case basis, shall be determined by the Commission for the following types of projects:

(1) Solar Thermal;

(2) Biomass Power Projects based on Rankine cycle Technology;

(3) Biomass Gasifier based projects;

(4) Biogas based projects;

(5) Municipal Solid Waste, Refuse Derived Fuel based projects with Rankine cycle technology and cold plasma gasification as approved by MNRE;

(6) Tidal power projects;

(7) Solar PV with battery (Hybrid or Stand-alone)

(8) Solar and Wind Hybrid

(9) Any other Renewable Energy technology as approved by MNRE.

(10) As per third proviso of Regulation 7.1 seeking Government subsidy.

8.2 Determination of Project specific tariff for generation of electricity from such Renewable Energy sources shall be in accordance with such terms and conditions as stipulated under relevant Orders of the Commission:

8.3 No annual generic tariff shall be determined for the technologies mentioned in Clause 8.1 of this Regulation:

Provided that the Financial and Operational norms as may be specified in these Regulations would be the ceiling norms suitably adjusted for subsidy amount (if any), while determining the Project Specific Tariff.

## 9 Petition and proceedings for determination of tariff

9.1 The Commission shall determine the generic tariff at the beginning of each year

of the Control Period for Renewable Energy technologies mentioned at Regulation 7 for projects to be commissioned in that year.

9.2 A Petition for determination of Project Specific Tariff shall be filed by the Project developer and shall be accompanied by:

9.2.1 Information in Forms 1.1, 1.2, 2.1 and 2.2 as applicable, and as appended in these Regulations;

9.2.2 Fees for filing the Petition, as applicable;

9.2.3 Detailed project report outlining the following:

a) technical and operational details;

b) site specific aspects;

c) premise for capital cost and financing plan, etc.;

d) A statement of all applicable terms and conditions;

e) expected expenditure for the period for which tariff is to be determined;

f) A statement containing full details of calculation of any subsidy and incentive received, due or assumed to be due from the Central Government and/or State Government / Administration;

g) the proposed tariff calculated without consideration of the subsidy and incentive (with working in iterative excel format).

9.2.4 The consent from Distribution Licensee to procure power at tariff approved by the Commission in the form of Initialled Energy Purchase Agreement (EPA), Memorandum of Understanding (MoU) or letter from the Distribution Licensee of the area.

9.2.5 Any other information that the Commission requires from the Petitioner to submit.

9.2.6 The proceedings for determination of tariff shall be in accordance with the JERC (Conduct of Business) Regulations, 2009 as amended from time to time.

## 10 Procurement of Power from Renewable Energy Projects

10.1 For Renewable Energy Technologies, for which Generic Tariff is determined by the Commission, the Distribution Licensee may procure power from such projects either at the Generic Tariff approved by the Commission or through the competitive bidding process:

Provided that in case the Distribution Licensee opts to procure power from any Renewable Energy Project(s) set up within their licensed area at the Generic Tariff for 1 MW and above approved by the Commission, the Distribution

Licensee shall file the Petition for prior approval of Energy Purchase Agreement for procurement of power from such Renewable Energy Project(s);

Provided further that in case the Distribution Licensee opts to procure power from Renewable Energy Projects through competitive bidding process, the Generic Tariff determined by the Commission shall act as a ceiling tariff and for such procurement of power, the Distribution Licensee shall file the Petition for adoption of tariff under Section 63 of the Act.

10.2 For Renewable Energy Projects, for which the Project Specific Tariff is determined by the Commission, the Distribution Licensee shall file the Petition for prior approval of Energy Purchase Agreement for procurement of power from such Renewable Energy Project(s):

Provided that in case the Project Developer and Distribution Licensee opt to file the Petition for approval of EPA and determination of tariff, the Project Developer and Distribution Licensee shall file Joint Petition in this regard.

10.3 The Distribution Licensee shall comply with all the statutory and regulatory provisions for procurement of power from Renewable Energy Projects, as applicable from time to time.

10.4 All Renewable Energy power plants shall be treated as 'Must Run' power plants and procurement of power by Distribution Licensee from such power plants shall not be subjected to 'Merit Order Despatch' principles.

Provided that the Renewable Energy Power Plant with installed capacity of 5 MW and above shall be required to furnish to Distribution Licensee a month-wise schedule. The Renewable Energy Power Plant shall also co-ordinate with State Load Dispatch Centre in respect to Optimum scheduling and dispatch of electricity as per provisions of the State Grid Code.

## 11 Tariff Structure

11.1 The tariff for Renewable Energy technologies shall be single-part tariff consisting of the following fixed cost components:

a) Operation and maintenance expenses;

b) Interest on loan capital;

c) Depreciation;

d) Interest on working capital;

e) Return on equity:

Provided that for Renewable Energy technologies like biomass power projects having fuel cost component, single-part tariff with two components, fixed cost component and fuel cost component, shall be determined.

## 12 Tariff Design

12.1 The generic tariff shall be determined considering the year of commissioning of the project, on levelized basis for the Tariff Period:

Provided that for Renewable Energy technologies having single-part tariff with two components, tariff shall be determined on levelized basis considering the year of commissioning of the project for fixed cost component while the fuel cost component shall be determined on the basis of year of operation.

12.2 For the purpose of levelized tariff computation, the discount factor equivalent to Post Tax weighted average cost of capital shall be considered.

12.3 Levelization shall be carried out for the 'useful life' of the Renewable Energy project.

12.4 The above principles shall also apply for project specific tariff.

## Chapter-2: FINANCIAL PRINCIPLES

### 13 Capital Cost

13.1 The norms for Capital Cost as specified in the subsequent technology specific Chapters shall be inclusive of all capital works including plant and machinery, transportation cost, civil work, erection and commissioning, financing and interest during construction, and evacuation infrastructure up to inter-connection point:

Provided that for project specific tariff determination, the generating company shall submit the break-up of Capital Cost items along with its Petition in the manner specified under Regulation 9.

### 14 Debt Equity Ratio

14.1 For the purpose of determination of tariff, the following provisions shall apply:

a) Debt Equity ratio of 70:30 shall be considered:

Provided that if the equity actually deployed is less than 30% (thirty percent) the actual equity shall be considered, and if the equity actually deployed is more than 30 % (thirty percent) of the capital cost, equity in excess of 30 % (thirty percent) shall be treated as normative loan:

Provided further that the equity invested and loan drawn in foreign currency shall be designated in Indian Rupees on the date of each investment, using the selling rates notified by the Reserve Bank of India on the date of such investment.

b) The Commission shall take into consideration any capital grant or subsidy offered by the Central or State Government or any other agency, while determining the tariff under these Regulations.

### 15 Loan and Finance Charges

15.1 **Loan Tenure**

For the purpose of determination of tariff, a loan tenure of 12 years shall be considered.

15.2 **Interest Rate**

a) The loans arrived at in the manner indicated in Regulation 14 shall be considered as gross normative loan for calculation for interest on loan.

b) 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.

c) For the purpose of computation of tariff for Renewable Energy Projects in Mainland Areas, normative interest rate as mentioned in the Table below shall be considered.

**Table: Normative Interest Rate**

| Particulars | Interest Rates |
|---|---|
| Mainland | SBI MCLR (One-year tenor) prevalent during the last available six months + 200 basis points |
| Island | SBI MCLR (One-year tenor) prevalent during the last available six months + 300 basis points |

d) 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.

## 16 Depreciation

16.1 The value base for the purpose of depreciation shall be the Capital Cost of the asset admitted by the Commission.

16.2 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.

16.3 Depreciation rate of 5.83% per annum shall be considered for first 12 years and remaining depreciation shall be spread during remaining useful life of the RE projects considering the salvage value of the project as 10% of project cost.

16.4 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.

## 17 Return on Equity

17.1 The value base for the equity shall be 30% of the capital cost or actual equity (in case of project specific tariff determination) as determined under Regulation 14.

17.2 The normative Return on Equity shall be:

a) 14% for Renewable Energy Projects in Mainland areas;

b) 16% for Renewable Energy Projects in Island areas;

to be grossed up by prevailing Minimum Alternate Tax (MAT) rate as on 1st April of available year at the time of determination of tariff for the entire useful life of the project.

## 18 Interest on Working Capital

18.1 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:

a) Operation & Maintenance expenses for one month;

b) Receivables equivalent to 2 (Two) months of energy charges for sale of electricity calculated on the normative Capacity Utilisation Factor (CUF / PLF) as applicable;

c) Maintenance spares @ 15% of Operation and Maintenance expenses.

18.2 The Working Capital requirement in respect of Biomass power projects with Rankine Cycle technology, Biogas, Biomass Gasifier based power projects, Municipal Solid Waste and Refuse Derived Fuel projects, and Cold plasma projects shall be computed in accordance with the following clause:

a) Fuel costs of four months for normative Plant Load Factor (PLF);

b) Operation & Maintenance expense for one month;

c) Receivables equivalent to 2 (Two) months of fixed and variable charges for sale of electricity calculated on the target PLF;

d) Maintenance spares @ 15% of annual Operation and Maintenance expenses.

18.3 Normative Rate of Interest on Working Capital shall be considered as follows:

**Table: Normative Working Capital Interest Rate**

| Particulars | Interest Rates |
|---|---|
| Mainland | State Bank of India MCLR (One-Year Tenor) prevalent during the last available six months + 300 basis points |
| Island | State Bank of India MCLR (One-Year Tenor) prevalent during the last available six months + 400 basis points |

## 19 Calculation of CUF/PLF:

19.1 The number of hours for calculation of CUF/PLF (wherever applicable) for various RE technologies shall be 8760.

## 20 Operation and Maintenance Expenses

20.1 ‘Operation and Maintenance’ or O&M expenses shall comprise of repair and maintenance (R&M), establishment including employee expenses, and administrative and general (A&G) expenses.

20.2 O&M expenses shall be determined for the Tariff Period based on normative O&M expenses as specified by the Commission subsequently in these Regulations for the first Year of Control Period.

20.3 Normative O&M expenses allowed during first year of the Control Period (i.e. FY 2019-20) under these Regulations shall be escalated at average inflation factor of previous three years considering 60% weightage for the actual point to point inflation over Wholesale Price Index numbers as per Office of Economic Advisor, Ministry of Commerce and Industry, Government of India and 40% weightage for the actual Consumer Price Index for Industrial Workers (all India) as per Labour Bureau, Government of India in the previous three years.

## 21 Rebate

21.1 For payment of bills to the generating company through letter of credit, a rebate of 2% shall be allowed.

21.2 Where payments are made by any mode other than through letter of credit within a period of one month of presentation of bills by the generating company, a rebate of 1% shall be allowed.

## 22 Late payment surcharge

22.1 In case the payment of any bill payable under these Regulations is delayed beyond a period of 60 days from the date of receipt of bill, a late payment surcharge at the rate of 1.25% per month shall be levied by the generating company.

## 23 Sharing of CDM Benefits

23.1 The proceeds of the carbon credit (if any) from approved CDM project shall be shared between generating company and concerned distribution company buying renewable power in the following manner, namely, 100% of the gross proceeds on account of CDM benefit to be retained by the project developer in the first year after the date of commercial operation of the generating station;

23.2 In the second year, the share of the distribution company shall be 10%, which shall be progressively increased by 10% every year till it reaches 50%, where after the proceeds shall be shared in equal proportion, by the generating company and the distribution company.

## 24 Subsidy or incentive by the Central / State Government

24.1 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:

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

i. Assessment of benefit shall be based on normative Capital Cost, accelerated depreciation rate as per relevant provisions under Income Tax Act and corporate Income Tax rate;

ii. Capitalization of RE project during second half of the fiscal year;

iii. Per unit benefit shall be derived on levelized basis at discount factor equivalent to weighted average cost of capital.

## 25 Taxes and Duties

25.1 Tariff determined under these Regulations shall be exclusive of taxes and duties as may be levied by the appropriate Government / Administration:

Provided that the taxes and duties levied by the appropriate Government / Administration shall be allowed as pass through on actual incurred basis.

## Chapter-3: Technology specific parameters for Wind Energy

### 26 Capital Cost

26.1 The Capital Cost for Wind Energy Projects shall comprise of the cost of the Wind Turbine Generator including its auxiliaries, land cost, site development charges and other civil works, charges for transportation to site, evacuation cost up to inter-connection point, financing charges and Interest during Construction, and capital investment relating to forecasting and scheduling.

26.2 The Capital Cost for Wind Energy Projects shall be as follows:

a) Mainland area: Rs. 5.25 Crore/MW;

b) Island areas (Andaman & Nicobar): Rs. 6.25 Crore/MW;

c) Island areas (Lakshadweep): Rs. 7.00 Crore/MW;

### 27 Capacity Utilisation Factor (CUF)

27.1 The Capacity Utilisation Factor (CUF) norm for Wind Energy Projects for this Control Period shall be as follows:

| | |
|---|---|
| Goa | 18% |
| Andaman & Nicobar Islands | 18% |
| Puducherry | 21% |
| Lakshadweep | 20% |
| Daman | 19% |
| Chandigarh | 18% |
| Dadra & Nagar Haveli | 18% |
| Diu | 26% |

### 28 Operation and Maintenance (O & M) Expenses

28.1 The normative O&M Expenses for the first year of the Control Period, i.e., FY 2019-20 shall be:

a) 1.5% of the Capital Cost for Wind Energy Projects in Mainland areas;

b) 2% of the Capital Cost for Wind Energy Projects in Island areas.

28.2 The normative O&M expenses for subsequent years shall be derived in accordance with the escalation mechanism specified at Regulation 20.3.

### 29 Auxiliary Consumption

29.1 Normative Auxiliary Consumption for the Wind Energy Projects shall be 0.25%.

## Chapter 4: Technology specific parameters for Small Hydro Project

### 30 Capital Cost

30.1 The normative Capital Cost for small hydro projects shall be as follows:

Projects in Mainland Areas:

a. Below 5 MW: Rs. 7.79 Cr/MW,
b. 5 MW to 25 MW: Rs. 7.07 Cr/MW

Projects in Island Areas:

a. Below 5 MW: Rs. 10.50 Cr/MW,
b. 5 MW to 25 MW: Rs. 9.00Cr/MW

30.2 The Capital Cost specified above will remain valid for the entire duration of the Control Period unless reviewed earlier by the Commission.

### 31 Capacity Utilisation Factor

31.1 CUF for Small Hydel Projects shall be 30%.

.

### 32 Auxiliary Consumption

32.1 Normative Auxiliary Consumption for small hydro projects shall be 1.0%.

### 33 Operation and Maintenance Expenses

33.1 The normative O&M Expenses for the first year of the Control Period, i.e., FY 2019-20 shall be:

a) 2% of the Capital Cost for Small Hydel Projects in Mainland areas;

b) 2.5% of the Capital Cost for Projects in Island areas.

