OFFICE OF THE
NAGALAND ELECTRICITY REGULATORY COMMISSION (NERC)
NAGALAND : KOHIMA

NOTIFICATION

Dated Kohima, the 30th Aug.2011

No.NERC/REGN/2011: In exercise of powers conferred under Section 61, 86 read with Section 181 of the Electricity Act, 2003 (36 of 2003) and all other powers enabling it in this behalf, and after previous publication, the Nagaland Electricity Regulatory Commission (NERC), Kohima hereby makes the following regulations, namely:

CHAPTER: 1

PRELIMINARY

1. Short title and commencement

(1) These regulations shall be called the Nagaland Electricity Regulatory Commission (**Terms and Conditions for Determination of Generation Tariff for Renewable Energy**) Regulations, 2011.

(2) These regulations shall come into force from the date of their publication in the Official Gazette of Nagaland.

(3) These regulations shall extend to the whole of the State of Nagaland.

2. DEFINITIONS. - In these regulations, unless the context otherwise requires,

(1) **"Act"** means the Electricity Act, 2003 (36 of 2003);

(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) **"Banking"** means the process under which a generating station supplies power to the grid not with the intention of selling it to either a third party or to a licensee, but with the intention of exercising its eligibility to draw back this power from the grid.

(4) **"Bank rate"** means the bank rate of Reserve Bank of India;

(5) **"Biomass"** means wastages produced during agricultural and forestry operations (for example straws and stalks) or produced as a by-product of processing operations of agricultural produce (eg. 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.

(6) **"Capital Cost"** means capital cost as defined under Regulation 15 of these Regulations.

(7) **'Central Commission' or 'CERC'** shall mean Central Electricity Regulatory Commission referred to in sub-section (1) of Section 76 of the Act;

(8) **'CERC RE Tariff Regulations'** shall mean Central Electricity Regulatory Commission (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2009, as amended from time to time.

(9) **"Commission"** means the Nagaland Electricity Regulatory Commission;

(10) **"Current Year"** means the year in which the Aggrezgate Revenue Requirement petition or petition for determination of tariff is to be filed;

(11) **'Date of Commercial Operation (or) Commissioning'** in relation to a unit means the date declared by the generator on achieving maximum continuous rating through a successful trail run and in relation to the generating station, the date of commercial operation means the date of commercial operation of the last unit or block of generating station and expression "commissioning" shall be construed accordingly. In case of small hydro plants the date of commissioning shall, however, not be linked to achieving maximum continuous rating, but the generator will have to demonstrate the same within three years of commissioning.

(12) **'Existing RE Project'** means the renewable energy project whose date of commissioning falls prior to date of notification of these Regulations;

(13) **"Ensuing Year"** shall mean the year immediately following the current year ;

(14) **"Force Majeure Event"** means event beyond the reasonable control of the generating company or the licensee, including, but not limited to earthquake, cyclone, flood, storm, war, terrorist attack, civil commotion or other similar occurrence that lead to any act that would involve a breach of relevant laws or Regulations;

(15) **'Gross Station Heat Rate' or 'SHR'** means the heat energy input in kcal required to generate one kWh of electrical energy at generator terminals of a thermal generating station;

(16) **'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;

(17) **'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 the line isolator on outgoing feeder on HV side of the pooling sub-station;

Provided the Pooling Sub-station shall mean the sub-station at project site of the wind farm or solar power plant, as the case may be, and shall constitute step-up transformer and associated switchgear, and to the LV side of which, multiple (more than one) generating unit(s) (i.e. wind turbine generators or solar PV modules/arrays/inverter units) are connected.

ii) In relation to mini/micro hydro power, small hydro power, biomass power and non-fossil fuel based co-generation power projects and Solar Thermal Power Projects the, inter-connection point shall be the line isolator on outgoing feeder on HV side of generator transformer;

(18) **"Integrated Utility"** means the Department of Power in the State of Nagaland , in its present form or the successor entities performing more than one of the functions of generation, transmission and distribution after restructuring thereof ;

(19) **'MNRE'** means the Ministry of New and Renewable Energy of the Government of India.

(20) **'New RE Project'** means the renewable energy project whose date of commissioning shall be subsequent to the date of notification of these Regulations;

(21) **'Non-firm power'** means the power generated from renewable sources, the hourly variation of which is dependent upon nature's phenomenon like sun, cloud, wind, etc., that cannot be accurately predicted.

(22) **"Non-fossil Fuel Based Co-generation"** means the process in which more than one form of energy (such as steam and electricity) are produced in a sequential manner by use of biomass provided the project may qualify to be a co-generation project if it fulfills the eligibility criteria as specified in Regulation 4 (2) (e).

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

(24) **"Open Access Customer"** means (a) a consumer permitted by the Commission to receive supply of electricity from a person other than distribution licensee of his area of supply, or (b) a generating company (including captive generating plant) or (c) a licensee, who has availed or intends to avail of Open Access in accordance with the regulations of the Commission for grant of open access to the transmission lines and the distribution system of a licensee;

(25) **"Open Access Regulations"** means the regulations notified by the Commission for grant of open access to the transmission lines and the distribution system of a licensee ;

(26) **'Project'** means a generating station or the evacuation system upto 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;

(27) **"Previous Year"** means the year immediately preceding the current year;

(28) **'Renewable Energy'** means the electricity generated from renewable energy sources.

(29) **'Renewable Energy Power Plants'** means the power plants other than the conventional power plants generating grid quality electricity from renewable energy sources.

(30) **'Renewable Energy Sources'** means renewable sources such as mini, micro and small hydro, wind, solar, biomass including bagasse, bio fuel co-generation, urban or municipal waste and such other sources as recognized or approved by the MNRE;

(31) **'Small Hydro'** means Hydro Power projects with a station capacity more than 1 MW and up to and including 25 MW.

(32) **'Solar PV power'** means the Solar Photo Voltaic power projects that uses sunlight for direct conversion into electricity through Photo Voltaic technology.

(33) **'Solar rooftop PV and other small solar power'** means the Solar rooftop or other small solar Photo Voltaic power projects that uses Photo Voltaic technology for generation of electricity, which are mounted on rooftop of

buildings or ground mounted installations, and satisfying any other eligibility criteria as may be specified by MNRE from time to time.

(34) **"State"** means the State of Nagaland;

(35) **"Tariff"** means the schedule of charges for generation of electricity determined by the Commission from time to time;

(36) **'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, non-fossil fuel co-generation	20 years
c) Mini/Micro and Small Hydro Power Plants	35 years
d) Solar PV/Solar thermal power plants	25 years
e) Solar rooftop PV systems and small ground mounted PV systems	25 years

(37) **"Year"** means financial year ending on 31st March.

Words or expressions occurring in these Regulations and not expressly defined herein shall bear the same meaning as respectively assigned to them in the Act.

3. Scope and extent of application

(1) These regulations shall apply in all cases where tariffs for generation and sale of electricity from Renewable Energy Sources to the distribution licensees within the State of Nagaland, are to be determined by the Commission under Section 62 of the Act.

Provided that in case of wind, mini/micro hydro projects, small hydro projects, biomass power, non-fossil fuel based cogeneration projects, solar PV, Solar Thermal, Solar rooftop PV and other small solar power projects, these regulations shall apply subject to the fulfillment of eligibility criteria specified in Regulation 4 of these Regulations.

(2) The generating stations covered under these regulations shall be deemed to be the generating stations of a generating company and all functions, obligations & duties assigned to such generating company under the Electricity Act, 2003 shall apply to these generating stations.

