

CENTRAL ELECTRICITY REGULATORY COMMISSION

NEW DELHI

No.L-7/186(201)/2009-CERC

Dated 15th May, 2009

NOTIFICATION (DRAFT)

In exercise of powers conferred under section 178 of the Electricity Act, 2003 (36 of 2003), and all other powers enabling it in this behalf, and after previous publication, the Central Electricity Regulatory Commission hereby makes the following regulations, namely:

1. Short title and commencement

- (1) These regulations may be called the Central Electricity Regulatory Commission (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2009.
- (2) These regulations shall come into force from the date of their publication in the Official Gazette.

2. Definitions and Interpretation

- (1) In these regulations, unless the context otherwise requires,-
 - (a) '**Act**' means the Electricity Act, 2003 (36 of 2003);
 - (b) '**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;

- (c) **'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, deoiled cakes, etc); wood produced in dedicated energy plantations or recovered from wild bushes/weeds; and the wood waste produced in some industrial operations;
- (d) **'Capital cost'** means the capital cost as defined in regulation 13;
- (e) **'Commission'** means the Central Electricity Regulatory Commission referred to in sub-section (1) of section 76 of the Act;
- (f) **'Conduct of Business Regulations'** means the Central Electricity Regulatory Commission (Conduct of Business) Regulations, 1999 as amended from time to time;
- (g) **'Gross calorific value'** or 'GCV' in relation to a fuel used in generating station means the heat produced in kCal 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;
- (h) **'Gross station heat rate'** or 'GHR' means the heat energy input in kCal required to generate one kWh of electrical energy at generator terminals of a thermal generating station;
- (i) **'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;

- (j) **'Inter-connection Point'** shall mean interface point of renewable energy generating facility with the transmission system or distribution system, as the case may be;
- For 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;
- For small hydro, biomass and bagasse cogeneration projects and Solar Thermal Power Projects the, inter-connection point shall be line isolator on outgoing feeder on HV side of generator transformer;
- (k) **'MNRE'** means Ministry of New and Renewable Energy of the Government of India.
- (l) **'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 correctly predicted.
- (m) **'Non fossil fuel based co-generation'** means the process in which more than one form of energy (such as steam and electricity) is 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 sub-Regulation (4) of Regulation 4.
- (n) **'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;
- (o) **'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;

- (p) **“Renewable Energy/Power”** means the grid quality energy/power generated from renewable energy sources.
- (q) **“Renewable Energy Power Plants”** means the power plants other than the conventional power plants generating grid quality electricity from renewable energy sources.
- (r) **“Renewable Energy Sources”** means renewable sources such as mini hydro, wind, solar including its integration with combined cycle, biomass, bio fuel cogeneration, urban/municipal waste and other such sources as approved by the MNRE;
- (s) **‘Small Hydro’** means Hydro Power projects with a station capacity up to and including 25 MW.

(s-a) Solar PV power’ means the Solar Photo Voltaic power project that uses sunlight for direct conversion into electricity through Photo Voltaic technology.

(s-b) Solar Thermal power’ shall mean the Solar Thermal power project that uses sunlight for direct conversion into electricity through Concentrated Solar Power technology

- (t) **“Tariff period”** means the period for which tariff is to be determined by the Commission on the basis of norms specified under these Regulations;
- (u) **“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 cogeneration | 20 years |
| (c) Small Hydro Plant | 35 years |
| (d) Solar <u>PV/Solar thermal power plants</u> | <u>25 years</u> |

(v) 'Year' means a financial year.

- (2) 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, but defined in the Act, or the Grid Code or the Central Electricity Regulatory Commission (Terms and conditions of Tariff) Regulations, 2009 shall have the meanings assigned to them respectively in the Act or the Grid Code or the Central Electricity Regulatory Commission (Terms and conditions of Tariff) Regulations, 2009.

3. Scope and extent of applications

These regulations shall apply in all cases where tariff, for a generating station or a unit thereof based on renewable sources of energy, is to be determined by the Commission under Section 62 read with Section 79 of the Act thereof.

Provided that in cases of wind, small hydro projects, biomass power and non-fossil fuel based cogeneration projects these regulations shall apply subject to the fulfilment of eligibility criteria ~~as~~ specified in regulation 4 of these Regulations.