33.2 The normative O&M expenses for subsequent years shall be derived in accordance with the escalation mechanism specified at Regulation 20.3.

# Chapter 5: Technology specific parameters for Solar PV Power Project (for Gross metering)

## 34 Technology Aspects

34.1 Norms for Solar Photovoltaic (PV) power projects under these Regulations shall be applicable for grid connected PV systems that directly convert solar energy into electricity and are based on technologies such as crystalline silicon or thin film, etc., as may be approved by MNRE.

## 35 Capital Cost

35.1 The normative Capital Cost for Solar PV projects shall be as follows:

a) Solar PV Projects in Mainland Areas: Rs. 5.00 Cr/MW (without capital Subsidy);

b) Solar PV Projects in Island Areas: Rs. 6.00 Cr/MW (without capital Subsidy).

35.2 The Capital Cost specified above will remain valid for the entire duration of the Control Period unless reviewed earlier by the Commission.

## 36 Capacity Utilization Factor

36.1 The Capacity Utilization Factor (CUF) for solar PV Projects shall be as shown below:

| State / Union Territory | CUF % |
|---|---|
| **Puducherry** | 18% |
| **Dadra & Nagar Haveli** | 18% |
| **Lakshadweep** | 17% |
| **Andaman & Nicobar Islands** | 17% |
| **Daman** | 18% |
| **Diu** | 18% |
| **Chandigarh** | 17% |
| **Goa** | 18% |

Provided that the Commission may deviate from the norm in case of project specific tariff determination in accordance with Regulations 9.

## 37 Operation and Maintenance Expenses

37.1 The normative O&M expenses for the first year of the Control Period, i.e., FY 2019-20, shall be:

a) 1.5% of Capital Cost for first year, for Solar PV Projects in Mainland Areas;

b) 2.0% of Capital Cost for first year, for Solar PV Projects in Island Areas.

37.2 The normative O&M expenses for subsequent years shall be derived in accordance with the escalation mechanism specified at Regulation 20.3.

## 38 Auxiliary Consumption

38.1 The auxiliary consumption factor shall be 0.25% of the gross generation:

Provided that the Commission may deviate from the above norm in case of project specific tariff determination in accordance with Regulation 9.

## Chapter 6: Technology specific parameters for Solar Thermal Power Project

### 39 Technology Aspects

39.1 Norms for Solar Thermal Power Projects under these Regulations shall be applicable for Concentrated Solar Power (CSP) technologies, viz., line focusing or point focusing, as may be approved by MNRE, and using direct sunlight, concentrating it several times to reach higher energy densities and thus, higher temperatures whereby the heat generated is used to operate a conventional power cycle to generate electricity.

### 40 Capital Cost

40.1 The Commission shall determine only project specific Capital Cost and tariff based on prevailing market trends for Solar Thermal Power project prevailing at the time of filing Petition for Tariff Determination.

### 41 Capacity Utilisation Factor

41.1 The CUF for Solar Thermal Power project shall be determined by the Commission, while approving project specific tariff.

### 42 Operation and Maintenance Expenses

42.1 The Commission shall determine project specific O&M expenses based on prevailing market trends for Solar Thermal Power project.

### 43 Auxiliary Consumption

43.1 The auxiliary consumption factor shall be 10% of gross normative generation.

# Chapter 7: Technology specific parameters for Biomass Power Projects based on Rankine Cycle Technology

## 44 Technology Aspect

44.1 The norms for tariff determination specified hereunder are for Biomass Power projects based on Rankine cycle technology application using air-cooled or water-cooled condenser.

## 45 Capital Cost

45.1 The Commission shall determine project specific Capital Cost and tariff for Biomass Power Projects on the Petition filed by Project Developer.

## 46 Plant Load Factor

46.1 Threshold PLF for determining fixed charge component of Tariff shall be:

a) During 1st year: 70%;

b) From 2nd Year onwards: 80%.

## 47 Auxiliary Consumption

47.1 The auxiliary power consumption factor shall be as follows:-

a) For the project using water cooled condenser:

i. During first year of operation: 11%

ii. From 2nd year onwards: 10%

b) For the project using air cooled condenser:

i. During first year of operation: 13%

ii. From 2nd year onwards: 12%

## 48 Station Heat Rate

48.1 The Station Heat Rate for Biomass Power projects shall be:

a) For projects using travelling grate boilers: 4200 kcal/kWh;

b) For projects using Atmospheric Fluidised Bed Combustion (AFBC) boilers: 4125 kcal/ kWh.

## 49 Operation and Maintenance Expenses

49.1 The normative O&M expenses for the first year of the Control Period, i.e., FY 2019-20 shall be 5% of the capital cost for first year.

49.2 The normative O&M expenses for subsequent years shall be derived in accordance with the escalation mechanism specified at Regulation 20.3.

## 50 Fuel Mix

50.1 The Biomass Power plant shall be designed in such a way that it uses different types of non-fossil fuels available within the vicinity of the Biomass Power project such as crop residues, agro-industrial residues, forest residues, etc., and other biomass fuels as may be approved by MNRE.

50.2 The Biomass Power Generating Companies shall ensure fuel management plan to ensure adequate availability of fuel to meet the respective project requirements.

50.3 The Fuel Price and Calorific Value of Fuel shall be approved by the Commission based on the Petition filed for Project Specific Tariff considering the type of fuel proposed to be used in the Project.

50.4 Biomass fuel price at the time of determination of tariff may be approved by the Commission based on an independent study if required, to be carried out by constituting a State/ UT level committee consisting of representatives of State/UT Nodal Agency, State Government, Distribution Licensees, biomass power producers association and any other organization.

## 51 Use of Fossil Fuel

51.1 The use of fossil fuels shall not be considered.

## 52 Monitoring Mechanism for the use of fossil fuel

52.1 The Project Developer shall furnish a monthly fuel usage statement and monthly fuel procurement statement duly certified by Chartered Accountant/Cost Accountant to the beneficiary (with a copy to appropriate agency appointed by the Commission for the purpose of monitoring the fossil and non-fossil fuel consumption) for each month, along with the monthly energy bill.

52.2 Non-compliance with the condition of fossil fuel usage by the Project Developer during any financial year, shall result in withdrawal of applicability of tariff as per these Regulations for such Biomass Power project.

**53 Revenue Generation from the By-product:**

Any revenue that is generated from the by products like fertilizers or charcoal shall also be considered while determining the Tariff.

# Chapter 8: Technology specific parameters for Biomass Gasifier Power Projects

## 54 Technology Aspect

54.1 The norms for tariff determination specified hereunder are for Biomass Gasifier Power projects.

## 55 Capital Cost

55.1 The Commission shall determine only project specific capital cost and tariff based on prevailing market trends for Biomass Gasifier Power project based on the Petition filed by Project Developer.

## 56 Plant Load Factor

56.1 Threshold PLF for determining fixed charge component of tariff shall be 85%.

## 57 Auxiliary Consumption

57.1 The auxiliary power consumption factor shall be 10% for the determination of tariff.

## 58 Operation and Maintenance Expenses

58.1 The Commission shall determine project specific O&M expenses based on prevailing market trends for Biomass Gasifier Power Projects.

## 59 Fuel Mix

59.1 The Biomass Gasifier Power plant shall be designed in such a way that it uses different types of non-fossil fuels available within the vicinity of biomass power project such as crop residues, agro-industrial residues, forest residues, etc., and other biomass fuels as may be approved by MNRE.

59.2 The Biomass Gasifier based Power Generating Companies shall ensure fuel management plan to ensure adequate availability of fuel to meet the respective project requirements.

59.3 The Fuel Price and Calorific Value of Fuel shall be approved by the Commission based on the Petition filed for Project Specific Tariff considering the type of fuel proposed to be used in the Project.

59.4 Biomass fuel price at the time of determination of tariff may be approved by the Commission based on an independent study if required, to be carried out by constituting a State/ UT level committee consisting of representatives of State/UT Nodal Agency, State Government, Distribution Licensees, biomass power producers association and any other organization.

## 60 Use of Fossil Fuel

60.1 The use of fossil fuels shall not be considered.

## 61 Monitoring Mechanism for the use of fossil fuel

61.1 The Project Developer shall furnish a monthly fuel usage statement and monthly fuel procurement statement duly certified by Chartered Accountant/Cost Accountant the beneficiary (with a copy to appropriate agency appointed by the Commission for the purpose of monitoring the fossil and non-fossil fuel consumption) for each month, along with the monthly energy bill.

61.2 Non-compliance with the condition of fossil fuel usage by the Project Developer during any financial year, shall result in withdrawal of applicability of tariff as per these Regulations for such Biomass Power project.

## 62 Revenue Generation from the By-product:

Any revenue that is generated from the by products like fertilizers or charcoal shall also be considered while determining the Tariff.

# Chapter 9: Technology specific parameters for Biogas based Power Projects

## 63 Technology Aspect

63.1 The norms for tariff determination specified hereunder are for grid connected biogas-based power projects that use 100% Biogas fired engine, coupled with Biogas technology for co-digesting agriculture residues, manure and other bio-waste as may be approved by MNRE.

## 64 Capital Cost

64.1 The Commission shall determine only project specific Capital Cost and tariff based on prevailing market trends for Biogas based project.

## 65 Plant Load Factor

65.1 Threshold PLF for determining fixed charge component of Tariff shall be 90%.

## 66 Auxiliary Consumption

66.1 The auxiliary power consumption factor shall be 12% for the determination of tariff.

## 67 Operation and Maintenance Expenses

67.1 The Commission shall determine project specific O&M expenses based on prevailing market trends for Biogas based Power Projects.

## 68 Fuel Cost (Feed stock Price)

68.1 The Fuel Price and Calorific Value of Fuel shall be approved by the Commission based on the Petition filed for Project Specific Tariff considering the type of fuel proposed to be used in the Project.

68.2 Biomass fuel price at the time of determination of tariff may be approved by the Commission based on an independent study if required, to be carried out by constituting a State/ UT level committee consisting of representatives of State/UT Nodal Agency, State Government, Distribution Licensees, biomass power producers association and any other organization.

## Chapter 10: Technology specific parameters for Power Projects using Municipal Solid Waste/Refuse Derived Fuel and based on Rankine cycle technology

### 69 Technology Aspect

69.1 The norms for tariff determination specified hereunder are for power projects which use Municipal Solid Waste (MSW) and refuse derived fuel (RDF) and are based on Rankine cycle technology application, combustion or incineration, Bio-methanation, Pyrolysis and High-end gasifier technologies.

### 70 Capital Cost

70.1 The Commission shall determine only project specific Capital Cost and tariff based on prevailing market trends for MSW and RDF projects.

### 71 Plant Load Factor

71.1 Threshold PLF for determining fixed charge component of tariff for the power projects which use MSW and RDF, shall be:

| Sl. No. | PLF | MSW | RDF |
|---|---|---|---|
| 1 | First year | 70% | 65% |
| 2 | From 2nd year onwards | | 80% |

### 72 Auxiliary Consumption

72.1 The auxiliary power consumption for MSW / RDF based power projects shall be 15%.

### 73 Station Heat Rate

73.1 The Station Heat Rate for MSW/RDF based power projects shall be approved by the Commission while determining the Project Specific tariff.

### 74 Operation and Maintenance Expenses

74.1 The normative O&M expenses for the first year of the Control Period, i.e., FY 2019-20 shall be 5% of Capital Cost for first year for Mainland Areas and 6% of Capital Cost for first year for Island Areas.

74.2 The normative O&M expenses for subsequent years shall be derived in accordance with the escalation mechanism specified at Regulation 20.3.

## 75 Fuel Cost and Calorific Value

75.1 The Fuel Price and Calorific Value of Fuel shall be approved by the Commission based on the Petition filed for Project Specific Tariff considering the type of fuel proposed to be used in the Project.

## Chapter 11: Miscellaneous

### 76 Deviation from norms

76.1 Tariff for sale of electricity generated from a generating plant based on Renewable Energy sources, may also be agreed between a generating company and a licensee, in deviation from the norms specified in these Regulations subject to the conditions that the levelized tariff over the useful life of the project on the basis of the norms in deviation does not exceed the levelized tariff calculated on the basis of the norms specified in these Regulations.

### 77 Power to Relax

77.1 The Commission may by general or special order, for reasons to be recorded in writing, and after giving an opportunity of hearing to the Parties likely to be affected, may relax any of the provisions of these Regulations on its own motion or on an application made before it by an interested person.

### 78 Power to Remove Difficulties

78.1 In case of any difficulty arising while giving effect to the provisions of these Regulations, the Commission may either suo-motu or on a Petition, by an order, make such provisions not inconsistent with the provisions of the Act as may appear to be necessary for removing the difficulty..

### 79 Repeal and Savings

79.1 Save as otherwise provided in this Renewable Energy Tariff, Regulations, 2019, JERC (Grid Connected Ground Mounted and Solar Rooftop and Metering) Regulations, 2015, together with amendments made from time to time, are hereby repealed.

### 80 Power to amend

80.1 The Commission may at any time add, vary, alter, suspend, modify, amend or repeal any of the provisions of these Regulations.