CHAPTER: 2

GENERAL CONDITIONS

4. Eligibility Criteria for qualifying as Generating Station based on Non-Conventional/ Renewable Energy Source

(1) For the purposes of these regulations, generation from all types of Renewable Energy Sources and non-fossil fuel based Co-generating Plants, as approved by Ministry of New and Renewable Energy (MNRE), Government of India shall be considered and such generating stations shall be collectively referred to as RE Based Generating Stations and Co-generating Stations.

(2) At present, generation from following sources and technologies shall qualify to be covered under these regulations:

(a) **Small hydro Project** – Generating Stations with capacity lower than or equal to 25 MW at single location, using new plant and machinery.

(b) **Wind power project** – located at the wind sites having minimum annual mean Wind Power Density (WPD) of 200 Watt/m^2 measured at hub height of 50 meters and using turbine generators.

(c) **Solar PV and Solar Thermal Power Projects**– Based on Technologies approved by MNRE.

(d) **Biomass power project** - Biomass power projects using new plant and machinery based on Rankine Cycle technology and using biomass fuel sources, provided use of fossil fuel is restricted only to 15% of total fuel consumption on annual basis;

(e) Non-fossil fuel based Co-generating Stations using new plant and machinery;

Topping cycle mode of co-generation – Any facility that uses non-fossil fuel input for the power generation and also utilizes the thermal energy generated for useful heat applications in other industrial activities simultaneously.

Provided that for the co-generation facility to qualify under topping cycle mode, the sum of useful power output and one half the useful thermal output be greater than 45% of the facility's energy consumption, during season.

Explanation- For the purpose of this clause,

(i) “Useful power output” is the gross electrical output from the generator. There will be an auxiliary consumption in the cogeneration plant itself (e.g. the boiler feed pump and the FD/ID fans). In order to compute the net power output it would be necessary to subtract the auxiliary consumption from the gross output. For simplicity of calculation, the useful power output is defined as the gross electricity (kWh) output from the generator.

(ii) “Useful Thermal Output” is the useful heat (steam) that is provided to the process by the cogeneration facility.

(iii) “Energy Consumption” of the facility is the useful energy input that is supplied by the fuel (normally bagasse or other such biomass fuel).

(f) Solar rooftop PV systems and other small Solar Power Projects – Based on Technologies approved by MNRE.

(g) Municipal waste based power plants – Based on Technologies approved by MNRE.

(3) Any new source or technology would qualify as “renewable energy”, only after the Commission has approved the technology based on MNRE approval. Further, the Commission shall determine tariffs separately for each technology.

(4) Under Section 14 of the Act no license is required for generation and distribution of power in notified rural areas. Hence, stand alone solar PV power project and solar thermal power project supplying to rural areas will not have the tariffs determined by Regulator.

5. Obligations and duties of the Generating Station

(1) RE based Generating Stations and Co-generating Stations shall indicate the capacity of its generating plant in the “Detailed Project Report” (DPR) keeping in view the potential of electricity generation available from such source and its optimal utilization. It shall further be obliged to submit the DPR, progress of construction and details regarding commissioning of the generating plant or any other related information to the Commission in such form and manner as may be required by the Commission.

(2) The RE based Generating Stations and Co-generating Stations shall:

(a) Submit the information in respect to generation, demand met, capacity availability, capacity utilization factor, auxiliary consumption, specific heat rate and specific oil consumption or on any other parameters etc. as may be directed by the Commission.

(b) Shall establish a communication and data transfer system with State Load Dispatch Centre and Co-ordinate with State Load Dispatch Centre.

(i) Scheduling

(ii) Exchange of data of quantity of electricity transmitted through the grid.

(iii) Real time grid operation and dispatch of electricity in accordance with IEGC and State Grid Code.

(3) The RE based Generating Stations and Co-generating Stations shall abide by the grid discipline and install adequate protection equipment for safety of its system and human life.

(4) The RE based Generating Stations and Co-generating Stations shall establish, operate and maintain generating station, substation and dedicated transmission lines connected therewith (without the requirement of a licence) in accordance with:

(a) The technical standards for construction of electrical plants, electric lines and connectivity with the grid as specified by the Authority (section 73 (b) of the EA 2003).

(b) Safety requirements for construction, operation and maintenance of electrical plants and electric lines as specified by the Authority (section 73 (c) of the EA 2003).

(c) Grid standards for operation and maintenance of transmission lines as specified by Central Electricity Regulatory Commission/Central Electricity Authority or the State Transmission Utility (section 73 (d) of the EA 2003).

(d) The conditions for installation of meters for supply of electricity as specified by the Authority or the State Transmission Utility (section 73 (e) of the EA 2003).

(5) The RE based Generating Stations and Co-generating Stations shall ensure the compliance of the “IEGC” and State Grid Code as amended from time to time.

(6) The RE based Generating Stations and Co-generating Stations shall ensure compliance of any general or specific direction issued and regulations made by the Commission for the generating companies.

(7) Power Purchase Agreements signed by the generating stations existing on the date of notification of these regulations shall be renewed in accordance with these regulations and such renewed PPAs shall be valid for entire life of the RE based Generating Stations and Co-generating Stations.

(8) The RE based Generating Stations and Co-generating Stations shall ensure economical use of resources, good performance and optimum investment at all times and shall endeavor to achieve the operational parameters as applicable to a particular source of energy, such as auxiliary consumption, heat rate, fuel consumption, capacity availability, capacity utilization factor etc. in case of a non-fossil fuel based co-generating station, as may be specified/determined by the Commission from time to time for fixation of tariff for different renewable source of energy.

(9) The RE based Generating Stations and Co-generating Stations shall coordinate with State Transmission Utility/Distribution Licensee for the purpose of planning and coordination relating to intra-state transmission/distribution system as provided under the Act.

(10) The RE based Generating Stations and Co-generating Stations shall pay fee and charges to the State Load Dispatch Centre as may be specified or directed by the Commission from time to time.

(11) The RE based Generating Stations and Co-generating Stations shall be under obligation to comply with the directions issued to it by the State Load Dispatch Centre.

(12) In case of dispute with reference to quality of electricity or safe, secure and integrated operation of the grid or in relation to any direction issued by the State Load Dispatch Centre, the matter shall be referred to the State Grid Coordination Committee.

6. Sale of Power

(1) All RE based Generating Stations and Co-generating Stations shall be allowed to sell power, over and above the capacity required for their own use, to the distribution licensee or to local rural grids at the rates determined by the Commission or to any consumer (provided that such consumer has been allowed Open Access under Open Access Regulations) or to any person within the State or outside the State at mutually agreed rates provided that

such sale outside the State is not in contravention to any Policy notified by the State Government or to any provision of any legally enforceable existing agreement signed by generating company with any person.

(2) The distribution licensee on an offer made by the said RE based Generating Stations and Co-generating Stations shall enter into a power purchase agreement in conformity with these Regulations and relevant provisions of other Regulations and the Act. The distribution licensee shall sign the PPA within two months of offer made by the generating company, failing which the generating company may approach the Commission for suitable remedy.

(3) The distribution licensee shall make an application for approval of power purchase agreement entered into with the generating station.

7. Open Access

(1) Open access in State Transmission/Distribution System shall be allowed to all RE based Generating stations and Co-generating Stations for captive use and to those covered under Regulation 6 (1), which shall be subject to provisions of these regulations.

(2) <u>Open Access in State Transmission System:</u>

A person, who has established the RE based Generating Stations or Co-generating Stations, shall have right to non-discriminatory open access to the State Transmission System for carrying electricity from his plant by using transmission lines and associated facilities subject to payment of transmission charges and adjustment of average Transmission Losses in kind as determined by the Commission.

Provided that the “open access” shall be subject to the availability of surplus transmission capacity as determined by State Transmission Utility.

(3) <u>Open Access in Distribution System:</u>

(a) For sale of electricity within the State, non-discriminatory open access to the distribution system of State distribution licensee shall be available to such RE based Generating Stations and Co-generating Stations, who have entered into an agreement to sell power to any consumer within the State or require power for their own captive use.