4. Eligibility Criteria

- (1) **Wind power project** – located at the wind sites having minimum annual mean Wind Power Density (WPD) of 200 Watt/m² using new wind turbine generators.
- (2) **Small hydro project** – located at the sites approved by MNRE using new plant and machinery, and installed power plant capacity to be lower than or equal to 25 MW at single location.
- (3) **Biomass power project** – Biomass power projects 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.
- (4) **Non-fossil fuel based co-generation project:** The project shall qualify to be termed as a **non-fossil fuel based** co-generation project, if it is in accordance with the definition and also meets the qualifying requirement outlined below:

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.

*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.**"*

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

Chapter 1: General Principles

5. 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 2009-10.

Provided that the benchmark capital cost for Solar PV and Solar thermal projects may be reviewed annually by the commission.

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 RE projects for the entire duration of the Tariff Period as specified in Regulation 6 below.

Provided also that the revision in Regulations for next Control Period shall be undertaken at least six months 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

(1.) (1.)—The Tariff Period for determination of tariff under these regulations for all types of RE projects except in case of Solar PV and Solar thermal power projects shall be thirteen (13) years.

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(2.) In case of Solar and Solar thermal power projects the Tariff Period shall be twenty five years (25) years.

7. Project Specific tariff

- (1) Project specific tariff, on case to case basis, shall be determined by the Commission for Municipal Solid Waste Projects or for any other new renewable energy technologies approved by MNRE.

Provided that, project specific tariff, on case to case basis, may be determined by the Commission in case of Solar PV and Solar Thermal Power Projects.

Petition for such tariff determination is filed in accordance with provisions outlined under Regulation 8. The commission while determining the project specific tariff for Solar PV and Solar Thermal shall be guided by the provisions of Chapters 8 of these Regulations.

- (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.

Provided that the financial norms as specified under Chapter-2 of these Regulations, except for capital cost, shall be ceiling norms while determining the project specific tariff.

8. Petition and proceedings for determination of tariff

- (1) A petition for determination of tariff shall be accompanied by such fee as may be determined by regulations and shall be accompanied by information in forms 1.1, 1.2, 2.1 and 2.2 specified in these regulations.

Provided that in case of project specific tariff determination as per Regulation (7), the petition shall be accompanied by detailed project report outlining technical and operational details, site specific aspects, premise for capital cost and financing plan etc.

- (2) The petition shall include the following:
- a) A statement of all applicable terms and conditions and expected expenditure for the period for which tariff is to be determined.
 - b) 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 Govt. This statement shall also include the proposed tariff calculated without consideration of the subsidy and incentive.
 - c) Any other information, as may be desired by the Commission.
- (4) The proceedings to be held by the Commission for determination of tariff shall be in accordance with the Conduct of Business Regulations.

9. Tariff Structure

- (1) The tariff for renewable energy technologies shall be single part tariff consisting of the following fixed cost components:
- (a) Return on equity;
 - (b) Interest on loan capital;
 - (c) Depreciation;
 - (d) Interest on working capital;
 - (e) Operation and maintenance expenses;

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

10. Tariff Design

- (1) The normative tariff shall be specified on levelled basis for the Tariff Period.

Provided that for renewable energy technologies having single part tariff with two components, tariff shall be specified on levelled 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 levelled tariff computation, the discount factor equivalent to 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'.

11. Scheduling of electricity generated from Renewable Energy Sources:

- (1) All renewable energy power plants except for biomass power plants and non-fossil fuel based cogeneration plants with installed capacity of 10 MW and above shall be treated as 'MUST RUN' power plants and shall not be subjected to 'merit order despatch' principles.
- (2) The biomass power generating station and non-fossil fuel based co-generation projects with an installed capacity of 10 MW and above shall be subjected to scheduling and despatch code as specified under Indian Electricity Grid Code (IEGC) and Central Electricity Regulatory Commission (Unscheduled

Interchange and related matters) Regulations, 2009 including amendments thereto.