(Rakesh Kumar)

Secretary

## ANNEXURES

### Form-1.1: Template for (Wind/ small hydro/Solar PV/ Solar Thermal)

| Sl. No. | Assumption Head | Sub-head | Sub-head (2) | Unit | Parameter |
|---|---|---|---|---|---|
| 1 | Power Generation | Capacity | Installed Power Generation | MW | |
| | | | Capacity | % | |
| | | | Capacity Utilization Factor (CUF) | % | |
| | | | Commercial Operation Date (COD) | dd/mm/yyyy | |
| | | | Useful Life | Years | |
| 2 | Project Cost | Capital Cost/ MW | Normative Capital Cost | Rs. Crore | |
| | | | Capital Cost | Rs. Crore /MW | |
| | | | Capital Subsidy, if any | Rs. Crore | |
| | | | Net Capital Cost | Rs. Crore | |
| 3 | Financial Assumption | Debt Equity | Tariff Period | years | |
| | | | Debt | % | |
| | | | Equity | % | |
| | | Debt Component | Total debt amount | Rs. Crore | |
| | | | Total equity amount | Rs. Crore | |
| | | | Loan Amount | Rs. Crore | |
| | | | Moratorium Period | Years | |
| | | | Repayment Period (incl moratorium) | Years | |
| | | | Interest Rate | % | |
| | | Equity Component | Equity Amount | Rs. Crore | |
| | | | RoE for 1st 10 years | % p.a. | |
| | | | RoE 11th year onwards | % p.a. | |
| | | | Discount Rate | % | |
| | | Depreciation | Dep Rate for 1st 12 years | % | |
| | | | Dep rate 13th year onwards | % | |
| | | Incentives | GBI, if any | Rs. Crore | |
| | | | Period for GBI | Years | |
| 4 | O& M Expenses | Normative O&M Expenses p.a. | | Rs. Crore | |
| | | O&M Expenses p.a. | | Rs. Crore | |
| | | Escalation Factor | | % | |
| 5 | Working Capital | O&M Expenses | % of O&M Expenses | Month | |
| | | Maintenance Spares | | % | |
| | | Receivables | | Month | |
| | | Interest on WC | | % | |

## Form-1.2: Template for (Biomass/MSW/RDF)

| Sl. No. | Assumption Head | Sub-head | Sub-head (2) | Unit | Parameter |
|---|---|---|---|---|---|
| 1 | Power Generation | Capacity | Installed Power Generation | MW | |
| | | | Aux Consumption | % | |
| | | | PLF (1st year) | % | |
| | | | PLF (2nd year onwards) | % | |
| | | | COD | dd/mm/yyyy | |
| | | | Useful Life | Years | |
| 2 | Project Cost | Capital Cost/ MW | Normative Capital Cost | Rs. Crore | |
| | | | Capital Cost | Rs. Crore /MW | |
| | | | Capital Subsidy, if any | Rs. Crore | |
| | | | Net Capital Cost | Rs. Crore | |
| 3 | Financial Assumption | Debt Equity | Tariff Period | years | |
| | | | Debt | % | |
| | | | Equity | % | |
| | | Debt Component | Total debt amount | Rs. Crore | |
| | | | Total equity amount | Rs. Crore | |
| | | | Loan Amount | Rs. Crore | |
| | | | Moratorium Period | Years | |
| | | | Repayment Period (including moratorium) | Years | |
| | | | Interest Rate | % | |
| | | Equity Component | Equity Amount | Rs. Crore | |
| | | | RoE for 1st 10 years | % p.a. | |
| | | | RoE 11th year onwards | % p.a. | |
| | | | Discount Rate | % | |
| | | Depreciation | Dep Rate for 1st 12 years | % | |
| | | | Dep rate 13th year onwards | % | |
| | | Incentives | GBI, if any | Rs. Crore | |
| | | | Period for GBI | Years | |
| 4 | O&M Expenses | Normative O&M Expenses | | Rs. Crore | |
| | | O&M Expenses p.a. | | Rs. Crore | |
| | | Escalation Factor | | % | |
| 5 | Working Capital | O&M Expenses | % of O&M Expenses | Month | |
| | | Maintenance Spares | | % | |
| | | Receivables | | Month | |
| | | Interest on WC | | % | |
| 6 | Fuel Related assumptions | Station Heat Rate | During 1 st year | kcal/kWh | |

| Sl. No. | Assumption Head | Sub-head | Sub-head (2) | Unit | Parameter |
|---|---|---|---|---|---|
| | | | 2nd year onwards | kcal/kWh | |
| | | Fuel Type and mix | Fuel Type-1 | % | |
| | | | Fuel Type-2 | % | |
| | | | MSW | % | |
| | | | RDF | % | |
| | | | Fossil Fuel (Coal) | % | |
| | | | GCV of Fuel Type-1 | kcal/kWh | |
| | | | GCV of Fuel Type-2 | kcal/kWh | |
| | | | GCV of MSW | kcal/kWh | |
| | | | GCV of RDF | kcal/kWh | |
| | | | GCV of Fossil Fuel (Coal) | kcal/kWh | |
| | | | Biomass Price (Fuel Type-1)/ Yr 1 | Rs./MT | |
| | | | Biomass Price (Fuel Type-2)/ Yr 1 | Rs./MT | |
| | | | MSW Price/ Yr 1 | Rs./MT | |
| | | | RDF Price/ Yr 1 | Rs./MT | |
| | | | Fossil Fuel (Coal) Price)/ Yr 1 | Rs./MT | |
| | | | Fuel Price Escalation Factor | % p.a. | |

## Form-2.1: Template for (Wind/ small hydro/Solar PV/Solar Thermal): Determination of Tariff Components – Yearwise upto Useful Life

| **Units Generation** | **Unit** | **Yr 1** | **Yr 2** | **Yr 3** | **Yr 4** | ,,,, | ,,,, | ,,, | ,,,, | ,,,, |
|---|---|---|---|---|---|---|---|---|---|---|
| Installed Capacity | MW | | | | | | | | | |
| Net Generation | MU | | | | | | | | | |
| **Tariff Components (Fixed charges)** | | | | | | | | | | |
| O&M Expenses | Rs. Crore | | | | | | | | | |
| Depreciation | Rs. Crore | | | | | | | | | |
| Interest on Loan | Rs. Crore | | | | | | | | | |
| Interest on working capital | Rs. Crore | | | | | | | | | |
| Return on Equity | Rs. Crore | | | | | | | | | |
| **Total Fixed Cost** | Rs. Crore | | | | | | | | | |
| **Per Unit Tariff Components** | | | | | | | | | | |
| Per Unit O&M Expenses | Rs./kWh | | | | | | | | | |
| Per Unit Int on term loan | Rs./kWh | | | | | | | | | |
| Per unit interest on working capital | Rs./kWh | | | | | | | | | |
| Per unit RoE | Rs./kWh | | | | | | | | | |
| **Per Unit Tariff Components** | Rs./kWh | | | | | | | | | |
| **Levilised Tariff** | | | | | | | | | | |
| Discount Factors | | | | | | | | | | |
| Discount Tariff Components | Rs./kWh | | | | | | | | | |
| Levilized Tariff | Rs/kWh | | | | | | | | | |

## Form-2.2: Template for (Biomass/ MSW/RDF): Determination of Tariff Components-– Yearwise upto Useful Life

| **Units Generation** | **Unit** | **Yr 1** | **Yr 2** | **Yr 3** | **Yr 4** | **,,,,** | **,,,,** | **,,,** | **,,,,** | **,,,,** |
|---|---|---|---|---|---|---|---|---|---|---|
| Installed Capacity | MW | | | | | | | | | |
| Net Generation | MU | | | | | | | | | |
| **Tariff Components (Fixed charges)** | | | | | | | | | | |
| O&M Expenses | Rs. Crore | | | | | | | | | |
| Depreciation | Rs. Crore | | | | | | | | | |
| Interest on Loan | Rs. Crore | | | | | | | | | |
| Interest on working capital | Rs. Crore | | | | | | | | | |
| Return on Equity | Rs. Crore | | | | | | | | | |
| **Total Fixed Cost** | Rs. Crore | | | | | | | | | |
| **Tariff Components (Fixed)** | | | | | | | | | | |
| Per Unit O&M Expenses | Rs./kWh | | | | | | | | | |
| Per Unit Int on term loan | Rs./kWh | | | | | | | | | |
| Per unit interest on working capital | Rs./kWh | | | | | | | | | |
| Per unit RoE | Rs./kWh | | | | | | | | | |
| **Per Unit Tariff Components** | Rs./kWh | | | | | | | | | |
| **Tariff Components (Variable)** | | | | | | | | | | |
| Fuel Type-1 | Rs Crore | | | | | | | | | |
| Fuel Type-2 | Rs Crore | | | | | | | | | |
| Fossil Fuel (Coal) | Rs Crore | | | | | | | | | |
| Municipal Solid Waste | Rs Crore | | | | | | | | | |
| Refuse Derived Fuel | Rs Crore | | | | | | | | | |
| Sub-Total (Fuel Costs) | Rs Crore | | | | | | | | | |

| **Units Generation** | **Unit** | **Yr 1** | **Yr 2** | **Yr 3** | **Yr 4** | **,,,,** | **,,,,** | **,,,** | **,,,,** | **,,,,** |
|---|---|---|---|---|---|---|---|---|---|---|
| Fuel Cost allowable to power | Rs Crore | | | | | | | | | |
| **Total Fuel Costs** | **Rs Crore** | | | | | | | | | |

| **Levilised Tariff** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Discount Factors | | | | | | | | | | |
| Discount Tariff Components (Fixed) | Rs./kWh | | | | | | | | | |
| Discount Tariff Components (Variable) | Rs./kWh | | | | | | | | | |
| Discount Tariff Components (Total) | Rs./kWh | | | | | | | | | |
| Levilized Tariff (Fixed) | Rs./kWh | | | | | | | | | |
| Levilized Tariff (Variable) | Rs./kWh | | | | | | | | | |
| Levilized Tariff (Total) | Rs./kWh | | | | | | | | | |

# JOINT ELECTRICITY REGULATORY COMMISSION FOR THE STATE OF GOA AND UNION TERRITORIES

## Explanatory Memorandum

## For

## Draft Renewable Energy Tariff Regulations, 2019

**____ 2019**

JOINT ELECTRICITY REGULATORY COMMISSION

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## 1 INTRODUCTION

1.1 In exercise of the powers conferred under Sub-section (1) of Section 181 read with Clauses (zd), (ze) and (zf) of the Electricity Act, 2003 (Act No. 36 of 2003) (hereinafter referred to as 'the Act'), the Joint Electricity Regulatory Commission (for the State of Goa and Union Territories) [hereinafter referred to as "Commission" or "JERC"] has issued the Draft Joint Electricity Regulatory Commission (for the State of Goa and Union Territories) (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2019 [hereinafter referred to as "Renewable Energy Tariff Regulations, 2019"] for inviting comments/suggestions from stakeholders .

1.2 This Explanatory Memorandum is being issued with the intent of explaining the rationale and objectives behind Draft Renewable Energy Tariff Regulations, 2019.

## 2 BACKGROUND

2.1 With the enactment of the Electricity Act, 2003 and launch of the National Action Plan on Climate Change (NAPCC), the Renewable Energy (RE) development has assumed significant importance. Further, the Tariff Policy, notified by the Government of India in January 2016 also reiterates the importance of RE generation and consequent benefits for the country. The key extracts of the Tariff Policy are as under: -

*"6.4(1) Pursuant to provisions of section 86(1)(e) of the Act, the Appropriate Commission shall fix a minimum percentage of the total consumption of electricity in the area of a distribution licensee for purchase of energy from renewable energy sources, taking into account availability of such resources and its impact on retail tariffs. Cost of purchase of renewable energy shall be taken into account while determining tariff by SERCs*

*.....*

*6.4 (2) 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. While determining the tariff from such sources, the Appropriate Commission shall take into account the solar radiation and wind intensity which may differ from area to area to ensure that the benefits are passed on to the consumers."*

2.2 The Govt. of India has set an ambitious target of 175 GW of RE capacity by FY 2021-22. The competition in the sector has increased recently, especially in the solar power segment, where tariffs reached a record low of Rs 2.44 per unit in December 2017 and the same level was reached again in September 2018. The large integrated players are in a better position with higher returns compared to the smaller developers. The RE space has become very attractive from investors' perspective and has received FDI inflow of US$ 6.84 billion between April 2000 and June 2018. More than US$ 42 billion has been invested in India's RE sector since 2014.

2.3 A total of 7103.28 MW of RE capacity was added in India during FY 2018-19, taking the cumulative installed RE capacity to 76.87 GW as on February, 2019, comprising 35.32 GW from Wind power, 27.09 GW from Solar Power, 9.92 GW from Bio Power and 4.54 GW from Small Hydro Power. Further, projects of capacity of 58.77 GW are under implementation or already bid out[1].

2.4 The current installed capacity of renewables in States and Union Territories under the jurisdiction of JERC are as shown under: -

**Table 1: Current Installed Capacity of Renewable Energy**

| Particulars | As on Jan' 2019 (in MW) | | | | | |
|---|---|---|---|---|---|---|
| | Small Hydro Power | Wind Power | Waste to Energy | Ground Mounted Solar | Roof Top Solar | Total |
| Goa | 0.05 | - | - | 0.95 | 0.74 | **1.74** |
| Andaman & Nicobar | 5.25 | - | - | 5.10 | 1.46 | **11.81** |
| Chandigarh | - | - | - | 6.34 | 26.06 | **32.40** |
| Dadar & Nagar Haveli | - | - | - | 2.49 | 2.97 | **5.46** |
| Daman & Diu | - | - | - | 10.15 | 4.32 | **14.47** |
| Lakshadweep | - | - | - | 0.75 | - | **0.75** |
| Puducherry | - | - | - | 0.03 | 1.77 | **1.80** |
| **Total** | **5.30** | **-** | **-** | **25.81** | **37.32** | **68.43** |

[2]Source: MNRE

## 3 Renewable Energy Policies

3.1 In the State and Union Territories under JERC, i.e., Goa, Andaman & Nicobar islands, Dadra & Nagar Haveli and Puducherry, various RE Policies have been issued, namely Goa State Solar Policy, 2017, Policy for power generation through new and RE sources in Andaman & Nicobar islands, Policy for development and deployment of RE power generation for Daman & Diu, Policy for development and deployment of RE power generation for Dadra and Nagar Haveli, to promote renewable technologies.

[1] Source: Monthly summary for Cabinet for the month of February, 2019

[2] https://mnre.gov.in/sites/default/files/uploads/State.xlsx

3.2 The Proposed RE regulations takes into account the existing regulatory and policy framework of the States and Union Territories under JERC. The multiple objectives of efficient and economic development of Renewable Energy, fairness to investors, choice of developer for disposal of power, interest of consumers, utility interests, ease of operational and implementation simplicity, competition, continuity, etc. needs to be addressed appropriately in a harmonious manner. The Commission has carefully tried to balance all such aspects while preparing these draft Renewable Energy Tariff Regulations, 2019.

3.3 The subsequent paragraphs lay down the rationale behind drafting of the JERC Renewable Energy Tariff Regulations, 2019.

## 4 Scope of RE Tariff Regulations

4.1 These Regulations shall be applicable in respectof Wind Power Projects, Small Hydro Power Projects, Biomass Power Projects based on Rankine cycle, Solar PV Power Projects, Solar Thermal Power Projects, Biomass Gasifier Power Projects, Biogas Power Projects, Municipal Solid Waste Power Projects, Refuse Derived Fuel based Power Projects, Cold Plasma Gasification based projects, Tidal Power Project and other emerging Renewable Energy technologies.