(b) Open access to State Distribution System may also be available to RE based Generating Station or Co-generating Station for sale of electricity outside the State.

Provided that State Distribution Licensee is in agreement with above Generating Station for wheeling such power outside the State through its system.

(c) Such open access to State distribution system shall be subject to payment of wheeling charges and adjustment of average distribution losses in kind as determined by the Commission.

(d) The “open access” to State Distribution System shall be subject to the availability of surplus distribution capacity in the State Distribution System.

(e) If any question arises as to the availability of surplus capacity in the State transmission system or the State distribution system, the matter shall be adjudicated and decided by the Commission.

CHAPTER: 3

PETITION AND PROCEDINGS FOR DETERMINATION OF TARIFF

8. Control Period or Review Period

The Control Period or Review Period under these regulations shall be of three (3) financial years. First year of the Control Period shall commence from the date of notification of these regulations and shall cover upto the end of financial year 2014-15.

Provided further 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 9 below;

Provided also that the revision in regulations for next Control Period shall be notified separately 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.

9. Tariff Period

1) The Tariff Period for Renewable Energy power projects except in case of Small hydro projects below 5 MW, Mini/Micro Hydro projects, Solar PV, Solar thermal power projects, Solar rooftop PV and other small Solar power projects shall be thirteen (13) years.
2) In case of Small hydro projects below 5 MW and Mini/Micro Hydro projects, the Tariff Period shall be thirty five (35) years.
3) In case of Solar PV, Solar thermal power projects, Solar rooftop PV and other small Solar power projects, the Tariff Period shall be twenty five years (25) years.
4) Tariff Period under these regulations shall be considered from the date of commercial operation of the renewable energy generating stations.
5) Tariff determined as per these regulations shall be applicable for Renewable Energy power projects, only for the duration of the Tariff Period as stipulated under Regulation 9 (1), (2) and (3).

10. Project Specific tariff

1) Project specific tariff, for generation of electricity from renewable energy sources on case to case basis, shall be determined by the Commission.

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 Regulations / Orders of the Commission.

   Provided that the financial norms as specified under Chapter-4 of these Regulations, except for capital cost and O&M cost, shall be ceiling norms while determining the project specific tariff.

11. Petition and proceedings for determination of tariff

1) A petition for determination of project specific tariff shall be accompanied by such fee as may be determined by regulations and shall be accompanied by
   a) Information in Forms 1.1, 1.2, 2.1 and 2.2 as the case may be, and as appended to these regulations;
   b) Detailed project report outlining technical and operational details, site specific aspects, premise for capital cost and financing plan, etc.
   c) A Statement of all applicable terms and conditions and expected expenditure for the period for which tariff is to be determined.
   d) 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. This statement shall also include the proposed tariff calculated without consideration of the subsidy and incentive.
   e) Any other information that the Commission requires the Petitioner to submit.

2) The proceedings for determination of tariff shall be in accordance with the Conduct of Business Regulations.

12. Tariff Structure

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) Depreciation;

c) Interest on loan capital;

d) Interest on working capital;

e) Return on equity;

Provided that for renewable energy technologies having fuel cost component, like biomass power projects and non-fossil fuel based co-generation projects, single-part tariff with two components, viz., fixed cost component and fuel cost component, shall be determined.

13. Tariff Design

1) The tariff shall be determined on levellised basis for the Tariff Period.
   Provided that for renewable energy technologies having single-part tariff with two components, tariff shall be determined on levellised basis considering the year of commissioning of the project for fixed cost component while the fuel cost component shall be specified on year of operation basis.
2) For the purpose of levellised tariff computation, the discount factor equivalent to normative weighted average cost of capital shall be considered.
3) Levellisation shall be carried out for the 'useful life' of the Renewable Energy project while tariff shall be specified for the period equivalent to 'Tariff Period'.

14. Despatch principles for electricity generated from Renewable Energy Sources:

1) All renewable energy power plants except for biomass power plants with installed capacity of 10 MW and above and non-fossil fuel based co-generation plants shall be treated as 'MUST RUN' power plants and shall not be subjected to 'merit order despatch' principles.
2) The biomass power generating station with an installed capacity of 10 MW and above and non-fossil fuel based co-generation projects shall be subjected to scheduling.

CHAPTER: 4

FINANCIAL PRINCIPLES

15. Capital Cost

The benchmark norms for the Capital Cost as specified in the subsequent technology specific chapters shall be inclusive of all capital works including plant and machinery, civil works, erection and commissioning, financing costs, preliminary and pre-operative expenses, 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 11.

16. Debt Equity Ratio

(i) For suo-motu determination of generic tariff, the debt equity ratio shall be 70: 30.

(ii) For project specific tariff, the following provisions shall apply:

If the equity actually deployed is more than 30% of the capital cost, equity in excess of 30% shall be treated as normative loan.

Provided that where equity actually deployed is less than 30% of the capital cost, the actual equity shall be considered for determination of tariff;

Provided further that the equity invested in foreign currency shall be denominated/ designated in Indian rupees on the date of each investment.

Provided further that the equity invested in foreign currency shall be designated in Indian rupees on the date of each investment.

17. Interest Rate on Loan Capital

(1) The loans arrived at in the manner indicated above shall be considered as gross normative loan for calculation of interest on loan. The normative loan outstanding as on April 1st of every year shall be worked out by deducting the cumulative repayment up to March 31st of previous year from the gross normative loan.

(2) For the purpose of computation of tariff, the normative interest rate shall be considered as average long term prime lending rate (LTPLR) of State Bank of India (SBI) prevalent during the previous year plus 150 basis points.

(3) 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.

(4) Normative period of loan repayment shall be considered as 10 years.

18. Depreciation

(1) For the purpose of tariff the depreciation shall be computed in the following manner.

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

(b) 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.

(c) Annual Depreciation shall be based on 'Differential Depreciation Approach' using 'Straight Line Method'.over two distinct periods comprising loan tenure and period beyond loan tenure over useful life. The depreciation rate for the first 10 years of the Tariff Period shall be 7% per annum and the remaining depreciation shall be spread over the remaining useful life of the project from 11th year onwards.

(d) 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.

(2) Capital subsidy received by the generator shall not be reduced from the capital cost for depreciation purposes. However, the generator will have to carry out any renovation or replacement or additional capitalization.

19. Return on Equity

(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 15.

(2) The normative Return on Equity shall be:

a) Pre-tax 19% per annum for the first 10 years.

b) Pre-tax 24% per annum 11th year onwards.

20. Interest on Working Capital

(1) The Working Capital requirement in respect of wind energy projects, small hydro power, solar PV and Solar thermal power projects shall be computed as under:

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 spare @ 15% of operation and maintenance expenses.

(2) The Working Capital requirement in respect of biomass power projects and non-fossil fuel based co-generation projects shall be computed as under:

(1) Fuel costs for four months equivalent to normative CUF;

(2) Operation & Maintenance expense for one month;

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

(4) Maintenance spare @ 15% of operation and maintenance expenses.

(3) Interest on Working Capital shall be at interest rate equivalent to average State Bank short term PLR (SBAR) during the previous year plus 100 basis points.

21. Operation and Maintenance Expenses

(1) 'Operation and Maintenance or O&M expenses' shall comprise repair and maintenance (R&M), establishment including employee expenses, and administrative and general expenses including insurance.

(2) Operation and maintenance expenses shall be determined for the Tariff Period based on normative O&M expenses specified by the Commission subsequently in these Regulations for the first Year of Control Period.

(3) Normative O&M expenses allowed during first year of the Control Period (i.e. FY 2010-11) under these Regulations shall be escalated at the rate of 5.72% per annum over the Tariff Period.