- (3) All non-firm renewable energy generating stations and the biomass power generating stations and non-fossil fuel based co-generation projects with installed capacity lower than 10 MW shall furnish the tentative day-ahead generation forecast (MWh) in blocks of 1.5 hour duration for the energy availability on collective basis at inter-connection point (Pooling Station) to the concerned Load Despatch Centre to facilitate better grid-co-ordination and management.

Provided further that UI charges as specified under Central Electricity Regulatory Commission (Unscheduled Interchange and related matters) Regulations, 2009 including amendments thereto shall not be applicable for deviation from forecasts furnished by such renewable energy generating stations.

12. Grid Connectivity

The concerned licensee shall be responsible for providing grid connectivity to the renewable energy power plants from the inter-connection point, on payment of wheeling or transmission charges as the case may be, in accordance with the regulations of the Appropriate Commission.

Chapter 2: Financial Principles

13. Capital Cost

The norms for the Capital cost as specified in the subsequent technology specific chapters shall be inclusive of all capital work including plant and machinery, 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 8.

14. Evacuation Infrastructure

- (1) The evacuation infrastructure including the interfacing lines, switch gears, metering, and protection management and other related equipments up to inter-connection point shall be developed by the generating company at its own cost as per the standards specified by the Authority.
- (2) The concerned licensee shall be the responsible for development of evacuation infrastructure or strengthening or existing system beyond the inter-connection point.

15. Debt Equity Ratio

(1) 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 designated in Indian rupees on the date of each investment.

16. Loan and Finance Charges

(1) Loan Tenure. For the purpose of determination of tariff, loan tenure of 12 years shall be considered.

(2) Interest Rate

- (a) The loans arrived at in the manner indicated above shall be considered as gross normative loan for calculation for interest on loan. The normative loan outstanding as on April 1st of every financial year shall be worked out by deducting the cumulative repayment up to March 31st of previous financial year from the gross normative loan.
- (b) For the purpose of computation of tariff, the normative interest rate shall be considered as long term prime lending rate (LTPLR) of State Bank of India (SBI) as on 1st April of the relevant of the control period, plus 100 basis points.
- (c) The tariff determined based on normative interest rate assumptions shall not vary on account of variation in SBI LTPLR over the duration of the Tariff Period. However, in case of variation in SBI LTPLR in excess of (+/-) 200 basis points than SBI LTPLR prevalent at the time of tariff determination, the Commission

may initiate regulatory process for revision in Tariff either on suo-motu basis or on an application filed by the concerned generating company, as the case may be.

17. Depreciation

- (1) The value base for the purpose of depreciation shall be the Capital Cost of the asset admitted by the Commission. The Salvage value of the asset shall be considered as 10% and depreciation shall be allowed up to maximum of 90% of the Capital Cost of the asset.
- (2) Depreciation per annum shall be based on 'Differential Depreciation Approach' over loan tenure and period beyond loan tenure over useful life computed on 'Straight Line Method'. The depreciation rate for the first 12 years of the Tariff Period shall be 6% per annum and the remaining depreciation shall be spread over the remaining useful life of the project from 13th year onwards.
- (3) Depreciation shall be chargeable from the first year of commercial operation.

Provided that in case of commercial operation of the asset for part of the year, depreciation shall be charged on *pro rata* basis.

18. 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 17% per annum for the first 10 years.
 - b) Pre-tax 23% per annum 11th years onwards.

19. Interest on Working Capital

- (1) The Working Capital requirement in respect of wind energy projects, small hydro power, solar PV and Solar thermal power projects shall be computed in accordance with the sub-Regulations below:

Wind Energy / Small Hydro Power /Solar PV / Solar thermal

- a) Operation & Maintenance expenses for one month;
 - b) Receivables equivalent to 1½ (one and a half) months of energy charges for sale of electricity calculated on the normative 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 in accordance with the sub-Regulations below:

Biomass Power and Non-fossil fuel Co-generation

- a) Fuel costs for four months equivalent to normative PLF;
 - b) Operation & Maintenance expense for one month;
 - c) Receivables equivalent to 1½ (one and a half) months of fixed and variable charges for sale of electricity calculated on the target PLF;
 - d) Maintenance spare @ 15% of operation and maintenance expenses
- (3) Interest on Working Capital shall be at interest rate equivalent to average State Bank of India short term PLR prevalent for the period 1st April 2008 to 31st March 2009.