## 5 Eligibility Criteria

5.1 The tariff determined under these Regulations shall be applicable in respect of RE technologies meeting specific Eligibility Criteria. The Commission for the purpose of setting the eligibility criteria for various Stakeholders has considered CERC Renewable Energy Tariff Regulations, 2017. It is to be noted that the Central Electricity Regulatory Commission (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2017 [hereinafter referred to as "CERC RE Tariff Regulations, 2017"] are a guiding factor for the State Electricity Regulatory Commissions (SERCs) in terms of Section 61(a) of the Act and Para 6.4 (3) of the Tariff Policy, 2016, which empower the Commission to lay down the guidelines for pricing of non-firm RE power. Further, in addition to RE Technologies mentioned in the CERC RE Tariff Regulations, the Commission has also considered the new emerging RE Technologies including hybrid of technologies.

5.2 Accordingly, this Commission has proposed the eligibility criteria in Regulation 4 of the Draft JERC Renewable Energy Tariff Regulations, 2019, as follows: -

" ……..

*(1)* ***Wind power project*** *– using new wind turbine generators, located at the sites approved by State Nodal Agency/State Government;*

*(2)* ***Small hydro project*** *– located at the sites approved by State Nodal Agency/ State Government using new plant and machinery, and installed power plant capacity to be lower than or equal to 25 MW at single location;*

(3) ***Solar PV and Solar Thermal Power Project*** *– Based on technologies approved by MNRE;*

(4) ***Biomass Gasifier based Power Project*** *– The project shall qualify to be termed as a biomass gasifier-based power project, if it is using new plant and machinery and having a Grid connected system that uses 100% producer gas engine, coupled with gasifier technologies approved by MNRE;*

(5) ***Biomass power project based on Rankine cycle technology*** *- Biomass power projects using new plant and machinery based on Rankine cycle technology and using biomass fuel sources, without use of fossil fuel;*

(6) ***Biogas based Power Project*** *– The project shall qualify to be termed as a biogas-based power project, if it is using new plant and machinery and having grid connected system that uses 100% Biogas fired engine, coupled with Biogas technology for co-digesting agriculture residues, manure and any other biowaste as may be approved by MNRE;*

(7) ***Municipal Solid Waste (MSW) based power projects*** *– The project shall qualify to be termed as a Municipal Solid Waste (MSW) based power project if it is using new plant and machinery based on Rankine cycle technology and using Municipal Solid Waste (MSW) as fuel sources;*

(8) ***Refuse derived fuel (RDF) based power projects*** *– The project shall qualify to be termed as a Refuse derived fuel (RDF) based power project, if it is using new plant and machinery based on Rankine cycle technology and using Refuse derived fuel (RDF) as fuel sources;*

(9) ***Cold Plasma Gasification based Power projects****- The project shall qualify to be termed as "Cold Plasma Gasification based power project" if it is using new plant and machinery based on the cold plasma gasification technology and it is used commercially as a form of waste treatment and has been tested for the gasification of municipal solid waste, biomass, industrial waste, hazardous waste and solid hydrocarbons, such as coal, oil sands, pet coke and oil shale.*

(10) ***Tidal wave power projects*** *– The project shall qualify to be termed as Tidal wave power projects, which uses the energy obtained from tidal waves to generate electricity."*

## 6 Approach for Development of Tariff Norms

6.1 While determining the tariff norms, the following approaches have been considered:

a) Detailed Analysis of the Regulations/ Orders notified and issued by the CERC and various SERCs such as Haryana, Maharashtra, Gujarat, Haryana, Madhya Pradesh, Karnataka and Tamil Nadu to analyze the approaches considered in determining the norms for tariff for a specific RE Technology.

b) Solar Radiation and Wind Speed Information for all the Territories to specify the Capacity Utilization Factor (CUF) for Solar PV Power Projects and Wind Power Projects.

c) PLF for Biomass projects/ Hydel Project as per CERC benchmark norms.

6.2 The tariff norms have been categorized broadly under three sections, namely, General Principles, Financial Principles, and Technology Specific Principles. The Explanatory Memorandum has been divided into the following sections:

a) General Principles

b) Financial Principles

c) Technology specific Principles: Wind Energy

d) Technology specific Principles: Small Hydro Power

e) Technology specific Principles: Solar PV

f) Technology specific Principles: Solar Thermal

g) Technology specific Principles: Biomass based generation with Rankine Cycle technology

h) Technology specific Principles: Biomass Gasifier based power generation

i) Technology specific Principles: Biogas based power generation

j) Technology specific Principles: Municipal Solid Waste based power generation based on Rankine Cycle technology

k) Technology specific Principles: Refuse derived fuel-based power generation based on Rankine Cycle technology.

6.3 The comprehensive approach adopted for development of norms for the purpose of tariff determination in respect of various RE technologies has been presented below and the same has been elaborated under subsequent sections.

## 7 General Principles

7.1 Under this section, the general principles for RE tariff determination such as Control Period, Tariff Period, Tariff Structure, Tariff Design, Tariff Review Mechanism, etc., have been covered.

## 8 Control Period

8.1 The Commission has reviewed the "Control Period" specified in RE Tariff Regulations by other SERCs, as shown under: -

**Table 2: Control Period Specified by Other SERCs**

| States | Duration of Control Period |
|---|---|
| CERC / PSERC | Three (3) years |
| MERC | Five (5) years |
| RERC | Five (5) years |
| HERC | Four (4) years |
| TNERC | Two (2) years |

8.2 From the above Table, it can be seen that, the Control Period specified by SERCs ranges between 2 to 5 years. Further, in order to specify the same, the Commission has considered the maturity level of non-solar technologies.

8.3 The maturity level of solar technologies has grown significantly. In addition, majority of the capacity addition through Solar PV technology and recent Wind capacity addition have come through the competitive bidding route. Moreover, utilization of the competitive bidding route for other RE technologies is on the anvil. Further, the reducing prices of equipment and discovery of lower tariff regimes through competitive bidding needs to be considered while specifying the Control Period.

8.4 Considering the long-term certainty of regulatory principles and in order to avoid a situation where the validity of underlying tariff parameters is questioned, the Commission has proposed to keep the Control Period of three (3) years, i.e., FY 2019-20 to FY 2021-22, in line with CERC RE Tariff Regulations, 2017.

8.5 The tariff determined for the RE projects commissioned during the Control Period, shall continue to be applicable for the entire duration of the Tariff Period.

8.6 The Commission has also proposed that the revision in Regulations for next Control Period would be undertaken prior to the end of the present Control Period and in case Regulations for the next Control Period are not notified until commencement of next Control Period, the tariff norms as per these Regulations shall continue to remain applicable until the notification of the revised Regulations, subject to adjustments as per revised Regulations.

## 9 Tariff Period

9.1 It is specified that the Tariff Period for Wind, Solar PV and Solar Thermal shall be 25 years, and for Biomass with Rankine cycle technology, Municipal Solid Waste, Refuse Derived Fuel, Biomass Gasifier Project, Biogas projects and Cold Plasma Projects, Tariff Period shall be 20 years, and for small hydro and tidal energy, the Tariff Period shall be 35 years. The same Tariff Period has been specified by various other ERCs like CERC, MERC, HERC, MERC, MPERC, KERC and TNERC.

## 10 Tariff Design

10.1 The Commission has analyzed the "Tariff Design" approach in Regulations of CERC and other SERCs. The Commission observed that CERC as well as other SERCs such as MERC, HERC, GERC, MPERC, RERC, KERC and TNERC follow the principle of levelized tariff over the useful life of RE Project instead of year-wise tariff.

10.2 Further, CERC Order dated 21.03.2019 in Case No. 1/SM/2019 explains the methodology of computation of discount factor as shown under: -

> *"……*
>
> *Accordingly, the discount factor considered for this exercise is equal to the post tax, weighted average cost of capital on the basis of normative debt: equity ratio (70:30) specified in the Regulations. Considering the normative debt equity ratio and weighted average of the post-tax rates for debt and equity component, the discount factor is calculated. Interest Rate considered for the loan component (i.e.70 %) of capital cost is 10.41 %. For equity component (i.e. 30 %), rate of Return on Equity (ROE) is considered at post tax rate of 14 %. The discount factor derived by this method for all technologies is 9.36 % ((10.41% x 0.70 x (1 – 29.12%)) + (14.0% x0.30)) (Income tax rate @ 29.12% (25% IT rate+ 12% surcharge +4% Health and Education cess)."*

10.3 The Commission is also of the view that instead of giving year-wise tariff, it would be more appropriate to determine the levelized tariff for useful life of the RE project, with appropriate discount rate for present value of the revenue representing weighted average cost of capital, on the basis of normative debt-equity ratio as specified in the Regulations.

10.4 Accordingly, the Commission in Regulation 12.2 of the Draft JERC Renewable Energy Tariff Regulations, 2019, has proposed as under:

> "*……..*
>
> *12.2 For the purpose of levelized tariff computation, the discount factor equivalent to Post Tax weighted average cost of capital shall be considered.*
>
> *12.3 Levelization shall be carried out for the 'useful life' of the Renewable Energy project."*

10.5 Accordingly, the proposed discount rate for present value of the revenue for renewable energy tariff determination shall be the post-tax Weighted Average Cost of Capital (WACC) as shown under:

Post Tax WACC = Cost of Debt + Cost of Equity

Where,

Cost of Debt = Normative Debt x (Normative Rate of Interest) x (1-Corporate Tax Rate)

Cost of Equity= Normative Equity x (Post Tax Return on Equity)

## 11 Tariff Determination

11.1 The CERC/ SERC adopt Generic Tariff or Project Specific Tariff for determination of tariff for various Renewable Technologies. Generic Tariff is determined considering the year of commissioning of the project, on levelized basis for the Tariff Period. Further, the generic tariff acts as the deemed ceiling tariff for the specified technology, for the purposes of competitive bidding.

11.2 In the State and UTs under JERC, it is observed that there is a potential for solar power projects and wind power projects in almost all territories, and other RE Technologies have potential in some territories depending upon the local conditions.

11.3 Accordingly, the Commission has adopted an approach of generic tariff determination for Solar PV, Small hydro and Wind, which have the maximum potential for development in the State of Goa and UTs. In case of any special circumstances even for these RE technologies, the Project Developer may approach the Commission for determination of Project Specific Tariff for above types of projects. Generic Tariff determined by the Commission through a Generic Tariff Order shall be excluding the impact of Capital Subsidy. In case any Project under the above profile of Projects avails Government Subsidy, the Project Developer shall approach the Commission for determination of Project Specific Tariff

11.4 In the absence of significant RE capacity for solar thermal, biomass, biogas, MSW/RDF, etc., in the State of Goa and UTs, there is no base to specify the norms of capital cost, fuel price and GCV. Hence, the Commission proposes project specific tariff on case-to-case basis for the following projects types:

(1) Solar Thermal;

(2) Biomass Power Projects based on Rankine cycle Technology;

(3) Biomass Gasifier based projects;

(4) Biogas based projects;

(5) Municipal Solid Waste and Refuse Derived Fuel based projects with Rankine cycle technology and cold plasma gasification as approved by MNRE;

(6) Tidal power projects;

(7) Solar PV with battery (Hybrid or Stand-alone);

(8) Solar and Wind Hybrid;

(9) Cold Plasma or Any other RE technology as approved by MNRE.

11.5 However, if any financial norms are specified by the Commission for project-specific tariff, the same shall be the ceiling norms for the particular component.

11.6 The Commission has also proposed the procedure for filing the Petition for determination of project specific tariff under Regulation 9 of the Draft Renewable Tariff Regulations, 2019, as shown under: -

" …….

*9.2 A Petition for determination of Project Specific Tariff shall be filed by the Project developer and shall be accompanied by:*

*9.2.1 Information in Forms 1.1, 1.2, 2.1 and 2.2 as the case may be, and as appended in these Regulations;*

*9.2.2 Fees for filing the Petition, as applicable;*

*9.2.3 Detailed project report outlining the following:*

*a) technical and operational details;*

*b) site specific aspects;*

*c) premise for capital cost and financing plan, etc.;*

*d) A statement of all applicable terms and conditions;*

*e) expected expenditure for the period for which tariff is to be determined;*

*f) A statement containing full details of calculation of any subsidy and incentive received, due or assumed to be due from the Central Government and/or State Government;*

*g) the proposed tariff calculated without consideration of the subsidy and incentive (with working in iterative excel format).*

*9.2.4 The consent from Distribution Licensee to procure power at tariff approved by the Commission in the form of Initialled Energy Purchase Agreement (EPA), Memorandum of Understanding (MoU) or letter from Distribution Licensee of the area.*

*9.2.5 Any other information that the Commission requires the Petitioner to submit.*

*9.2.6 The proceedings for determination of tariff shall be in accordance with the JERC (Conduct of Business) Regulations, 2009 as amended from time to time."*

## 12 Procurement of Power from Renewable Energy Projects

12.1 In most of the States, the procurement of RE, mainly solar and wind, is being done through competitive bidding. However, owing to the varied geography of the States and UTs under JERC, it is difficult for the project developers to set up the generating stations at competitive prices. In the mainland, the major source of RE is solar technology. The potential for other sources of RE is yet to be harnessed. The power Generation in the islands is predominantly from diesel generating plants, which are very costly and polluting. Physical isolation of the islands also increases the associated costs for the developer. Accordingly, the Commission is of the view that in order to encourage the growth of RE sources in the State of Goa and UTs, the procurement of power from RE sources needs to be permitted under both the options, i.e., at generic tariff and / or specific tariff determined by the Commission or through the competitive bidding route.

12.2 Accordingly, the Commission in Regulation 10 of the Draft Renewable Energy Tariff Regulations, 2019 has proposed the methodology for procurement of power from RE sources as shown under:

> *"10 Procurement of Power from Renewable Energy Projects*
>
> *10.1 For Renewable Energy Technologies, for which the Generic Tariff is determined by the Commission, the Distribution Licensee may procure power from such projects either at the Generic Tariff approved by the Commission or through the competitive bidding process:*
>
> *Provided that in case the Distribution Licensee opts to procure power from any Renewable Energy Project(s) set up within their licensed area at the Generic Tariff for 1 MW and above approved by the Commission, the Distribution Licensee shall file the Petition for prior approval of Energy Purchase Agreement for procurement of power from such Renewable Energy Project(s);*
>
> *Provided further that in case the Distribution Licensee opts to procure power from Renewable Energy Projects through competitive bidding process, the Generic Tariff determined by the Commission shall act as a ceiling tariff and for such procurement of power, the Distribution Licensee shall file the Petition for adoption of tariff under Section 63 of the Act.*
>
> *10.2 For Renewable Energy Projects, for which the Project Specific Tariff is determined by the Commission, the Distribution Licensee shall file the Petition for prior approval of Energy Purchase Agreement for procurement of power from such Renewable Energy Project(s):*
>
> *Provided that in case the Project Developer and Distribution Licensee opt to file the Petition for approval of EPA and determination of tariff, the Project Developer and Distribution Licensee will have to file Joint Petition in this regard.*

*10.3 The Distribution Licensee shall comply with all the statutory and regulatory provisions for procurement of power from Renewable Energy Projects, as applicable from time to time.*

*10.4 All Renewable Energy power plants shall be treated as 'Must Run' power plants and procurement of power by Distribution Licensee from such power plants shall not be subjected to 'Merit Order Despatch' principles.*

*Provided that the Renewable Energy Power Plant with installed capacity of 5 MW and above shall be required to furnish to Distribution Licensee a month-wise schedule. The Renewable Energy Power Plant shall also co-ordinate with State Load Dispatch Centre in respect to Optimum scheduling and dispatch of electricity as per provisions of the State Grid Code."*

## Chapter- 2: Financial Principles

In this Chapter, the financial principles such as Benchmarking of Capital Cost, Debt-Equity ratio, Loan and Finance Charges, Depreciation, Return on Equity, and Interest on Working Capital have been discussed.