22. Rebate

(1) For payment of bills of the generating company through letter of credit, a rebate of 2% shall be allowed.

(2) Where payments are made 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.

23. Late payment surcharge

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

24. Sharing of CDM benefits

The proceeds of carbon credit from approved CDM project shall be shared between generating company and concerned beneficiaries in the following manner, namely-

a) 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;

b) In the second year, the share of the beneficiaries 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 beneficiaries.

c) The CDM benefits shall not be considered for determination of levellised or yearly tariff and total amount of proceeds shall be remitted directly by the generating company to the distribution licensee for each financial year within one month of its receipt along with auditor's certification in accordance with above provisions.

25. Subsidy or incentive by the Central/State Government

(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:

a) 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.

b) Capitalisation of RE projects during second half of the fiscal year.
c) Per unit benefit shall be derived on levellised basis at discount factor equivalent to weighted average cost of capital.

Provided further that incase any Central Government or State Government notification specifically provides any generation based incentive over and above tariff, the same shall not be factored in while determining the tariff.

26. Taxes and Duties

Tariff determined under these Regulations shall be exclusive of taxes and duties on generation and sale of electricity from renewable energy project as may be levied by the appropriate Government:

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

CHAPTER: 5

TECHNOLOGY SPECIFIC PARAMETERS FOR WIND ENERGY PROJECTS

27. Capital Cost

The Capital Cost for wind energy projects shall include wind turbine generator including its auxiliaries, land cost, site development charges and other civil works, transportation charges, evacuation cost upto inter-connection point, financing charges and interest during construction (IDC). There is significant progress in development of technology in respect of wind energy that has resulted in higher capacity machines. MNRE has also stated that the cost could fall due to expansion of market.

CERC in the (Terms and Conditions for Tariff determination from Renewable Energy Sources), Regulations, 2009 has specified the normative capital cost for wind energy projects as Rs. 515 lakh / MW for 2009-10. In the statement of Objects and Reasons, CERC has stated that *"the capital cost as proposed under Regulations was proposed after in depth analysis of capital cost for different projects either financed by IREDA or registered with UNFCC for the purpose of CDM benefits. Further, capital cost norms for FY 2009-10 was worked out after considering the capital cost data for past 5 years and escalating it with indexation formula. Further, MNRE has conveyed that the capital cost for IREDA funded projects in recent past has been around 5.60 Cr / MW but considering the other norms and largest project database as considered by CERC, the capital cost of Rs. 5.15 Cr / MW is reasonable".* The CERC has revised the normative capital cost of the wind energy projects as Rs. 4.67 Crore / MW for FY 2010-11 in the Terms and Conditions for Tariff determination from Renewable Energy Sources (First Amendment) Regulations, 2010, in line with the indexation mechanism.

The Commission after taking into consideration of the above aspects has specified a benchmark capital cost of Rs. 4.67 Crore / MW for FY 2010-11 i.e., during the first year of control period and which will be revised for projects to be commissioned in each subsequent year, linked to capital cost indexation formula.

28. Capital Cost Indexation Mechanism

The indexed Capital Cost in case of wind energy projects for each year of the Control Period shall be notified pursuant to issuance of such indexed capital cost for wind energy projects by Central Electricity Regulatory Commission in

accordance with indexation mechanism stipulated under CERC Terms and Condition for Tariff Determination from Renewable Energy Sources, Regulations 2009.

29. Capacity Utilization Factor

Capacity utilization factor (CUF), for wind energy projects depends on several factors such as wind velocity, air density, capacity and performance of machine, age of machine, height of the hub and length of the blade. Capacity utilization factor is a vital parameters influencing the viability of a wind energy project at a particular site.

CERC in the RE Regulations 2009 has specified norms for CUF as given below.

Sl. No.	Annual Mean Wind Power Density Watt / M^2	Capacity utilization Factor
1	200-250	20 %
2	250-300	23 %
3	300-400	27 %
4	Above 400	30 %

In the statement of objections and reasons of RE Regulations, 2009 CERC has stated as under.

(1) In the draft Regulations, the norms for capacity utilization factor were specified on the basis of annual mean wind power density, in which wind sites were grouped in five zones. The idea behind such approach was that the energy generation from wind is very site specific and varies considerably from one site to another. Therefore, norms should be set on the parameters which actually govern the energy generation. The norms have been specified on single parameter basis i.e. on WPD basis for ease of its implementation.

(2) Further, as regards the suggestion of considering hub-height as well while specifying CUF norms, the Commission is of the view that WPD will be different at different heights due to variation in prevailing wind velocity at different heights. On the basis of micrositing and wind resource survey, any wind site would be most suitable for a particular type of machine at a specified hub-height. For operationalisation purpose, it has been mentioned that wind power density mentioned in the Regulations shall be annual mean wind power density measured at 50m hub-height.

(3) Centre for Wind Energy Technology (C-WET), specified to group the WPD on the basis of wind resource assessment carried out by them in four groups of annual mean wind power density range i.e. 200-250 W/m_2, 250-300 W/m_2, 300-400

W/m2, and above 400 W/m2. C-WET further mentioned that it is in process of preparing the detailed State-wise Wind Atlas which will take some more time. C-WET also provided the State-wise Wind Power Density map, indicating the different annual mean wind power density zones.

CERC in their (Terms and Conditions for Tariff determination from Renewable Energy Sources) (First Amendment) Regulation, 2010 has provided the same norms of CUF for FY 2010-11.

The Commission in consideration of the above aspects has specified the benchmark CUF norm for wind energy projects for FY 2010-11 as given below.

S.No	Annual Mean Wind Power Density Watt / M^2	Capacity utilization Factor
1	200-250	20 %
2	250-300	23 %
3	300-400	27 %
4	Above 400	30 %

The annual mean wind power density specified above shall be measured at 50 metre hub height.

For the purpose of classification of wind energy project into a particular wind zone class, the state wise wind power density map prepared by the centre for Wind Energy Technology (C-WET) shall be considered.

30. Operation and Maintenance Expenses

Considering the O&M expenses norms specified by different SERCs in their Tariff Orders, CERC in the RE Regulations 2010 has specified O&M cost norm for Wind Energy as Rs. 6.87 lakhs / MW for FY 2010-11 which shall be escalated at the rate of 5.72 % per annum over the tariff period for determination of the levellised tariff.

The Commission in accordance with the above has specified a benchmark norms of O&M expenses for the first year of control period i.e., FY 2010-11 as 6.87 lakh per MW. The normative O&M expenses shall be escalated at the rate of 5.72% per annum over the tariff period to compute the levellised tariff.

CHAPTER: 6

TECHNOLOGY SPECIFIC PARAMETERS FOR SMALL HYDRO PROJECTS

31. Capital Cost

Considering the MNRE recommendations and other aspects CERC has considered the norms for capital cost as given below in the RE Tariff Regulations, 2009.

S.No	Particulars	Capital Cost
1	SHP located in Uttarkhand, Himachal Pradesh, North Eastern Region	
a	Less than 5 MW	Rs. 700 Lakh / MW
b	5 MW to 25 MW	Rs. 630 lakh / MW
2	SHP located in other parts of country	
a	Less than 5 MW	Rs. 550 lakh / MW
b	5 MW to 25 MW	Rs. 500 lakh / MW

In line with indexation mechanism specified in the R.E Tariff Regulations, 2009, CERC has revised the normative capital cost for FY 2010-11 for Small Hydro Projects in the Terms and Conditions for Tariff determination from Renewable Energy Sources (First Amendment) Regulations 2010 as given below.

Region	Project	Capital Cost (Rs. lakh / MW)
Himachal Pradesh, Uttarakhand and North Eastern State	Below 5 MW 5 MW to 25 MW	635 571
Other States	Below 5 MW 5 MW to 25 MW	499 454

The Commission in consideration of the above aspects has specified a benchmark normative capital cost for small Hydro Projects during for FY 2010-11 as given below.