20. 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.
- (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 2009-10) under these Regulations shall be escalated at the rate of 5.72% per annum over the Tariff Period.

21. Sharing of CDM Benefits

- (1) The proceeds of carbon credit from approved CDM project shall be shared between generating company and concerned off-taker 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.

22. Subsidy or incentive by the Central / State Government

The Commission shall take into consideration any incentive or subsidy offered by the Central/ State Government to the renewable energy power plants while determining the tariff under these Regulations.

Chapter 3: Technology specific parameters for Wind Energy

23. Capital Cost

- (1) The capital cost for wind energy project shall include Wind turbine generator including its auxiliaries, land cost, site development charges and other civil works, transportation charges, evacuation cost up to inter-connection point, financing charges and IDC.
- (2) The capital cost for wind energy projects shall be Rs.515 Lakhs/MW (FY 2009-10 during first year of Control Period) and shall be linked to indexation formula as outlined under Regulation 24.

24. Capital Cost Indexation Mechanism

- (1) The following indexation mechanism shall be applicable in case of wind energy projects for adjustments in capital cost over the Control Period with the changes in Wholesale Price Index for Steel and Electrical Machinery.

$$CC_{(n)} = P\&M_{(n)} * (1+F_1+F_2+F_3)$$

$$P\&M_{(n)} = P\&M_{(0)} * (1+d_{(n)})$$

$$d_{(n)} = [a * \{(SI_{(n-1)}/SI_{(0)}) - 1\} + b * \{(EI_{(n-1)}/EI_{(0)}) - 1\}] / (a+b)$$

Where,

CC_(n) = Capital Cost for nth year

P&M_(n) = Plant and Machinery Cost for nth year

P&M₍₀₎ = Plant and Machinery Cost for the base year

d_(n) = Capital Cost escalation factor for year (n) of Control Period

SI_(n-1) = Average WPI Steel Index prevalent for fiscal year (n-1) of the Control Period

$SI_{(0)}$ = Average WPI Steel Index prevalent for fiscal year (0) at the beginning of the Control Period i.e. April 2008 to March 2009

$EI_{(n-1)}$ = Average WPI Electrical Machinery Index prevalent for fiscal year (n-1) of the Control Period

$EI_{(0)}$ = Average WPI Electrical and Machinery Index prevalent for fiscal year (0) at the beginning of the Control Period i.e. April 2008 to March 2009

a = Constant to be determined by Commission from time to time,
(In default it is 0.6), for weightage to Steel Index

b = Constant to be determined by Commission from time to time,
(In default it is 0.4), for weightage to Electrical Machinery Index

F_1 = Factor for Land and Civil Works (0.08)

F_2 = Factor for Erection and Commissioning (0.07)

F_3 = Factor for IDC and Financing Cost (0.10)

25. Capacity Utilisation Factor

(1) CUF norms for this control period shall be as follows:

Annual Mean Wind Power Density (W/m^2)	CUF
200-250	20%
250-275	22%
275-300	24%
300-400	27%
> 400	30%

- (2) For the purpose of applicable tariff to particular wind energy project, the wind energy project developer shall arrange for its wind resource data and annual mean wind power density for the project site to be duly certified by Centre of Wind Energy Technology (C-WET) at least 3 months prior to project COD.

26. Operation and Maintenance Expenses

- (1) Normative O&M expenses for the first year of the Control Period (i.e. FY 2009-10) shall be Rs 6.50 Lakh per MW.
- (2) Normative O&M expenses allowed under these Regulations shall be escalated at the rate of 5.72% per annum over the tariff period to compute the levellised tariff.

Chapter 4: Technology specific parameters for Small Hydro Project

27. Capital Cost

- (1) The normative capital cost for small hydro projects during first year of Control Period (FY 2009-10) shall be Rs 630 Lakh/MW for SHP projects installed in Himanchal Pradesh, Uttarakhand and North Eastern States. Further, for SHP projects in other States, the normative capital cost during the first year of Control Period (FY 2009-10) shall be Rs 500 Lakh/ MW.
- (2) The capital cost for subsequent years shall be determined on the basis of indexation formula as outlined under Regulation 28.