### 13 Capital Cost

13.1 For the benchmark capital costs in respect of different RE technologies, the Commission has considered inter alia, the capital cost norms as approved by CERC as well as various SERCs, in the last few years.

13.2 The analysis of benchmark capital cost for each RE Technology has been elaborated separately under Technology specific section.

### 14 Debt-Equity Ratio

14.1 The CERC and SERCs (for e.g.- GERC, MERC, RERC, KERC, TNERC, etc.) have specified the debt equity ratio as shown below:

- Debt Equity ratio of 70:30 shall be considered:
- If the equity actually deployed is less than 30% (thirty percent), the actual equity shall be considered, and if the equity actually deployed is more than 30% (thirty percent) of the capital cost, equity in excess of 30 % (thirty percent) shall be treated as normative loan.
- The equity invested and loan drawn in foreign currency shall be designated in Indian Rupees on the date of each investment, using the selling rates notified by the Reserve Bank of India on the date of such investment.
- Any capital grant or subsidy offered by the Central or State Government or any other agency, shall be taken into consideration, while determining the tariff under these Regulations.

14.2 The Commission has adopted the same approach of specifying the Debt:Equity Ratio of 70:30. Accordingly, the Draft Renewable Tariff Regulations, 2019 specifies as shown under:

> *"14 Debt Equity Ratio*
>
> *14.1 For the purpose of determination of tariff, the following provisions shall apply:*
>
> *a) Debt Equity ratio of 70:30 shall be considered:*
>
> *Provided that if the equity actually deployed is less than 30% (thirty percent) the actual equity shall be considered, and if the equity actually deployed is more than 30 % (thirty percent) of the capital cost, equity in excess of 30 % (thirty percent) shall be treated as normative loan:*

*Provided further that the equity invested and loan drawn in foreign currency shall be designated in Indian Rupees on the date of each investment, using the selling rates notified by the Reserve Bank of India on the date of such investment.*

*b) The Commission shall take into consideration any capital grant or subsidy offered by the Central or State Government or any other agency, while determining the tariff under these Regulations."*

## 15 Loan and Finance Charges

### a) Loan Tenure

15.1 In case of Solar Power - Grid Connected Ground Mounted and Solar Rooftop and Metering Regulations-2015, the Commission after considering the suggestions from stakeholders specified a normative loan tenure of 12 years for the purpose of determination of tariff.

15.2 The tenure of loans extended to RE projects by Financial Institutions (FIs) like PFC, IREDA, and REC is in the range of 10-15 years. The Commission is of the view that since most of the RE technologies have achieved a maturity level, it should be possible for the developers to secure loan from Lenders/FIs for a duration of say 12 years or more. Hence, the Commission has specified the normative loan tenure of 12 years.

### b) Interest Rate

15.3 The interest rates charged by various FIs to various RE projects is dependent on the type/technology of project, loan tenure and the risk profile of the borrower and the same typically ranges from 10% to 13.7% per annum depending on the technology. The interest rate trends reveal that the rates have been reducing over the past few years and are expected to reduce further in the next year.

15.4 The Commission has also noted the interest rates considered by CERC other SERCs as shown under:

**Table 3: Applicable Interest Rates in SERCs and CERC**

| Particulars | CERC/HERC | MERC | GERC | RERC | MPERC | KERC | TNERC |
|---|---|---|---|---|---|---|---|
| Tenure (Years) | 13 years | 12 years | 10 years | 13 years | 10 years | 15 years | 10 years |
| Interest Rate | 1-year MCLR of SBI plus 200 basis points. | 1-year MCLR of SBI plus 300 basis points | SBI Base Rate plus 250 basis points | 1-year MCLR of SBI plus 200 basis points. | 12% p.a. | 10.50% p.a. | SBI MCLR rate of 1 year plus 200 basis points |

15.5 In line with the CERC RE Tariff Regulations, 2017, the Commission has proposed a normative interest rate of two hundred (200) basis points above the average State Bank of India (SBI) MCLR (one-year tenor) prevalent during the first six months of the relevant year of the Control Period for the determination of tariff for mainland areas.

15.6 Further, the Commission is of the view that for RE projects in the islands, a higher spread as compared to mainland areas needs to be specified due to higher associated costs resulting in a higher risk. Thus, for island areas, the Commission has proposed normative interest rate of three hundred (300) basis points above the average State Bank of India (SBI) MCLR (one-year tenor) prevalent during the first six months of the relevant year of the Control Period.

## 16 Depreciation

16.1 The Commission has compared the rates of depreciation allowed by various other SERCs and CERC as shown under: -

**Table 4: Depreciation in SERCs and CERC**

| Particulars | CERC | HERC | MERC | GERC | RERC | MPERC | KERC | TNERC |
|---|---|---|---|---|---|---|---|---|
| Rate of Depreciation | 5.28% p.a. for first 13 years and remaining to be spread during useful life of the project. | 5.38% p.a. for first 13 years and remaining to be spread during useful life of the project. | 5.83% p.a. for the first 13 years and remaining to be spread during useful life of the project. | 7% p.a. for first 10 years, and 1.33% for the remaining life. | 5.28% p.a. for first 13 years and remaining to be spread during useful life of the project. | 7.00% p.a. for first 10 years, remaining to be spread over the life of the plant. | 5.38% p.a. for first 13 years and remaining to be spread during useful life of the project. | 3.60% p.a. Dep. calculated up to 95% of capital cost. |

16.2 The Commission is of the view that since most of the RE technologies covered here have achieved maturity level, it would be possible for the developers to secure a loan from lenders/FIs for duration of say 12 years or more. Following the 'Differential Depreciation Approach' over the loan tenure and beyond the loan tenure over a useful life computed on 'Straight Line Method', the Commission proposes depreciation rate of 5.83% per annum for first 12 years and remaining depreciation to be spread over the remaining useful life of the RE projects from 13$^{th}$ year onwards, considering the salvage value of the project as 10% of project cost.

## 17 Return on Equity

17.1 The Commission has reviewed the norms on Return on Equity (RoE) followed by various CERC and SERCs as shown under: -

**Table 5: RoE Specified in SERCs and CERC**

| Particulars | CERC/ HERC | MERC | GERC | RERC | MPERC | KERC | TNERC |
|---|---|---|---|---|---|---|---|
| Return on Equity | 14% grossed up with the tax rate equivalent to MAT rate | 16% (grossed up with base rate)<br>Tax rate- MAT rate in the first 10 years from COD, and wtd avg normal tax rate during the remaining | 14% post tax (grossed up with base rate) Tax Rate- MAT at 21.34% for first 10 years from COD, Corporate tax rate at 34.61% from 11th year | 14% grossed up with the tax rate equivalent to MAT rate. | 20% p.a. pre-tax RoE for first 10 years, 24% pre-tax RoE from 11th year onwards. | 14% grossed up with the tax rate equivalent to MAT rate | 17.60% pre-tax RoE |

17.2 The relevant extracts from the Explanatory Memorandum of CERC Draft RE Tariff Regulations, 2017 are quoted as shown below: -

"*The Commission also reviewed the 10 yr G-Sec rates for the past six months. The yield data for last available six months from Reserve Bank of India's monthly bulletin is as under:*

| **Month** | **10 yr G-Sec yield** ***(Source: Monthly RBI Bulletin)*** |
|---|---|
| June 2016 | 7.51 |
| July 2016 | 7.27 |
| August 2016 | 7.13 |
| September 2016 | 6.81 |
| October 2016 | 6.83 |
| November 2016 | 6.30 |
| **Average for Last Available 6 Months** | **6.97** |

*The Commission had undertaken an exercise to determine Return on Equity using the Capital Asset Pricing Model (CAPM) principles.*

*As per CAPM Methodology;*

*Return on Equity = Risk Free Rate +β (Market Rate – Risk Free Rate) Where;*

*Risk Free Rate – Average of last available six months yield of G-Sec (June 2016 – November 2016) – 6.97%;*

*β – Calculated for BSE Power Index for the period (01.01.2016 – 30.12.2016) as 1.004; Market Rate – CAGR of last 20 years BSE* Sensex values (1996 - 2016) *calculated as 11.38%;*

*Return on Equity = 6.97% + 1.004 (11.38% - 6.97%)*

*Return on Equity = 11.40%*

*Considering the market realities and norms proposed by various SERCs, the Commission proposes to give a market premium of seven hundred (700) basis points over the prevailing average G-Sec rates prevalent during the last available six months of the relevant year of the Control Period for the determination of tariff.*

*Accordingly, the Commission proposes to consider Return on Equity of 14% (post tax) for the next Control Period (2017-2020). Going forward, Minimum Alternate Tax/ Corporate Tax are expected to be lowered and the Commission has observed that the effective tax rate is lower than the Corporate Tax rate. Hence, for the certainty of regulatory principles, it is proposed that the return on equity shall be grossed up by Minimum Alternate Tax prevailing as on 1st April of the previous financial year for the entire useful life of the project."*

17.3 The Commission in line with CERC RE Tariff Regulations, 2017, has considered, 14% RoE grossed up with tax rate equivalent to MAT rate, for Mainland areas. Further, the Commission is of the view that the RoE for RE projects in Island areas should be higher than that in the mainland areas due to higher risks involved and has hence, specified 16% RoE grossed up with tax rate equivalent to MAT rate for Island areas.

## 18 O&M Expenses

18.1 The Commission has analysed and specified the normative O&M Expenses for the first year for each technology while discussing the technology specific parameters.

18.2 The Commission has reviewed the escalation rates yearly for O&M adopted by various CERC and SERCs over the useful life of the Project as shown follows: -

**Table 6: Escalation Rates Adopted by SERCs and CERC for O&M Computation**

| Particulars | Escalation |
|---|---|
| CERC | Ratio of 60:40, WPI: CPI |
| MERC | Ratio of 50:50, WPI: CPI |
| HERC | At 5.72 % p.a. |
| RERC | At 5.85% p.a. |
| MPERC | Ratio of 60:40, WPI: CPI |
| KERC | Ratio of 60:40, WPI: CPI |
| TNERC | At 5.72% p.a. |

18.3 The O&M expenses for any project comprises the following:

- Employee Expenses
- Administration and General (A&G) expenses

- Repairs & Maintenance Expenses

18.4 The year-on-year increase in Employee expenses mainly depend on Consumer Price Index (CPI). The increase in A&G expenses depends on Wholesale Price Index (WPI) and CPI. The increase in R&M expenses mainly depend upon WPI. Accordingly, the Commission proposes escalation ratio (WPI: CPI) at 60:40 for determining the O&M expenses over the useful life of the Project. Accordingly, Regulation 20.3 of the JERC Draft Regulations specifies as under:

*"20.3 Normative O&M expenses allowed during first year of the Control Period (i.e. FY 2019-20) under these Regulations shall be escalated by escalation factor determined based on previous three years average of Annual increase in Wholesale Price Index as per Office of Economic Advisor of Government of India, Ministry of Commerce and Industry and Consumer Price Index for Industrial Workers (All India) as per Labour Bureau, Government of India in the ratio of 60:40 for arriving the O&M Expenses for subsequent years."*

## 19 Interest on Working Capital

19.1 The Commission has compared the norms for interest on working capital specified by various CERC and SERCs are given in the following Table :

**Table 7: Interest on Working Capital by SERCs and CERC**

| Particulars | CERC | HERC | MERC | GERC | RERC | MPERC | KERC | TNERC |
|---|---|---|---|---|---|---|---|---|
| IWC | | | | | | | | |
| a)O&M Expense | a) 1 month; | a) 1 month; | a) 1 month; | a) 1 month | a) 1 month; | a) 1 month; | a) -- | a)1 month, |
| b) Receivables | b) 2 months of charges for sale of electricity calculated at the normative CUF; | b) 2 months of charges for sale of electricity calculated at the normative CUF; | b) 2 months of tariff for sale of electricity calculated on normative CUF; | b)1-month energy charges for sale of electricity calculated on a normative CUF. | b) 1.5 month of charges for sale of electricity calculated at the normative CUF; | b) 2 months of charges for sale of electricity calculated at the normative CUF; | b)2 months<br>c) -- | b)2 months |
| c)Maintenance Spares | c)15% of O&M Expenses. | c)15% of O&M Expenses. | c) 15% of O&M expenses. | c) --- | c) 15% of O&M Expenses. | c) 15% of O&M Expenses. | | |
| Interest rate - | Avg SBI MCLR (1 year tenor) plus 300 basis points. | Avg SBI MCLR (1 year tenor) plus 200 basis points. | Avg of SBI MCLR of the previous year, plus 350 basis points. | 11.85%. | Avg SBI MCLR (1-year tenor) plus 300 basis points. | 12.5%. | 11% | 1 year SBI MCLR plus 300 bp i.e. 11.55 %. |

19.2 The norms indicated for working capital specified by CERC appear to be most appropriate which are also similar to the norms specified for conventional projects. The Commission has accordingly specified the working capital norms in line with the CERC Regulations.

19.3 To incorporate an approach which aligns closer to the market dynamics and reflects the prevalent interest rates, the Commission proposes and take into consideration the State Bank of India MCLR (One-year Tenor) for the last available six months.

19.4 In addition, the Commission notes that the period of working capital loans being short, the interest rate would be higher than the interest rate chargeable for long-term loans. However, the interest rates trend reveal that the interest rates have been reducing over a past year and are expected to reduce further in the next year. Further, as discussed earlier, a slightly higher interest rate needs to be specified for RE Projects in the Island Areas under the jurisdiction of the Commission considering the higher risks involved.