S.No	Project Size	Capital Cost (Rs. lakh / MW)
1	Below 5 MW	635
2	5 MW to 25 MW	571

However, the above figures are normative and subject to changes based on changes in MNRE rates & wholesale Price Index of Steel & Electrical Machinery.

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 11.

The capital cost for subsequent years shall be revised for projects to be commissioned in each subsequent year linked to capital cost indexation formula.

32. Capital Cost Indexation Mechanism

The indexed Capital Cost in case of Small Hydro projects for each year of the Control Period shall be notified pursuant to notification of such indexed capital cost for Small Hydro projects by Central Electricity Regulatory Commission in accordance with indexation mechanism stipulated under CERC RE Tariff Regulations, 2009.

33. Capacity Utilization Factor

The capacity utilization factor would be considered on the basis of CUF of small hydro projects in the state while approving the tariff. The benchmark capacity utilization factor for small hydro projects will be 30%.

Explanation:

For the purpose of these Regulations normative CUF is net of free power to the home state if any, and any quantum of free power if committed by the developer over and above the normative CUF shall not be factored into the tariff.

34. Auxiliary Consumption

Normative auxiliary consumption for Small Hydro Projects shall be 1.0 %.

35. Operation and Maintenance Expenses

CERC has considered the normative O&M expenses for small projects for the year 2009-10 as given below.

Region	**Project**	**O&M Expenses (Rs. lakh / MW)**
Himachal Pradesh, Uttarakhand and North Eastern State	Below 5 MW	22
	5 MW to 25 MW	15.86
Other States	Below 5 MW	17.97
	5 MW to 25 MW	12.69

CERC has stated in the statement of objection / reasons that the norms for O&M expenses have been specified after normalizing the O&M expense norms considered by different SERCs for small hydro projects.

Considering the escalation at a rate of 5.72 % as provided in the RE Tariff Regulations, 2009, CERC revised the normative O&M expenses for small hydro projects for the year 2010-11 as given below.

Region	**Project**	**O&M Expenses (Rs. lakh / MW)**
Himachal Pradesh, Uttarakhand and North Eastern State	Below 5 MW	22.20
	5 MW to 25 MW	15.86
Other States	Below 5 MW	17.97
	5 MW to 25 MW	12.69

The Commission in accordance with the above aspects has specified normative O&M expenses for the first year of the control period i.e., FY 2010-11 as given below.

Project Size	O&M Expenses (Rs Lakh / MW)
Below 5 MW	22.20
5 MW to 25 MW	15.86

Normative O&M expenses allowed under these Regulations shall be escalated at the rate of 5.72 % per annum for the tariff period for the purpose of determination of levellised tariff.

CHAPTER: 7

TECHNOLOGY SPECIFIC PARAMETERS FOR BIOMASS BASED POWER PROJECTS

36. Technology Aspect

The norms for tariff determination specified here under are for biomass power projects based on Rankine Cycle technology application using water cooled condensers.

Majority of the plants in India are based on Rankine Cycle technology. The tariff norms for determination for biomass power projects based on gasification or any other technology other than Rankine Cycle technology will be dealt with on case to case basis.

37. Capital Cost

CERC has specified in the RE Tariff Regulations, 2009, the normative capital cost for the biomass power projects as Rs. 450.00 lakhs / MW for FY 2009-10.

CERC has stated in the statement of objections / reasons as given below:

1. *In order to determine normative capital cost the Commission has analyzed and has taken into consideration the details of the biomass power projects developed through funding assistance from IREDA and also projects which are registered with UNFCCC. The specified norm for Capital Cost are inclusive of Capital works including plant and machinery, civil works, erection and commissioning, financing and interest during construction, and evacuation infrastructure upto interconnection point.*
2. *In addition, the Commission has undertaken study of the various approaches viz. Regulatory Approach or Pooled Cost Approach, Actual Project Cost Approach, etc for the purpose of development of norms for capital cost. The aforesaid approaches have been discussed in length in the Explanatory Memorandum published along with the Draft Regulations. Accordingly, the Commission has retained the norm for capital cost as specified under draft Regulations.*
3. *The Commission would also like to clarify that the norms are specified for the projects which are employing Water Cooled condensers. The norms for projects employing Air Cooled Condensers shall be dealt by the Commission*

on case to case basis under project specific determination of tariff, if such petition is filed by any project developer.

CERC has specified in the Terms and Conditions for Tariff determination from Renewable Energy Sources) (First Amendment) Regulations, 2010. The normative capital cost of the biomass power projects based on Rankine Cycle technology application using water cooling condenser at Rs 4.03 Crore / MW for FY 2010-11 in line with the indexation mechanism specified in their RE Regulations.

The Commission in consideration of the above aspects specified a benchmark norm of normative capital cost for the biomass power projects, based on Rankine Cycle technology applications using water cooled condenser at Rs. 403 lakh / MW for FY 2010-11 which shall be linked to capital cost indexation formula.

38. Capital Cost Indexation Mechanism

The indexed Capital Cost in case of Biomass energy projects for each year of the Control Period shall be notified pursuant to issuance of such indexed capital cost for Biomass Power projects by Central Electricity Regulatory Commission in accordance with indexation mechanism stipulated under CERC RE Tariff Regulations.

39. Plant Load Factor

1) Threshold Plant Load Factor for determining fixed charge component of Tariff shall be:
   a) During Stabilization : 60%
   b) During the remaining period of the first year (after stabilization) : 70%
   c) From 2nd Year onwards : 80 %
2) The stabilization period shall not be more than 6 months from the date of commissioning of the project.

40. Auxiliary Consumption

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

41. Station Heat Rate

The benchmark norms for Station Heat Rate for new biomass power projects will be 3800 kcal/kWh.

42. Operation and Maintenance Expenses

(1) The benchmark normative Operation & Maintenance (O&M) expenses for the first year of the Control Period (i.e., FY 2010-11) shall be Rs.21.41 lakh per MW.

(2) Normative O&M expenses allowed at the commencement of the Control Period (i.e., FY 2010-11) under these Regulations shall be escalated at the rate of 5.72% per annum.

43. Fuel Mix

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 biomass power project such as crop residues, agro-industrial residues, forest residues, etc., and other biomass fuels as may be approved by MNRE.

2) The biomass power generating Companies shall ensure fuel management plan to ensure adequate availability of fuel to meet the respective project requirements.

44. Use of Fossil Fuel

The use of fossil fuels shall be limited to the extent of 15% of total fuel consumption on annual basis or as amended by MNRE from time to time.

45. Monitoring Mechanism for the use of fossil fuel

1) The project developer shall furnish a monthly fuel procurement statement and monthly fuel usage statement duly certified by Chartered Accountant to the beneficiary, with whom the power purchase agreement has been made (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. The statement shall cover details such as;

   a) Quantity of fuel (in tonnes) for each fuel type (biomass fuels and fossil fuels) procured and consumed during the month for power generation purposes,

   b) Cumulative quantity (in tonnes) of each fuel type procured and consumed till the end of that month during the year,

c) Actual (gross and net) energy generation (denominated in kWh) during the month,
d) Cumulative actual (gross and net) energy generation (denominated in kWh) until the end of that month during the year,
e) Opening fuel stock quantity (in tonnes),
f) Receipt of fuel quantity (in tonnes) at the power plant site and
g) Closing fuel stock quantity (in tonnes) for each fuel type (biomass fuels and fossil fuels) available at the power plant site.

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.

46. Calorific Value

The benchmark norms for average Calorific Value of the biomass fuel(s) used for the purpose of determination of tariff for new biomass power projects shall be 3467 kcal/kg.