28. Capital Cost Indexation Mechanism

- (1) The following indexation mechanism shall be applicable in case of small hydro power projects for adjustments in capital cost over the Control Period with the changes in Wholesale Price Index for Steel and Electrical Machinery.

$$CC_{(n)} = P\&M_{(n)} * (1+F_1+F_2+F_3)$$

$$P\&M_{(n)} = P\&M_{(0)} * (1+d_{(n)})$$

$$d_{(n)} = [a * \{(SI_{(n-1)}/SI_{(0)}) - 1\} + b * \{(EI_{(n-1)}/EI_{(0)}) - 1\}] / (a+b)$$

Where,

CC_(n) = Capital Cost for nth year

P&M_(n) = Plant and Machinery Cost for nth year

P&M₍₀₎ = Plant and Machinery Cost for the base year

d_(n) = Capital Cost escalation factor for year (n) of Control Period

SI_(n-1) = Average WPI Steel Index prevalent for fiscal year (n-1) of the Control Period

$SI_{(0)}$ = Average WPI Steel Index prevalent for fiscal year (0) at the beginning of the Control Period i.e. April 2008 to March 2009

$EI_{(n-1)}$ = Average WPI Electrical Machinery Index prevalent for fiscal year (n-1) of the Control Period

$EI_{(0)}$ = Average WPI Electrical and Machinery Index prevalent for fiscal year (0) at the beginning of the Control Period i.e. April 2008 to March 2009

a = Constant to be determined by Commission from time to time,
(In default it is 0.6), for weightage to Steel Index

b = Constant to be determined by Commission from time to time,
(In default it is 0.4), for weightage to Electrical Machinery Index

F_1 = Factor for Land and Civil Work (0.16)

F_2 = Factor for Erection and Commissioning (0.10)

F_3 = Factor for IDC and Financing Cost (0.14)

29. Capacity Utilisation Factor

Capacity Utilisation factor for the small hydro projects located in Himanchal Pradesh, Uttarakhand and North eastern States shall be 45% and for other States, CUF shall be 30%.

30. Auxiliary Consumption

Normative Auxiliary Consumption for the small hydro projects shall be 0.5%.

31. Operation and Maintenance Expenses

(1) Normative O&M expenses for the first year of the Control period (i.e. FY 2009-10) shall be 12.0 Lakh per MW.

- (2) 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 levelled tariff.

32. Water Royalty Charges

Tariff as determined by the Commission under these Regulations shall be exclusive of water royalty charges as may be levied by State Government on SHP projects.

Provided that water royalty charges as levied by State Government on SHP projects shall be allowed as pass through on actual incurred basis.

Chapter 5: Technology specific parameters for Biomass based Power Projects

33. Technology Aspect

The norms for tariff determination specified hereunder are for biomass power projects based on Rankine cycle technology application.

34. Capital Cost Benchmarking

The normative capital cost for the biomass power projects shall be Rs.450Lakh/MW (FY 2009-10 during first year of Control Period) and shall be linked to index formula as outlined under Regulation 35.

35. Capital Cost Indexation Mechanism

- (1) The following indexation mechanism shall be applicable in case of biomass power projects for adjustment in capital cost over the Control Period with the changes in Wholesale Price Index for Steel and Electrical Machinery,

$$CC_{(n)} = P\&M_{(n)} * (1+F_1+F_2+F_3)$$

$$P\&M_{(n)} = P\&M_{(0)} * (1+d_{(n)})$$

$$d_{(n)} = [a * \{(SI_{(n-1)}/SI_{(0)}) - 1\} + b * \{(EI_{(n-1)}/EI_{(0)}) - 1\}] / (a+b)$$

Where,

CC_(n) = Capital Cost for nth year

P&M_(n) = Plant and Machinery Cost for nth year

P&M₍₀₎ = Plant and Machinery Cost for the base year

d_(n) = Capital Cost escalation factor for year (n) of Control Period

SI_(n-1) = Average WPI Steel Index prevalent for fiscal year (n-1) of the Control Period