19.5 Considering the above, the Commission in Regulation 18 of its Draft JERC Renewable Tariff Regulations, 2019, proposes the norms for working capital interest as under:

*"18 Interest on Working Capital*

*18.1 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:*

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

*b) Receivables equivalent to 2 (Two) months of energy charges for sale of electricity calculated on the normative Capacity Utilisation Factor (CUF);*

*c) Maintenance spares @ 15% of Operation and Maintenance expenses.*

*18.2 The Working Capital requirement in respect of Biomass power projects with Rankine Cycle technology, Biogas, Biomass Gasifier based power projects, Municipal Solid Waste and Refuse Derived Fuel projects shall be computed in accordance with the following clause:*

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

*b) Operation & Maintenance expense for one month;*

*c) Receivables equivalent to 2 (Two) months of fixed and variable charges for sale of electricity calculated on the target PLF;*

*d) Maintenance spares @ 15% of Operation and Maintenance expenses.*

*18.3 Normative Rate of Interest on Working Capital shall be considered as follows:*

**Table: Normative Working Capital Interest Rate**

| Particulars | Interest Rates |
|---|---|
| Mainland | State Bank of India MCLR (One-Year Tenor) prevalent during the last available six months + 300 basis points |
| Island | State Bank of India MCLR (One-Year Tenor) prevalent during the last available six months + 400 basis points |

"

## 20 Subsidy and Incentive

20.1 Regulation 23 of CERC RE Tariff Regulations, 2017, specifies that:

*"23. 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.*

*Provided that the following principles shall be considered for ascertaining income tax benefit on account of accelerated depreciation, if availed, for the purpose of tariff determination:*

*i) Assessment of benefit shall be based on normative capital cost, accelerated depreciation rate as per relevant provisions under Income Tax Act and corporate income tax rate.*

*ii) Capitalization of RE projects during second half of the fiscal year. Per unit benefit shall be derived on levelized basis at discount factor equivalent to weighted average cost of capital."*

20.2 Accordingly, the Commission proposes that the tariff determined under these Regulations shall be exclusive of taxes (other than Corporate Tax and Minimum Alternate Tax) and duties as may be levied by the appropriate Government, provided that the taxes (other than Corporate Tax and Minimum Alternate Tax) and duties levied by the appropriate Government shall be allowed as pass through on actual incurred basis, in line with CERC RE Tariff Regulations, 2017.

20.3 The Commission in Regulation 24 of its Draft JERC Renewable Tariff Regulations, 2019 has proposed that: -

*"24 Subsidy or incentive by the Central / State Government*

*24.1 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:*

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

*i. Assessment of benefit shall be based on normative Capital Cost, accelerated depreciation rate as per relevant provisions under Income Tax Act and corporate Income Tax rate;*
*ii. Capitalization of RE projects during second half of the fiscal year;*
*iii. Per unit benefit shall be derived on levelized basis at discount factor equivalent to weighted average cost of capital."*

## 21 Technology Specific Norms: Calculation of CUF/PLF

21.1 Under this section, technology specific parameters, viz., Capacity Utilization Factor/Plant Load Factor for Small Hydro Power projects, Solar PV and Solar Thermal projects, Wind Energy Projects, Biomass Power (with Rankine Cycle technology), Non fossil fuel Co-generation, Biomass gasifier-based power project, Biogas based power projects, Municipal Solid Waste and Refuse Derived Fuel based projects have been discussed.

21.2 The Commission has reviewed the same technology-wise, which has been discussed in the subsequent Chapters.

21.3 The Commission in its computation of Generic Tariff for the Control Period has considered the total number of hours in a year as 24 hours x 365 days = 8760 hours.

## Chapter- 3: Technology Specific Parameters for Wind Power Projects

### 22 Capital Cost

22.1 The Commission has compared the capital cost specified by various SERCs and CERC for Wind Power Projects in the following table: -

**Table 8: Capital Cost for Wind Projects (Rs Cr/MW)**

| Particulars | CERC | HERC | MERC | GERC | RERC | MPERC | KERC | TNERC |
|---|---|---|---|---|---|---|---|---|
| Capital Cost | Project specific capital cost | Project specific capital cost | Rs. 6.74 Cr/MW | Rs. 6.15 Cr/MW | Rs. 5.65 Cr/MW | Rs.5.75 Cr/MW | Rs.6.00 Cr/MW | Rs.5.25 Cr/MW |

22.2 The Capital cost of wind turbines has considerably reduced over the years from FY 2010-11. 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 financial 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. Hence, considering the reduced prices, a capital cost of Rs.5.25 crore per MW has been adopted for the Mainland areas. Due to higher transportation costs associated with Island areas, the proposed capital cost per MW specified for Island areas is higher than that of mainland areas. Further, considering the soil conditions of Lakshadweep Island, foundation costs will be higher in Lakshadweep Island as compared to A&N Island and hence, the Commission has specified higher Capital Cost for Lakshadweep Island.

22.3 Accordingly, the Commission proposes the Capital Cost for Wind Energy Projects as follows: -

a) Mainland area: Rs. 5.25 Crore / MW;

b) Island areas (Andaman & Nicobar): Rs. 6.25 Crore/MW;

c) Island areas (Lakshadweep): Rs.7.00 Crore/MW

22.4 CERC in its RE Tariff Regulations, 2012 specified the mechanism for escalating the Capital Cost every year for the Control Period. However, CERC in its Tariff Regulations, 2017 has removed the mechanism for annual escalation for escalating the Capital Cost every year during the Control Period and mentioned that the Capital Cost specified will remain valid for the entire duration of the Control Period unless reviewed earlier by the Commission.

22.5 The relevant extract of the Explanatory Memorandum of the CERC RE Tariff Regulations, 2017, is reproduced below: -

*"The Commission in its RE Tariff Regulations 2012 specified capital cost indexation formula to consider the year on year variation for the underlying capital cost parameters for each RE technology except Solar PV and Solar Thermal.*

*During the Control Period 2012-17, the maturity levels of RE technologies have increased with total RE installations at over 50,000 MW as on 31st December 2016 (Source: MNRE). Further with the announcement of renewable energy capacity addition, it is expected that energy efficient technologies shall also be deployed by project developers resulting in cost savings and greater energy generation.*

*Considering the downward trend in energy generation equipment and factoring the market response, the capital cost indexation formula based on site independent factors mainly plant and machinery and site specific parameters such as land/civil works, erection and commissioning and finance cost and interest during construction are not providing the market sentiment and has resulted in a gap between regulatory assumptions and actual project parameters."*

22.6 Accordingly, in line with the above, JERC proposes to review the capital cost for all RE technologies every year based on market information. The Commission has proposed in Regulation 26 of the Draft JERC Renewable Tariff Regulations, 2019 as shown under:

*"26 Capital Cost*

*26.1 The Capital Cost for Wind Energy Projects shall comprise of the cost of the Wind Turbine Generator including its auxiliaries, land cost, site development charges and other civil works, charges for transportation to site, evacuation cost up to inter-connection point, financing charges and Interest during Construction, and capital investment relating to forecasting and scheduling.*

*26.2 The Capital Cost for Wind Energy Projects shall be as follows:*

*a) Mainland area: Rs. 5.25 Crore/MW;*

*b) Island areas (Andaman & Nicobar): Rs. 6.25 Crore/MW;*

c) *Island areas (Lakshadweep): Rs.7.00 Crore/MW"*

## 23 Capacity Utilization Factor (CUF)

23.1 The Commission has compared the CUF for wind power projects as allowed by various CERC and SERCs as shown under: -

**Table 9: Capacity Utilization Factor for Wind Projects in SERCs and CERC (%)**

| Particulars | CERC/HERC | MERC | GERC | RERC | MPERC | KERC | TNERC |
|---|---|---|---|---|---|---|---|
| CUF | 1) Upto 220 W/m2- 22% 2) 221-275 W/m2- 24% 3) 276-330 W/m2- 28% 4) 331- 440 W/m2- 33% 5) >440 W/m2- 35% | 1)Upto 250 W/m2- 22% 2) 250-300 W/m2 -25% 3) 300-400 W/m2- 30% 4) >400 W/m2- 32% | 24.5% | 1) Jaisalmer, Jodhpur and Balmer- 21% 2) Others- 20% De-ration is 1.25% of CUF from 6th, 10th, 14th and 18th year. | 23% | 31% | 29.15% |

23.2 The different ERCs have stipulated the norms for CUF after considering the zone-wise wind speed. Accordingly, the Commission has specified the CUF for Islands and Mainland areas considering the wind speed and CUF range specified by MNRE. For Island areas, in order to promote the RE capacity addition, the Commission has specified the CUF equivalent to the lowest range of CUF specified by MNRE. Accordingly, the CUF proposed by the Commission in Draft Regulations is as follows:

**Table 10: CUF for Islands and Mainlands for Wind Projects (%)**

| State / Union Territory | Wind Speed ( m/s ) | Wind Power Density (W/ Sq m ) | CUF Range (MNRE) | CUF Proposed |
|---|---|---|---|---|
| Goa | 5.4 | 180 | 18% | **18%** |
| Andaman & Nicobar Islands | 5.4 – 5.6 | 180 - 210 | 18 – 20% | **18%** |
| Puducherry | 5.6 – 6 | 210 - 250 | 20 – 22% | **21%** |
| Lakshadweep | 5.6 – 6 | 210 - 250 | 20 – 22% | **20%** |
| Daman | 5.4 – 5.6 | 180 - 210 | 18 – 20% | **19%** |
| Chandigarh | 5.4 | 180 | 18% | **18%** |
| Dadra & Nagar Haveli | 5.4 | 180 | 18% | **18%** |
| Diu | 6.4 – 6.7 | 300 - 350 | 25 – 28% | **26%** |

Source: NIWE, MNRE

## 24 Operation and Maintenance (O&M) Expenses

24.1 O&M expenses are a significant component of the overall generation cost of wind energy, but can vary substantially among projects depending upon the size of the project and technology of the turbine. O&M costs are related to a limited number of cost components, including insurance, regular maintenance, repair, spare parts and administration. Some of these cost components can be estimated relatively easily. For insurance and regular maintenance, it is possible to obtain standard service contracts covering a considerable share of the wind turbine's total lifetime. Conversely, costs for repair and related spare parts are much more difficult to predict. Further, although all cost components

tend to increase as the turbine gets older, costs for repair and spare parts are particularly influenced by turbine age, starting low and increasing over time.

24.2 The Commission has compared the O&M Expenses allowed by different ERCs as shown under:

**Table 11: O&M Expenses allowed by SERCs and CERC**

| Particulars | CERC/ HERC | MERC | GERC | RERC | MPERC | KERC | TNERC |
|---|---|---|---|---|---|---|---|
| O&M Expenses | Project Specific | 1.47% of capital cost i.e. Rs 7.72 lakh/MW at base year | Rs 8 lakh/MW at base year, | Rs.7.87 lakh/MW at base year | 1 % of the capital cost of the project as O&M expenses in the first year | Rs.8.00 lakh/MW, Aux Consumption- 0.5% | O&M expense of: 1) 1.1% on 85% of Capital investment (plant and machinery cost) 2) 0.22% on 15% of the Capital investment (land and civil works) |

24.3 It is observed that the O&M Expenses for Wind Power Project for the first year of operation is typically around 1.5% of Capital Cost. Accordingly, the Commission has specified the O&M Expenses for first year of Control Period as 1.5% of Capital Cost for Mainland areas. The Commission is of the view that the O&M expenses for Island areas will be higher than O&M expense in Mainland areas due to higher transportation costs involved and availability of O&M Expense and other reasons. Accordingly, the Commission has specified the O&M Expenses for first year of Control Period as 2% of Capital Cost for Island areas.

## Chapter- 4: Technology Specific Parameters for Small Hydro Project

### 25 Capital Cost

25.1 Regulation 28 of the CERC RE Tariff Regulations, 2017 specifies as under: -

***"28. Capital Cost***

*(1) The normative capital cost for small hydro projects during first year of Control Period (FY 2017-18) shall be as follows:*

| *Region* | *Project Size* | *Capital Cost (Rs. Lakh/ MW)* |
|---|---|---|
| *Himanchal Pradesh, Uttarakhand, West Bengal and North Eastern States* | *Below 5 MW* | *1000* |
| | *5 MW to 25 MW* | *900* |
| ***Other States*** | ***Below 5 MW*** | ***779*** |
| | ***5 MW to 25 MW*** | ***707*** |

"

25.2 Accordingly, in line with the CERC Regulations, this Commission has proposed the normative capital cost for Small Hydro Projects in Mainlands for the Control Period as:

Projects in Mainland Areas:

a. Below 5 MW is Rs 7.79 Cr/MW,
b. 5 to 25 MW is Rs. 7.07 Cr/MW)

25.3 Further, it is to be noted that, due to higher transportation cost and issues associated with setting up of renewable projects in the Island areas, the Commission has proposed normative capital cost higher than the Mainlands are as follows:

Projects in Island Areas

a. Below 5 MW is Rs 10.00 Cr/MW,
b. 5 to 25 MW is Rs. 9.50 Cr/MW)

25.4 The Capital Cost specified above will remain valid for the entire duration of the Control Period unless reviewed earlier by the Commission. The rationale for the same is as explained in para 22.4 to 22.6 above.

### 26 Capacity Utilisation Factor

26.1 The Commission has compared the CUF allowed by other SERCs as shown in the following table: -

**Table 12: CUF (%) Allowed in SERCs and CERC for Small Hydro Projects**

| Particulars | CERC | HERC | MERC | GERC | MPERC | KERC |
|---|---|---|---|---|---|---|
| CUF | 1)Himachal, Uttarakhand, WB & NE states- 45% 2) Others- 30% | 56% | 30% | 42% | 30% | 30% |

26.2 It can be seen that the CUF ranges from 30-56%. Accordingly, the Commission proposes CUF of 30%, in line with CERC RE Tariff Regulations, 2017.

## 27 Auxiliary Consumption

The SERCs like MERC, GERC, MPERC and KERC have allowed Auxiliary Consumption of 1%. Accordingly, the Commission proposes normative Auxiliary Consumption for the Small Hydro Projects as 1.0%.