47. Fuel Cost

The benchmark norms for Biomass fuel price shall be 1855 Rs/MT during first year of the Control Period FY 2010-11 and thereafter shall be linked to indexation mechanism as specified under Regulation 48. Alternatively, for each subsequent year of Tariff period, the normative escalation factor of 5% per annum shall be applicable at the option of the biomass project developer.

48. Fuel Price Indexation Mechanism

(1) The indexed Biomass Fuel Price (Pn) in case of Biomass Power projects for each year (n) of the Control Period shall be notified pursuant to notification of such indexed Biomass Fuel Price norm as applicable for Biomass Power projects by Central Electricity Regulatory Commission in accordance with indexation mechanism stipulated under CERC RE Tariff Regulations, 2009.

CHAPTER: 8

TECHNOLOGY SPECIFIC PARAMETERS FOR NON-FOSSIL FUEL BASED COGENERATION PROJECTS

49. Technology Aspect

A project shall qualify as a non-fossil fuel based co-generation project, if it is in accordance with the eligibility criteria as specified under Regulation 4(4).

50. Capital Cost

The benchmark normative capital cost for the non-fossil fuel based cogeneration projects shall be Rs. 398 lakhs / MW for the first year of control period (i.e., FY 2010-11) and shall be linked to indexation formula as outlined under Regulation 51.

51. Capital Cost Indexation Mechanism

The indexed Capital Cost in case of Non-fossil fuel based Co-generation projects for each year of the Control Period shall be notified pursuant to notification of such indexed capital cost for Non-fossil fuel based Co-generation projects by Central Electricity Regulatory Commission in accordance with indexation mechanism stipulated under CERC RE Tariff Regulations, 2009.

52 . Plant Load Factor

1) For the purpose of determining fixed charge, the plant load factor for non-fossil fuel based co-generation projects shall be computed on the basis of plant availability for number of operating days considering operations during crushing season and off-season as specified under clause (2) below and load factor of 92%.
2) The number of operating days shall be as follows:

Operating Days	Plant Load Factor (%)
150 days (crushing)+ 60 days (off-season) = 210 days operating days	53 %

53. Auxiliary Consumption

The auxiliary power consumption factor shall be 8.5% for computation of tariff.

54. Station Heat Rate

The benchmark norm Station Heat Rate of 3600 kcal/kWh for power generation component alone shall be considered for computation of tariff for non-fossil fuel based co-generation projects.

55. Calorific Value

The benchmark norm for Gross Calorific Value for bagasse shall be considered as 2250 kcal/kg. For the use of biomass fuels other than bagasse, calorific value as specified under Regulation 46 shall be applicable.

56. Fuel Cost

(1) The price of bagasse shall be 1221 Rs/MT during first year of the Control Period (i.e., FY 2010-11) and thereafter shall be linked to indexation formulae as outlined under Regulation 58. Alternatively, for each subsequent year of the control period, the normative escalation factor of 5% per annum shall be applicable at the option of the developer.

(2) For use of biomass other than bagasse in co-generation projects, the biomass prices as specified under Regulation 47 shall be applicable.

57. Fuel Price Indexation Mechanism

In case of non-fossil fuel based cogeneration projects, the following indexing mechanism for adjustment of fuel prices for each year of operation, will be applicable for determination of applicable variable charge component of tariff incase developer wishes to opt for indexing mechanism.

The indexed Bagasse Fuel Price (Pn) in case of Non-fossil fuel based Co-generation projects for each year (n) of the Control Period shall be notified pursuant to notification of such indexed Bagasse Fuel Price norm as applicable for Non-fossil fuel based Co-generation projects within Maharashtra by Central Electricity Regulatory Commission in accordance with indexation mechanism stipulated under CERC RE Tariff Regulations.

58. Operation and Maintenance Expenses

(1) The benchmark normative O&M expenses during first year of the Control Period i.e., FY 2010-11) shall be Rs. 14.11 lakh per MW.

(2) Normative O&M expenses allowed at the commencement of the Control Period (i.e. FY 2010-11) under these Regulations shall be escalated at the rate of 5.72% per annum.

CHAPTER: 9

TECHNOLOGY SPECIFIC PARAMETERS FOR SOLAR PV POWER PROJECTS

59. Technology Aspect

Norms for Solar Photovoltaic (PV) Power under these Regulations shall be applicable for grid connected PV systems that directly convert solar energy into electricity through Photo Voltaic Technology such as crystalline, Silicon or Thin Film etc as may be approved by MNRE.

60. Capital Cost

1. Land Cost

Commission has considered the land requirement as 5 acres / MW which is in line with the land requirement as outlined under the guidelines for selection of solar projects under JNNSM.

The development in technology shall improve in future which will eventually reduce requirement of land per MW of installation. Further the land acquired for setting up Solar PV power projects is mostly arid / barren or of no commercial use. To avoid cost of transmission system, developer may prefer to acquire land close to grid sub-station. Commission considers the cost of land as Rs. 0.15 Cr / MW based on land requirement for Solar PV project at 5 acres / MW at an estimated cost of Rs. 3 lakh / acre.

2. Civil and General Works

Commission considers cost towards civil and general works at Rs. 0.90 Cr / MW based on the detailed projects of some developers submitted to SERCs

3. Cost of PV Modules and Mounting Structures

PV Modules:

PV modules are critical components of the solar PV Power Projects. CERC has considered the cost of PV modules as US $ 2.2 / Wp as appropriate which translates to PV module cost of Rs. 10.19 crore / MWp

at the exchange rate of Rs. 46.33 / US $. Cost of PV modules has been reducing over the period with advancement of technology.

There is significant difference in cost of crystalline PV modules vis-a-vis that of thin film PV modules; with cost of thin film PV modules being lower than that of crystalline PV modules. Further, the conversion efficiencies of thin film (8%- 10%) being lower than that of crystalline PV modules (12%-14%); for similar generation at a given site, more number of thin film PV modules with associated mounting structures, cables etc. would be necessary. On the other hand, while cost of crystalline PV modules is higher than that of thin film PV modules, other associated costs of mounting structure, cables etc. would be lower than that of thin film for equivalent MW installation at given site. Thus, for comparative analysis, it is preferred to view combined cost of PV modules per MW and mounting structures per MW

In accordance to the above aspects, the Commission has considered the cost estimate of PV modules at Rs. 10.19 Cr / MW.

Mounting Structure:

Mounting structure requirement is mainly influenced by the selection of technology viz. crystalline silicon or thin film and deployment of tracking system (fixed axis or with tracking). The Solar to electricity conversion efficiency of crystalline silicon technology is more compared to the thin film technology which translates to employing less number of modules compared with the latter to generate same units of electricity. The per Watt cost of thin film modules are less compared to the crystalline silicon module. Hence, employing thin film technology will require less cost towards modules however in order to achieve 19% CUF, due to lower solar to electricity conversion efficiency, large number of modules shall need to be employed which will increase cost towards the mounting structure.

In view of the above the Commission has accordingly considered the cost towards mounting structures as Rs 1.00Cr/MW.

4. Power Conditioning Unit

The overall output from the Solar PV Power Plant to a large extent depends on the quality of the power conditioning unit.

CERC taking into consideration the cost specified by the various developers in their project reports submitted to the SERCs considered the cost towards power conditioning unit as Rs. 2 Cr / MW.

Accordingly Commission considers the cost towards power conditioning unit as Rs. 2.00 Cr / MW.

5. Evacuation cost upto inter-connection point

Commission considers the cost of evacuation arrangement (Cables and Transformers) as Rs. 0.85 Cr / MW in line with CERC's consideration.