$SI_{(0)}$ = Average WPI Steel Index prevalent for fiscal year (0) at the beginning of the Control Period i.e. April 2008 to March 2009

$EI_{(n-1)}$ = Average WPI Electrical Machinery Index prevalent for fiscal year (n-1) of the Control Period

$EI_{(0)}$ = Average WPI Electrical and Machinery Index prevalent for fiscal year (0) at the beginning of the Control Period i.e. April 2008 to March 2009

a = Constant to be determined by Commission from time to time,
(In default it is 0.7), for weightages to Steel Index

b = Constant to be determined by Commission from time to time,
(In default it is 0.3), for weightages to Electrical Machinery Index

F_1 = Factor for Land and Civil Works (0.10)

F_2 = Factor for Erection and Commissioning (0.09)

F_3 = Factor for IDC and Financing Cost (0.14)

36. Plant Load Factor

Threshold Plant Load Factor for determining fixed charge component of Tariff shall be:

1. During Stabilisation: 60%
2. During the first year after Stabilisation: 70%
3. From 2nd Year onwards: 80%

37. Auxiliary Consumption

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

38. Station Heat Rate

The Station Heat Rate for biomass power projects shall be 3650 kCal / kWh

39. Operation and Maintenance Expenses

- (1) Normative O&M expenses for the first year of the Control period (i.e. FY 2009-10) shall be 20.25 Lakh per MW.
- (2) Normative O&M expenses allowed at the commencement of the Control Period (i.e. FY 2009-10) under these Regulations shall be escalated at the rate of 5.72% per annum.

40. 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.

41. Use of Fossil Fuel

The use of fossil fuels shall be limited to the extent of 15% of total fuel consumption on annual basis.

42. Monitoring Mechanism for the use of fossil fuel

- (1) The Project developer shall furnish a monthly fuel usage statement and monthly fuel procurement statement duly certified by Chartered 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. The statement shall cover details such as -

- a) Quantity of fuel (in tonnes) for each fuel type (biomass fuels and fossil fuels) consumed and procured during the month for power generation purposes,
 - b) Cumulative quantity (in tonnes) of each fuel type consumed and procured till the end of that month during the financial year,
 - c) Actual (gross and net) energy generation (denominated in units) during the month,
 - d) Cumulative actual (gross and net) energy generation (denominated in units) until the end of that month during the financial 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.

43. Calorific Value

The Calorific Value of the biomass fuel used for the purpose of determination of tariff shall be as follows:

State	Calorific Value (kCal/kg)
Andhra Pradesh	3275
Haryana	3458
Maharashtra	3611
Madhya Pradesh	3612
Punjab	3368
Rajasthan	3689
Tamilnadu	3300
Uttar Pradesh	3371
Other States	3467

44. Fuel Cost

Biomass fuel price during first year of the Control Period (i.e. FY 2009-10) shall be as presented in the table below and shall be linked to index formulae as specified under Regulation 45. Alternatively, for each subsequent year of the Tariff Period, the normative escalation factor of 5% per annum shall be applicable at the option of the biomass project developer.

State	Biomass Price (Rs/MT)
Andhra Pradesh	1231
Haryana	2039
Maharashtra	1694
Madhya Pradesh	1222
Punjab	1967
Rajasthan	1807
Tamilnadu	1715

Uttar Pradesh	1428
Other States	1685

45. Fuel Price Indexation Mechanism

- (1) In case of biomass power 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, in case developer wishes to opt for indexing mechanism:

$$P_{(n)} = P_{(n-1)} * \{a * (WPI_{(n)}/WPI_{(n-1)}) + b * (1+IRC)_{(n-1)} + c * (Pd_{(n)}/Pd_{(n-1)})\}$$

Where

$P_{(n)}$ = Price per ton of biomass for the n^{th} year to be considered for tariff determination

$P_{(n-1)}$ = Price per ton of biomass for the $(n-1)^{\text{th}}$ year to be considered for tariff determination. In case of $n=1$, P_{n-1} shall be equal to P_0 .

a = Factor representing fuel handling cost

b = Factor representing fuel cost

c = Factor representing transportation cost

$IRC_{(n-1)}$ = Average Annual Inflation Rate for indexed energy charge component in case of captive coal mine source (in %) to be applicable for $(n-1)^{\text{th}}$ year, as may be specified by CERC for 'Payment purpose' as per Competitive Bidding Guidelines

Pd_n = Weighted average price of HSD for n^{th} year.