## 28 Operation and Maintenance Expenses

28.1 The Commission analysed the norms specified for O&M Expenses by various Regulatory Commissions as shown in the following table: -

**Table 13: O&M Expenses in SERCs and CERC for Small Hydro Projects**

| Particulars | CERC | HERC | MERC | GERC | MPERC | KERC |
|---|---|---|---|---|---|---|
| O&M Expenses | 1) Himachal, Uttarakhand, WB, NE states- (Below 5MW is Rs 36 lakh/MW, 5 to 25 MW-Rs 27 lakh/MW) | 1) Below 5 MW- Rs. 29 lakh/ MW | 1) 1 to 5MW- 3.60% of Capital Cost | 1) Upto 5MW- 3.3% of capital cost, | 3% of capital cost | Rs 14.66 lakh/MW |
| | 2) Others- (Below 5 MW is Rs 29 lakh/MW, 5 to 25 MW is Rs. 21 lakh/MW) 5.72% p.a. | 2) 5-25 MW: Rs. 21 lakh /MW | 2) 5 to 25 MW-2.80% of Capital Cost | 2) 5 to 25 MW-2.5% of capital cost | | |

28.2 It can be seen that the O&M Expenses allowed by ERCs ranges between 2-3% of the Capital Cost. Hence, the Commission has specified the O&M Expenses for first year of Control Period as 2% of Capital Cost for Mainland areas. The Commission is of the view that the O&M expenses for Island areas will be higher than O&M expense in Mainland areas due to higher transportation costs and O&M Expense involved and other reasons. Accordingly, the Commission has specified the O&M Expenses for first year of Control Period as 2.5% of Capital Cost for Island areas.

## Chapter 5: Technology specific parameters for Solar PV Power Project

### 29 Technology Aspects

29.1 Norms for Solar Photovoltaic (PV) power projects under these Regulations shall be applicable for grid connected PV systems that directly convert solar energy into electricity and are based on technologies such as crystalline silicon or thin film, etc., as may be approved by MNRE.

### 30 Capital Cost

30.1 The Commission has compared the Capital Cost specified by other ERCs as shown in the following table: -

**Table 14: Capital Cost (Rs Cr/MW) in SERCs and CERC for Solar PV Projects**

| Particulars | CERC/HERC | MERC | GERC | RERC | MPERC | KERC | TNERC |
|---|---|---|---|---|---|---|---|
| Capital Cost- Solar PV | Project specific capital cost to be determined | Rs.6.05 Cr/MW | Rs.6.15 Cr/MW | The normative CC for Solar plants to be determined by Commission separately for each year. | Rs.5.30 Cr/MW | Rs. 3.50 Cr/ MW | Rs. 3.35 Cr/ MW |

30.2 It can be seen that most ERCs have allowed normative Capital Cost of Rs. 3.5 Crore to Rs 6.15 Crore per MW. The Commission has accordingly proposed a ceiling norm for capital cost, as Rs. 5 Crore/ MW for Mainland areas and Rs 6 Crore/MW for Island areas owing to higher transportation costs. However, considering the changing market scenario, decline in module prices and competitive rates in recent times, the Commission shall review the prices as and when felt appropriate.

30.3 Accordingly, the Commission proposes the normative Capital Cost for Solar PV projects for the Control Period as:

a) Solar PV Projects in Mainland Areas: Rs. 5.00 Cr/MW,
b) Solar PV Projects in Island Areas: Rs. 6.00 Cr/MW

The Capital Cost specified above will remain valid for the entire duration of the Control Period unless reviewed earlier by the Commission. The rationale for the same is as explained in para 22.4 to 22.6 above.

## 31 Capacity Utilization Factor

31.1 The Commission for the purpose of setting normative CUF for Solar PV Projects, has analysed the CUF allowed by various ERCs as shown in the following table: -

**Table 15: CUF (%) in SERCs and CERC for Solar PV Projects**

| Particulars | CERC/HERC | MERC | GERC | RERC | MPERC |
|---|---|---|---|---|---|
| Solar PV | 19% | 19% | 19% with deration of 1% annually | 20% with deration of 0.5% of CUF every year | 19% |

31.2 The Commission has also analysed the solar radiation in the State and the Union Territories under JERC, for determination of CUF, as shown in the following Table:

**Table 16: GHI for Mainland and Islands for Solar PV Projects**

| State/Union Territory | GHI – Meteo norm 7.3.1 | GHI – Solar GIS | GHI - MNRE | GHI – Average of all sources |
|---|---|---|---|---|
| Goa | 5.78 | 5.75 | 5.81 | **5.78** |
| Puducherry | 5.89 | 5.81 | 5.92 | **5.87** |
| Dadra & Nagar Haveli | 5.54 | 5.5 | 5.61 | **5.56** |
| Lakshadweep | 5.82 | 5.81 | 5.84 | **5.82** |
| Andaman & Nicobar Islands | 5.29 | 5.22 | 5.3 | **5.27** |
| Daman | 5.6 | 5.55 | 5.62 | **5.59** |
| Diu | 5.89 | 5.87 | 5.94 | **5.9** |
| Chandigarh | 5.21 | 5.11 | 5.34 | **5.22** |
| ***All figures in kWh/m2/Day** | | | | |

**Table 17: CUF (%) for Mainland and Islands for Solar PV Projects**

| State / Union Territory | GHI – MNRE ( in kWh/m2/Day) | Average CUF % – Crystalline Film Technology | Average CUF % – Thin Film Technology | Recommended CUF % |
|---|---|---|---|---|
| **Puducherry** | 5.87 | 16.90% | **19.70%** | 18.00% |
| **Dadra & Nagar Haveli** | 5.61 | 18.30% | 17.89% | 18.00% |
| **Lakshadweep** | 5.84 | 17.59% | 16.84% | 17.00% |
| **Andaman & Nicobar** | 5.3 | 16.87% | 17.07% | 17.00% |
| **Daman** | 5.62 | 18.40% | 18.01% | 18.00% |
| **Diu** | 5.94 | 18.60% | 18.18% | 18.00% |
| **Chandigarh** | 5.34 | 16.67% | 16.01% | 17.00% |

| State / Union Territory | GHI – MNRE ( in kWh/m2/Day) | Average CUF % – Crystalline Film Technology | Average CUF % – Thin Film Technology | Recommended CUF % |
|---|---|---|---|---|
| **Goa** | 5.81 | 18.71% | - | 18.00% |

31.3 Considering the Capacity Utilization Factor (CUF) for solar PV Projects as specified by MNRE considering the solar radiation data, the CUF proposed by the Commission in Draft Regulations are as shown in the following table:

**Table 18: Proposed CUF (%) for Solar PV Projects**

| State / Union Territory | CUF % |
|---|---|
| **Puducherry** | 18.00% |
| **Dadra & Nagar Haveli** | 18.00% |
| **Lakshadweep** | 17.00% |
| **Andaman & Nicobar Islands** | 17.00% |
| **Daman** | 18.00% |
| **Diu** | 18.00% |
| **Chandigarh** | 17.00% |
| **Goa** | 18.00% |

31.4 The Commission may deviate from the norm depending on the merits of the project in case of project specific tariff determination in pursuance of Regulations.

## 32 Operation and Maintenance Expenses

32.1 The Commission has reviewed the O&M Expenses specified by various ERCs as shown in the following table: -

**Table 19: O&M Expenses specified by SERCs and CERC for Solar PV Projects**

| Particulars | CERC/ HERC | MERC | GERC | RERC | MPERC | KERC | TNERC |
|---|---|---|---|---|---|---|---|
| Solar PV | Project Specific | Rs 13 lakh/MW | Rs.10.90 lakh/MW | Rs.12.76 lakh/MW | Rs. 7 Lakhs/MW | Rs 4.5 lakh/ MW | O&M expense of 1.4% of capital cost, |

It is observed that most of the ERCs have a specified flat rate per MW as normative O&M Expenses. CERC in its recent Renewable Regulations, has specified project specific case for O&M Expenses of Solar PV. The Commission is of the view that, in the wake of setting up of a number of small and large-scale solar PV projects, the O&M costs have reduced and there are also advancements in automation to take care of O&M requirements of solar PV projects.

32.2 It is observed that the O&M Expenses for a Solar PV Project for first year of

operation is typically around 1.5% of Capital Cost. Accordingly, the Commission has specified the O&M Expenses for first year of Control Period as 1.5% of Capital Cost for Mainland areas. The Commission is of the view that the O&M expenses for Island areas will be higher than O&M expense in Mainland areas due to higher transportation costs involved and other reasons. Accordingly, the Commission has specified the O&M Expenses for first year of Control Period as 2% of Capital Cost for Island areas.

## 33 Auxiliary Consumption

33.1 A photovoltaic power plant consumes minimal energy for auxiliary purposes. Auxiliary power may be required for air-conditioning in inverter and control rooms, cleaning water softening and pumping system, security night lighting and general office lights and fans.

33.2 The Commission observed that the auxiliary consumption allowed by other ERCs like CERC, HERC, GERC, MPERC and KERC is 0.25% of gross generation.

33.3 Accordingly, the Commission has proposed auxiliary consumption factor to be 0.25% of gross generation with the provision that the Commission may deviate from the above norm depending upon the merit of the case, in case of project specific tariff.

## Chapter 6: Technology Specific Parameters for Solar Thermal Power Project

### 34 Technology Aspects

The norms for Solar thermal power shall be applicable for Concentrated solar power (CSP) technologies, viz., line focusing or point focusing, as may be approved by MNRE, and using direct sunlight, concentrating it several times to reach higher energy densities and thus, higher temperatures whereby the heat generated is used to operate a conventional power cycle to generate electricity.

### 35 Capital Cost

The Commission shall determine only project specific capital cost and tariff based on the prevailing market trends for Solar Thermal project.

### 36 Capacity Utilisation Factor

The CUF for Solar thermal project shall be determined while approving the project specific tariff.

### 37 Operation and Maintenance Expenses

The Commission shall determine only project specific O&M expenses based on prevailing market trends for Solar Thermal project.

### 38 Auxiliary Consumption

The Commission has observed that the auxiliary consumption specified by various ERCs like CERC, MERC, GERC, MPERC is 10%. Accordingly, the Commission proposes 10% auxiliary consumption for solar projects for the Control Period.

# Chapter 7: Technology specific parameters for Biomass Power Projects based on Rankine Cycle Technology

## 39 Technology Aspect

The norms for tariff determination specified hereunder are for biomass power projects based on Rankine cycle technology application using air-cooled or water-cooled condenser.

## 40 Capital Cost

The Commission shall determine project specific Capital Cost and tariff for Biomass Projects based on the Petition filed by Project Developer and after due diligence of the same by the Commission.

## 41 Plant Load Factor

41.1 The Commission has reviewed the PLF adopted by various ERCs as shown in the following table: -

**Table 20: PLF Adopted by SERCs and CERC for Biomass Power Projects based on Rankine Cycle Technology**

| Parameter | CERC | HERC | MERC | GERC | RERC | MPERC | KERC | TNERC |
|---|---|---|---|---|---|---|---|---|
| Plant Load Factor | During Stabilization (6 months) 60%,<br><br>During remaining period of first year after stabilization: 70%, | 1st Year of Operation including Stabilization: 65% | For water cooled Condenser projects: During Stabilization (6 months) 60%,<br><br>During remaining period of first year after stabilization: 70%, | First Year: 70% | During Stabilization (6 months) 60%,<br><br>During remaining period of first year after stabilization: 70%, | During stabilization: 60%<br><br>During remaining period of first year after stabilization: 70% | 75% | 80% |
| | From second year onwards: 80% | From 2nd Year onwards: 80 % | From second year onwards: 80% | Balance Life: 80% | From second year onwards: 75% | From 2nd Year: 80% | | |

41.2 It is observed from the table preceding this para that in most ERCs the PLF adopted during stabilization period is 60-70% and from 2nd year onwards the PLF is 75-80%. Accordingly, this Commission proposes a threshold PLF for determining fixed charge component as shown under:

a) During 1st year: 70%

b) From 2 Year onwards: 80 %

## 42 Auxiliary Consumption

42.1 The Commission has reviewed the auxiliary power consumption adopted by various ERCs as shown in the following table: -

**Table 21: Auxiliary Consumption in SERCs and CERC for Biomass Power Projects based on Rankine Cycle Technology**

| Parameter | CERC | HERC | RERC | MERC/MPERC/ GERC/ KERC & TNERC |
|---|---|---|---|---|
| Auxiliary Consumption | For water cooled condenser: During 1st | For water cooled condenser: | For water cooled condenser: | 10% |
| | From 2nd Year: 10.0% | 10% | During Stabilization (6 months) : 10.5% After stabilization: 10.0% | |
| | For air cooled condenser: During 1st Year : 13% | For air cooled condenser: | For air cooled condenser: | |
| | From 2nd Year: 12% | 12% | During Stabilization (6 months) : 12.5% After stabilization: 12.0% | |

42.2 The Commission has proposed the Auxiliary Consumption in line with that specified in CERC RE Tariff Regulations, 2017.

42.3 Accordingly, the Commission has proposed the auxiliary power consumption factor as follows: -

a) For the project using water cooled condenser:

i. During first year of operation: 11%

ii. From 2nd year onwards: 10%

b) For the project using air cooled condenser:

i. During first year of operation: 13%

ii. From 2nd year onwards: 12%

## 43 Station Heat Rate

43.1 The Commission has reviewed the Station Heat Rate adopted by various ERCs as shown in the following table: -

**Table 22: Station Heat Rate in SERCs and CERC for Biomass Power Projects based on Rankine Cycle Technology**

| Parameter | CERC | HERC | MERC | GERC | RERC | MPERC | TNERC |
|---|---|---|---|---|---|---|---|
| Station Heat Rate | Grate Boilers: 4200 kcal/kWh | Grate boiler: 4126 kcal/kWh | 4200 kcal/kWh | For Water Cooled Condenser 3800 kcal/kWh | For water cooled During Stabilization (6 months) : 4300 kcal/kWh | 4200 kcal/kWh | 3840 kcal/kWh |
| | AFBC boilers: 4125 kcal/kWh | AFBC boilers: 4063 kcal/kWh | | For Air Cooled Condenser 3950 kcal/kWh | After stabilization: 4200 kcal/kWh, During Stabilization (6 months) : 4540 kcal/kWh After stabilization: 4440 kcal/kWh | | |

43.2 The Commission has proposed the Station Heat Rate in line with that specified in CERC RE Tariff Regulations, 2017.

43.3 Accordingly, the proposed Station Heat Rate for biomass power projects is as shown under:

a) For projects using travelling grate boilers: 4200 kcal/kWh.

b) For projects using AFBC boilers: 4125 kcal/ kWh.