6. Preliminary and Pre-operative expenses

Preliminary and Pre-operative expenses cost towards pre-operative and preliminary expenses essentially include cost towards services related to installation and commissioning, project management, expenditure incurred in transport of equipments, insurance, contingency taxes, duties, interest during construction (IDC) finance charges etc.

Preliminary and pre-operative costs may constitute around 8% to 10% of the total capital cost of solar PV projects.

Accordingly, the Commission has considered the preliminary and pre-operative costs as Rs. 1.81 Cr / MW.

Based on the above the Commission has specified the benchmark capital cost norm for Solar PV power projects as Rs. 1690 lakh / MW as summarized below.

Sl. No	**Particulars**	**Capital Cost Norms (Rs. Cr / MW)**
1	Land Cost	0.15
2	Civil and General Works	0.90
3	PV Modules	10.19
4	Mounting Structures	1.00
5	Power Conditioning Unit	2.00
6	Evacuation cost upto inter connection point (Cables & Transformers)	0.85
7	Preliminary and pre-operative Expenses	1.81
	Total Capital Cost	**16.90**

61. Capacity Utilization Factor

The capacity utilization factor (CUF) shall depend on insulation level which varies from State to State also various locations. Clear sunny days of around

290 days to 320 days are available in most parts of the country. The mean monthly global solar radiation incident over India is found to be of the order 5.5 to 6 KWh / Sq m / day.

Considering the data for clear sunny days and solar radiation incident the capacity utilization factor in Nagaland is observed as 20%.

The Commission has specified the CUF of 19 % to 21% as benchmark CUF for Solar PV based power projects.

62. Operation and Maintenance Expenses

In case of solar PV based power projects, repairs and maintenance expenses are not significant due to limited wear and tear and mainly pertains transformer replacement of ports for control system or power conditioning systems. Manpower related expenses would pertain to inspection / testing / cleaning array systems etc. There is no operational experience of MW scale PV solar system in India to ascertain norms for O&M expenses.

Commission has specified O&M expenses at 9.0 lakh / MW for the first year of operation which shall be escalated at the rate of 5.72 % per annum.

63. Tariff for solar roof PV and other small solar power.

Tariff for Solar rooftop PV and other small solar power projects, complying with eligibility criteria as may be specified by MNRE from time to time, shall be higher by Rs 0.50/kWh or such other higher amount as may be stipulated by Commission from time time, over and above the tariff applicable for Solar PV power projects as per norms outlined under Regulation 61, 62 and 63.

Provided that such tariff shall be applicable for solar generation including such solar generation used for captive consumption, subject to compliance of related terms and conditions as may be specified by MNRE from time to time.

CHAPTER: 10

TECHNOLOGY SPECIFIC PARAMETERS FOR SOLAR THERMAL POWER PROJECTS

64. Technology Aspect

Norms of thermal power 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 uses 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.

65. Capital Cost

Land

Commission considers land requirement of 6 acres / MW for setting of solar thermal power plant. The requirement of land per MW will vary depending on the isolation level and nature of CSP scheme (with or without storage) being deployed. Commission considers cost of land as Rs. 3 lakhs / acre.

Accordingly, Commission has considered cost of land as Rs. 0.18 Cr / MW based on land requirement for solar thermal projects at 6 acres / MW and at estimated cost of Rs. 3 lakh / acre.

Direct Cost:

The direct cost components include expenditure towards solar field and power block, land, civil and structural works etc. CERC considering capital cost of few solar thermal projects specified in India based on detailed reports submitted by such project developers before various SERCs and to MNRE for participating in the generation based incentive scheme observed that the cost of solar field and power block has been estimated to be around Rs. 12.90 Cr / MW.

Indirect Cost:

The indirect cost, which primarily constitute preliminary project expenses, technology supervision, contingency site preparation and infrastructure

arrangements, interest during construction together constitute to approximately 10 % to 15 % of the direct cost.

Taking into consideration the above facts, the Commission has specified the benchmark capital cost norm for solar thermal power projects as 15.30 Cr / MW as summarized below.

Sl. No.	Particulars	Capital Cost Norms (Rs. / Cr / MW)
A	Direct Cost	13.48
	1) Land	0.18
	2) Solar Block 3) Power Block	12.90
	4) General Civil & Structural Works	0.40
B	Indirect Cost	1.82
	1) Preliminary & Pre-operative expenses 2) Contingency 3) IDC	1.82
C	**Total Capital Cost**	**15.30**

66. Capacity Utilization Factor

MNRE has suggested that normative capacity utilization factor of 23 % for solar thermal power plants without storage may be considered.

CERC taking into consideration the submission made by the developers of the prospective projects and recommendation of MNRE, has considered the norm for capacity utilization factor for solar thermal power projects (without storage) as 23 %.

Accordingly, the Commission has specified the benchmark norm for capacity utilization factor as 23% to solar thermal power projects.

67. Operation and Maintenance Expenses

In case of solar thermal power projects, repairs and maintenance expenses are not significant due to limited wear and tear and mainly pertain to operation and maintenance for power block components. Man power related expenses would pertain to inspection / testing / cleaning array systems etc. There is no operational experience of MW scale solar thermal power projects in India to ascertain norms for O&M expenses. Commission has specified O&M expenses as to 13.0 lakh / MW for the first year of operation which shall be escalated of the rate of 5.72 % per annum.

68. Auxiliary Consumption

Commission has considered the benchmark norm for auxiliary consumption as 10%.

CHAPTER :11

MISCELLANEOUS

69. Power to Relax

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.

70. Power to Amend

The Commission may, at anytime, vary, alter, modify or amend any provisions of these regulations.

71. Power to remove difficulties

If any difficulty arises in giving effect to the provisions of these regulations, the Commission may, by general or special order, make such provisions not inconsistent with the provisions of the Act, as may appear to be necessary for removing the difficulty.

By order of the Commission

P.SANI
Dy.Dir-Cum-Commission Secretary
NERC, Kohima.

Form - 1.1

Form Template for (Wind Power or Small Hydro Project or Solar PV / Solar thermal): Parameter Assumptions

Sl. No	Assumption Head	Sub-Head (1)	Sub-Head (2)	Unit	Parameter Values
1	Power Generation	Capacity	Installed Power Generation Capacity	MW	
			Capacity Utilization Factor	%	
			Commercial Operation Date	mm/yyyy	
			Useful Life	Years	
2	Project Cost	Capital Cost / MW	Normative	Rs. lakh / MW	
			Capital Cost	Rs. lakh	
			Capital Subsidy, if any	Rs. lakh	
			Net Capital Cost	Rs. lakh	
3	Financial Assumptions	Debt Equity	Tariff Period	Years	
			Debt	%	
			Equity	%	
			Total Debt Amount	Rs. lakh	
			Total Equity Amount	Rs. lakh	
		Debt Component			
			Loan Amount	Rs. lakh	
			Moratorium Period	Years	
			Repayment Period (incld Moratorium)	Years	
			Interest Rate	%	
		Equity Component			
			Equity amount	Rs. lakh	
			Return on Equity for First 10 years	% P.a	
			Return on Equity 11th year onwards	% P.a	
			Discount Rate	%	
		Depreciation			
			Depreciation Rate for first 12 years	%	
			Depreciation Rate 13th year onwards	%	
		Incentives	Generation Based incentives, if any	Rs. lakh P.a	
			Period for GBI	Years	
4	Operation & Maintenance	Normative O&M Expenses		Rs. lakh / MW	
		O&M Expenses per annum		Rs. lakh	
		Escalation factor for O&M Expenses		%	
5	Working Capital	O&M Expenses		Months	
		Maintenance Spare	(% of O&M expenses)	%	
		Receivables		Months	
		Interest on Working Capital		% P.a	

Form – 1.2

Form Template for (Wind Power or Small Hydro Project or Solar PV / Solar thermal): Parameter Assumptions