## 44 Operation and Maintenance Expenses

44.1 The Commission has reviewed the O&M Expenses adopted by various ERCs as shown in the following table: -

**Table 23: O&M Expenses in SERCs and CERC for Biomass Power Projects based on Rankine Cycle Technology**

| Parameter | CERC/ HERC | MERC | GERC | RERC | MPERC | KERC | TNERC |
|---|---|---|---|---|---|---|---|
| O&M Expenses | Rs. 40 Lakh/MW | 5.32% of the Capital cost For FY 2018-19: Rs. | First Year: 5% of capital Cost | For water cooled Condenser: | 4% of Capital cost for the first year | Rankine cycle based Biomass-Power plants with water cooled condenser: | O&M Charges for machinery (on 85% of capital investment) 5% on 85% of capital cost |

| Parameter | CERC/ HERC | MERC | GERC | RERC | MPERC | KERC | TNERC |
|---|---|---|---|---|---|---|---|
| | | 29.60 Lakh/MW | | | | First Year: 5% of capital Cost | |
| | | | | For FY 2018-19 Rs. 42.27 Lakh/MW,<br><br>Escalation rate: 5.85% per annum For air cooled Condenser: | | Rankine cycle based Biomass-Power plants with air cooled condenser: First Year: 4% of capital Cost | O&M Charges for land and civil works (on 15% of capital investment) 0.90% on 15% of capital cost. |
| | | | | For FY 2018-19: Rs. 45.07 Lakh/MW | | | |

From the Table above, it is observed that the normative O&M Expenses allowed by the ERCs range from 4-5% of the Capital Cost. Accordingly, the Commission has proposed normative O&M expenses for the first year of the Control Period (i.e., FY 2019-20) as 5% of Capital Cost for biomass power projects based on Rankine cycle technology.

## 45 Fuel Mix

45.1 The Commission proposes that biomass power plants shall be designed in such a way that it operates on different types of non-fossil fuels available within the vicinity of biomass power project such as crop residues, agro-industrial residues, forest residues, etc., and other biomass fuels as may be approved by MNRE.

45.2 The Biomass Power Generating Companies shall ensure fuel management plan to ensure adequate availability of fuel to meet the respective project requirements.

45.3 The Fuel Price and Calorific Value of Fuel shall be approved by the Commission based on the Petition filed for Project Specific Tariff considering the type of fuel proposed to be used in the Project.

45.4 Biomass fuel price at the time of determination of tariff may be approved by the Commission based on independent study to be carried out by constituting a State/ UT level committee consisting of representatives of State/UT Nodal Agency, State Government, Distribution Licensee, Biomass Power Producers' Association and any other organization of stakeholders having interest in the field of Biomass Power.

## 46 Use of Fossil Fuel

46.1 The Commission would like to emphasize that the prime objective of the Regulations is to promote usage of biomass for energy generation. Therefore, if usage of fossil fuel is allowed, the very objective of using clean fuel shall be defeated. Thus, considering the necessity to promote the usage of biomass as fuel in the power projects, the Commission proposes not to allow the usage of fossil fuel in biomass-based power projects.

## 47 Monitoring Mechanism for the use of fossil fuel

47.1 The Commission proposes that the Project Developer shall furnish a monthly fuel usage statement and monthly fuel procurement statement duly certified by Chartered/Cost Accountant to the beneficiary (with a copy to appropriate agency appointed by the Commission for the purpose of monitoring the fossil and non-fossil fuel consumption) for each month, along with the monthly energy bill raised for the power generated.

47.2 Non-compliance with the condition of fossil fuel usage by the Project Developer during any financial year, shall result in withdrawal of applicability of tariff as per these Regulations for such biomass-based power project.

## 48 Revenue Generation from the By-product

48.1 The Commission is of the view that any revenue that is generated from the by products like fertilizers or charcoal shall also be considered while determining the Tariff.

# Chapter 8: Technology specific parameters for Biomass Gasifier Power Projects

## 49 Technology Aspect

The norms for tariff determination specified hereunder are for biomass gasifier-based power projects.

## 50 Capital Cost

The Commission shall determine only project specific capital cost and tariff based on prevailing market trends for Biomass Gasifier project based on the Petition filed by Project Developer and after due diligence of the same by the Commission.

## 51 Plant Load Factor

The proposed threshold PLF for determining fixed charge component of tariff shall be 85%, in accordance with CERC RE Tariff Regulations, 2017.

## 52 Auxiliary Consumption

The proposed auxiliary power consumption factor shall be 10% for the determination of tariff, in accordance with CERC RE Tariff Regulations, 2017.

## 53 Operation and Maintenance Expenses

The proposed normative O&M expenses for the first year of the Control period (i.e., FY 2019-20) shall be Rs. 52.83 Lakh per MW.

## 54 Fuel Mix

54.1 The Commission proposes that the Biomass Gasifier based power plant shall be designed in such a way that it uses different types of non-fossil fuels available within the vicinity of biomass power project such as crop residues, agro- industrial residues, forest residues, etc., and other biomass fuels as may be approved by MNRE.

54.2 The Biomass Gasifier based Power Generating Companies shall ensure fuel management plan to ensure adequate availability of fuel to meet the respective project requirements.

54.3 The Fuel Price and Calorific Value of Fuel shall be approved by the Commission based on the Petition filed for Project Specific Tariff considering the type of fuel proposed to be used in the Project.

54.4 Biomass fuel price at the time of determination of tariff may be approved by the Commission based on independent study to be carried out by constituting a State/ UT level committee consisting of representatives of State/UT Nodal Agency, State Government, Distribution Licensee, Biomass Power Producers' Association and any other organization of stakeholders having interest in the field of Biomass Power.

# Chapter 9: Technology specific parameters for Biogas based Power Projects

## 55 Technology Aspect

The norms for tariff determination specified hereunder are for grid connected biogas-based power projects that uses 100% Biogas fired engine, coupled with Biogas technology for co-digesting agriculture residues, manure and other bio- waste as may be approved by MNRE.

## 56 Capital Cost

The Commission shall determine only project specific capital cost and tariff based on prevailing market trends for Biogas based project.

## 57 Plant Load Factor

The proposed threshold PLF for determining fixed charge component of Tariff shall be 90% in accordance with CERC RE Tariff Regulations, 2017.

## 58 Auxiliary Consumption

The proposed auxiliary power consumption factor shall be 12% for the determination of tariff, in accordance with CERC RE Tariff Regulations, 2017.

## 59 Operation and Maintenance Expenses

The proposed normative O&M expenses for the first year of the Control Period, i.e., FY 2019-20 shall be Rs. 52.83 Lakh per MW, in accordance with CERC RE Tariff Regulations, 2017.

## 60 Fuel Cost (Feed stock Price)

The Fuel Price and Calorific Value of Fuel shall be approved by the Commission based on the Petition filed for Project Specific Tariff considering the type of fuel proposed to be used in the Project.

# Chapter 10: Technology specific parameters for Power Projects using Municipal Solid Waste / Refuse Derived Fuel and based on Rankine cycle technology

## 61 Technology Aspect

The norms for tariff determination specified hereunder are for power projects which use municipal solid waste (MSW) and refuse derived fuel (RDF) and are based on Rankine cycle technology application, combustion or incineration, Bio-methanation, Pyrolysis and High-end gasifier technologies.

## 62 Capital Cost

The Commission shall determine only project specific Capital Cost and tariff based on prevailing market trends for MSW projects.

## 63 Plant Load Factor

The proposed threshold PLF for determining fixed charge component of tariff for the power projects, which use MSW and RDF shall be as shown under, in accordance to CERC RE Tariff Regulations, 2017.

**Table 24: PLF Proposed for MSW/RDF**

| Sl. No. | PLF | MSW | RDF |
|---|---|---|---|
| a) | First year | 70% | 65% |
| b) | From 2nd year onwards | | 80% |

## 64 Auxiliary Consumption

The proposed auxiliary power consumption for MSW / RDF based power projects shall be 15%, in accordance with CERC RE Tariff Regulations, 2017.

## 65 Station Heat Rate

The Station Heat Rate for MSW/RDF based power projects shall be approved by the Commission while determining the Project Specific tariff.

## 66 Operation and Maintenance Expenses

66.1 The Commission has analysed the O&M expenses of various ERCs as shown under: -

**Table 25: O&M Expenses allowed by SERCs and CERC for MSW/RDF**

| Parameter | CERC | MERC | GERC | RERC | MPERC | KERC | TNERC |
|---|---|---|---|---|---|---|---|
| O&M Expenses | Project specific based on prevailing market trends | 8.87% of Capital Cost | Mass Incineration: 6% of Capital cost,<br>RDF based Incineration: 5% of Capital cost | Rs. 54 Lakhs/MW | 5% of Capital Cost | 6% of Capital Cost | 5.5% of Capital Cost |

66.2 From the Table above, it can be seen that most ERCs have adopted O&M norms ranging from 4-5% of the Capital Cost.

66.3 Hence, the Commission has proposed 5% of Capital Cost for first year for Mainland Area. The Commission has proposed 6% of Capital Cost for first year for Island Area, i.e., 1% higher, owing to the increased transportation costs in the island areas.

## 67 Fuel Cost and Calorific Value

67.1 The Fuel Price and Calorific Value of Fuel shall be approved by the Commission based on the Petition filed for Project Specific Tariff considering the type of fuel proposed to be used in the Project.

**ANNEXURES**

## Reference Orders & Regulations

### CERC

- Central Electricity Regulatory Commission (Terms and Conditions for Tariff determination from RE Sources) Regulations, 2017.

### MERC

- Solar, Wind & Small Hydro- Maharashtra Electricity Regulatory Commission (Terms and Conditions for Determination of Renewable Energy Tariff) Regulations, 2015.
- The Commission vide order dated August 18, 2018 in Case No. 204 of 2018, has considered two approaches for determination of generic tariff for eligible RE Technologies i.e.

  Approach 1: No precedent of competitive bidding,

  Approach 2: Precedent of Competitive Bidding.

### RERC

- Solar/Wind/ Small Hydro- Rajasthan Electricity Regulatory Commission (Terms and Conditions for Determination of Tariff for Renewable Energy Sources -Wind and Solar Energy) Regulations, 2014.
- The Commission on March 5, 2018, has published the Draft RERC (Terms and Conditions of Tariff for Renewable Energy Sources-Wind and Solar Energy) (Second Amendment) Regulations, 2018 and Draft Rajasthan Electricity Regulatory Commission (Terms and Conditions for Determination of Tariff for Renewable Energy Sources – Biomass, Biogas and Biomass Gasifier) (First Amendment) Regulations, 2018, taking into consideration, CERC (Terms and Conditions for Tariff determination from RE Sources) Regulations, 2017.
- MSW- Order dated May 18, 2018 in Petition No. 1195/17 and Petition No. 1221/17 to determine the project specific tariff under the provisions of said Regulations with respect to the upcoming Municipal Solid Waste to Energy plants at Langariawas, Jaipur and Keru dumpsite, Jodhpur.
- Bagasse-Order dated Jan 25, 2018 in Petition No. 1100/17 for determination of Tariff for Renewable Energy Sources- Biomass, Biogas and Biomass Gasifier Energy) Regulations, 2015.
- Biomass-Suo Motu Order dated March 8, 2019, for Determination of generic tariff for sale of electricity to Distribution Licensee from Biomass, Biogas and Biomass Gasifier based power plants getting commissioned in the State during FY 2018-19 and revised variable charges of the Biomass power plants commissioned during the period 2009-2015, FY 2015-16, FY 2016-17 and FY 2017-18.

**GERC**

- Solar- Order No. 3 of 2015, dated August 17, 2015, Determination of tariff for Procurement by Distribution Licensees and others from Solar Energy Projects for the State of Gujarat.
- Wind- Order No. 2 of 2016, dated August 30, 2016, Determination of tariff for Procurement of Power by the Distribution Licensees and others from Wind Power Projects.
- MSW- Order No.4 of 2016, dated November 10, 2016, Determination of Tariff and other terms and conditions for Procurement of Power by Distribution Licensees Municipal Solid Waste to Energy Projects in the State of Gujarat.
- Biomass & Bagasse- Determination of Tariff for Procurement of Power by the Distribution Licensees and Others from Biomass based Power Projects and Bagasse based Co-generation Projects for Control Period up to FY 2019-20.vide Tariff Order dated 15th March 2018
- Small Hydro- Order no. 5 of 2016 dated 14.12.2016, i.e. Determination of Tariff and other terms & conditions for procurement of Power by Distribution Licensees from small, mini and micro hydro power projects in the State of Gujarat

**TNERC**

- Solar-Order on generic tariff for Solar Power and related issues vide Order No.5 of 2019 dated March 29, 2019.
- Wind-Order on generic tariff for Wind Power and related issues vide Order No.6 of 2018 dated April 13, 2018
- MSW-Comprehensive Tariff Order for Municipal Solid Waste (MSW) based Power Plants vide Tariff Order dated 28th March, 2017
- Bagasse & Biomass-Power procurement by Distribution Licensee from Bagasse based Co-generation plants and allied issues relating to captive use and third party sale vide Tariff Order dated 28th March 2018.

**MPERC**

- Solar- Tariff Order for Solar Energy based Power Generation vide order dated August 8, 2016, SMP 25/2016.
- Wind-Tariff Order for Procurement of Power from Wind Electric generators vide order dated March 3, 2016, SMP 74/2015.
- MSW- Tariff Order for Procurement of Power from Wind Electric generators vide order dated March 3, 2016, SMP 74/2015.
- Bagasse- Extension of control period for the tariff order dated 01.04.2013 for procurement of power from Bagasse based cogeneration power projects in Madhya Pradesh vide Tariff Order dated 4th May, 2017
- Biomass-Tariff Order for procurement of power from Biomass based Power Projects vide tariff order dated 2nd March 2012, in the matter of compliance to the judgment passed by the Hon'ble Appellate Tribunal for Electricity in Appeal No. 211 of 2015 vide Order dated: 30th Nov, 2016

- Small Hydro- Tariff Order for Procurement of Power from Small hydro power projects in Madhya Pradesh vide order dated December 21, 2018, SMP 18/2018.

**KERC**

- Solar- Generic Tariff Order for new Solar Power Projects vide order dated May 18, 2018.
- Wind- Generic Tariff Order for Wind Power Projects vide order dated February 27, 2019.
- MSW- Determination of tariff from Municipal Solid Waste based Power Plants vide Tariff Order dated 19th Sept 2016.
- Bagasse/Biomass/ Small Hydro- Determination of tariff in respect of Mini-Hydel, Bagasse based Co-Generation and Rankine cycle based Bio-mass Renewable Energy Power Projects vide Tariff Order dated 14th May, 2018

**PSERC**

- Suo Motu Order i.e. Petition No. 23 of 2018 dated August 9, 2018, Determination/fixation of levelized generic tariff for Renewable Energy Power Projects for FY 2018-19.

**HERC**

- (Terms and Conditions for determination of Tariff from Renewable Energy Sources, Renewable Purchase Obligation and Renewable Energy Certificate) Regulations, 2017.