Generation parameter	**Unit**	**Yr-1**	**Yr-2**	**Yr-3**	**Yr-4**	**Yr-5**	**Yr-6**	**Yr-7**	**Yr-8**	**Yr-9**	**Yr-10**	**Yr-11**	**Yr-12**	**Yr-13**	**Yr-14**
Installed Capacity	MW														
Net Generation	MU														
Tariff Components (Fixed Charge)	**Unit**	**Yr-1**	**Yr-2**	**Yr-3**	**Yr-4**	**Yr-5**	**Yr-6**	**Yr-7**	**Yr-8**	**Yr-9**	**Yr-10**	**Yr-11**	**Yr-12**	**Yr-13**	**Yr-14**
O&M Expenses	Rs. Lakh														
Depreciation	Rs. Lakh														
Interest on term loan	Rs. Lakh														
Interest on Working Capital	Rs. Lakh														
Return on Equity	Rs. Lakh														
Total Fixed Cost	Rs. Lakh														
Per Unit Tariff Components	**Unit**	**Yr-1**	**Yr-2**	**Yr-3**	**Yr-4**	**Yr-5**	**Yr-6**	**Yr-7**	**Yr-8**	**Yr-9**	**Yr-10**	**Yr-11**	**Yr-12**	**Yr-13**	**Yr-14**
PU O&M Expenses	Rs / kWH														
PU Depreciation	Rs / kWH														
PU Interest on term loan	Rs / kWH														
PU Interest on working capital	Rs / kWH														
PU Return on Equity	Rs / kWH														
PU Tariff Components	Rs / kWH														
Levellised Tariff	**Unit**	**Yr-1**	**Yr-2**	**Yr-3**	**Yr-4**	**Yr-5**	**Yr-6**	**Yr-7**	**Yr-8**	**Yr-9**	**Yr-10**	**Yr-11**	**Yr-12**	**Yr-13**	**Yr-14**
Discount Factors															
Discounted Tariff Components	Rs / kWH														
Levellised Tariff	Rs / kWH														

Form – 2.1

Form Template for Biomass Power or Non-fossil fuel based Cogen: Parameter Assumptions

Sl. No	Assumption Head	Sub-Head (1)	Sub-Head (2)	Unit	Parameter Values
1	Power Generation	Capacity	Installed Power Generation Capacity	MW	
			Auxiliary Consumption factor	%	
			PLF (during stabilization upto 6 months)	%	
			PLF (during 1st year stabilization)	%	
			PLF (2nd yr onwards)	%	
			Commercial Operation Date	mm/yyyy	
			Useful Life	Years	
2	Project Cost	Capital Cost / MW	Normative Capital Cost	Rs. lakh / MW	
			Capital Cost	Rs. lakh	
			Capital Subsidy, if any	Rs. lakh	
			Net Capital Cost	Rs. lakh	
3	Financial Assumptions	Debt Equity	Tariff Period	Years	
			Debt	%	
			Equity	%	
			Total Debt Amount	Rs. lakh	
			Total Equity Amount	Rs. lakh	
		Debt Component			
			Loan Amount	Rs. lakh	
			Moratorium Period	Years	
			Repayment Period (including Moratorium)	Years	
			Interest Rate	%	
		Equity Component			
			Equity amount	Rs. lakh	
			Return on Equity for First 10 years	% P.a	
			Return on Equity 11th year onwards	% P.a	
			Discount Rate	%	
		Depreciation			
			Depreciation Rate for first 12 years	%	
			Depreciation Rate 13th year onwards	%	
		Incentives	Generation Based incentives, if any	Rs. lakh P.a	
			Period for GBI	Years	
4	Operation & Maintenance	Normative O&M Expenses		Rs. lakh / MW	
		O&M Expenses per annum		Rs. lakh	
		Escalation factor for O&M Expenses		%	

Contd……

Contd……

5	Working Capital	O&M Expenses		Months	
		Maintenance Spare	(% of O&M expenses)	%	
		Receivables		Months	
		Interest on Working Capital		% P.a	
6	Fuel related assumptions	Station Heat Rate	During stabilization	Kcal/kWH	
			Post stabilization	Kcal/kWH	
		Fuel types & mix	Biomass fuel type – 1	%	
			Biomass fuel type – 2	%	
			Fossil Fuel (coal)	%	
			GCV of Biomass fuel type-1	KCal / kg	
			GCV of Biomass fuel type-2	KCal / kg	
			GCV of fossil Fuel (coal)	KCal / kg	
			Biomass price (fuel type-1): Yr-1	Rs / MT	
			Biomass price (fuel type-2): Yr-1	Rs / MT	
			Fossil Fuel price (Coal): Yr-1	Rs / MT	
			Fuel price escalation factor	% P.a	

Form – 2.2

Form Template for Biomass Power or Non-fossil fuel based Cogen: Parameter Assumptions

Generation parameter	**Unit**	**Yr-1**	**Yr-2**	**Yr-3**	**Yr-4**	**Yr-5**	**Yr-6**	**Yr-7**	**Yr-8**	**Yr-9**	**Yr-10**	**Yr-11**	**Yr-12**	**Yr-13**
Installed Capacity	MW													
Net Generation	MU													

Tariff Components (Fixed Charge)	**Unit**	**Yr-1**	**Yr-2**	**Yr-3**	**Yr-4**	**Yr-5**	**Yr-6**	**Yr-7**	**Yr-8**	**Yr-9**	**Yr-10**	**Yr-11**	**Yr-12**	**Yr-13**
O&M Expenses	Rs. Lakh													
Depreciation	Rs. Lakh													
Interest on term loan	Rs. Lakh													
Interest on Working Capital	Rs. Lakh													
Return on Equity	Rs. Lakh													
Total Fixed Cost	Rs. Lakh													

Tariff Components (Variable charge)	**Unit**	**Yr-1**	**Yr-2**	**Yr-3**	**Yr-4**	**Yr-5**	**Yr-6**	**Yr-7**	**Yr-8**	**Yr-9**	**Yr-10**	**Yr-11**	**Yr –12**	**Yr-13**
Biomass fuel type 1	Rs. Lakh													
Biomass fuel type 2	Rs. Lakh													
Fossil fuel (coal)	Rs. Lakh													
Sub-total (Fuel Costs)	Rs. Lakh													
Fuel cost allocable to power	%													
Total Fuel Costs	Rs. Lakh													

Contd…..

Contd……

Per Unit Tariff Components (fixed)	**Unit**	**Yr-1**	**Yr-2**	**Yr-3**	**Yr-4**	**Yr-5**	**Yr-6**	**Yr-7**	**Yr-8**	**Yr-9**	**Yr-10**	**Yr-11**	**Yr-12**	**Yr-13**
PU O&M Expenses	Rs / kWH													
PU Depreciation	Rs / kWH													
PU Interest on term loan	Rs / kWH													
PU Interest on working capital	Rs / kWH													
PU Return on Equity	Rs / kWH													
PU Tariff Components (fixed)	Rs / kWH													
PU Tariff Components (Variable)	Rs / kWH													
PU Tariff Components (Total)	Rs / kWH													

Levellised Tariff	**Unit**	**Yr-1**	**Yr-2**	**Yr-3**	**Yr-4**	**Yr-5**	**Yr-6**	**Yr-7**	**Yr-8**	**Yr-9**	**Yr-10**	**Yr-11**	**Yr-12**	**Yr-13**
Discount Factors														
Discounted Tariff Components (Fixed)	Rs / kWH													
Discounted Tariff Components (Variable)	Rs / kWH													
Discounted Tariff Components (Total)	Rs / kWH													
Levellised Tariff (fixed)	Rs / kWH													
Levellised Tariff (Variable)	Rs / kWH													
Levellised Tariff (Total)	Rs / kWH													