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Pd_{n-1} = Weighted average price of HSD for (n-1)th year.

WPI_n = Whole sale price index for the month of April of nth year

WPI_{n-1} = Wholesale price index for month of April of (n-1)th year.

Where a, b & c will be specified by the Commission from time to time. In default, these factors shall be 0.2, 0.6 & 0.2 respectively.

(2) Variable Charge for the nth year shall be determined as under:

i.e. $VC_n = VC_0 \times (P_n / P_0)$ or $VC_n = VC_0 \times (1.05)^{(n-1)}$ (optional)

where,

VC_0 represents the Variable Charge based on Biomass Price P_0 for FY 2008-09 (i.e. beginning of Control Period) and shall be determined as under:

$$VC_0 = \frac{\text{Station Heat Rate (SHR)}}{\text{Gross Calorific Value (GCV)}} \times \frac{1}{(1 - \text{Aux Consum. Factor})} \times \frac{P_0}{1000}$$

**Chapter 6: Technology specific parameters for Non-fossil fuel based
Cogeneration Projects**

46. 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).

47. Capital Cost Benchmarking

The normative capital cost for the non-fossil fuel based cogeneration projects shall be Rs.445Lakh/MW for the first year of Control Period (i.e. FY 2009-10), and shall be linked to index formula as outlined under Regulation 48.

48. Capital Cost Indexation Mechanism

The following indexation mechanism shall be applicable in case of non-fossil fuel based cogeneration projects for adjustments in capital cost with the changes in Wholesale Price Index for Steel and Electrical Machinery,

$$CC_{(n)} = P\&M_{(n)} * (1+F_1+F_2+F_3)$$

$$P\&M_{(n)} = P\&M_{(0)} * (1+d_{(n)})$$

$$d_{(n)} = [a * \{(SI_{(n-1)}/SI_{(0)}) - 1\} + b * \{(EI_{(n-1)}/EI_{(0)}) - 1\}] / (a+b)$$

Where,

CC_(n) = Capital Cost for nth year

P&M_(n) = Plant and Machinery Cost for nth year

P&M₍₀₎ = Plant and Machinery Cost for the base year

d_(n) = Capital Cost escalation factor for year (n) of Control Period

$SI_{(n-1)}$ = Average WPI Steel Index prevalent for fiscal year (n-1) of the Control Period

$SI_{(0)}$ = Average WPI Steel Index prevalent for fiscal year (0) at the beginning of the Control Period i.e. April 2008 to March 2009

$EI_{(n-1)}$ = Average WPI Electrical Machinery Index prevalent for fiscal year (n-1) of the Control Period

$EI_{(0)}$ = Average WPI Electrical and Machinery Index prevalent for fiscal year (0) at the beginning of the Control Period i.e. April 2008 to March 2009

a = Constant to be determined by Commission from time to time,
(In default it is 0.7), for weightages to Steel Index

b = Constant to be determined by Commission from time to time,
(In default it is 0.3), for weightages to Electrical Machinery Index

F_1 = Factor for Land and Civil Work (0.10)

F_2 = Factor for Erection and Commissioning (0.09)

F_3 = Factor for IDC and Financing Cost (0.14)

49. Plant Load Factor

For the purpose of determining fixed charge, non-fossil fuel based cogeneration projects shall be considered to be operational for the period of 240 days (180 days during crushing season – cogeneration mode and 60 days of off-season/non-crushing season). Accordingly, the normative plant load factor for cogeneration project shall be considered as 60% (i.e. Availability factor 66% x load factor 90%).

50. Auxiliary Consumption

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

51. Station Heat Rate (Allocation of Fuel cost amongst Power and Steam)

- (1) The Station Heat Rate for non-fossil fuel based Cogeneration projects shall be 4000 kCal/kWh.
- (2) The fuel cost during season shall be allocated between power and steam, on the basis of the ratio of heat content in the steam extracted for the process to the heat content of the total steam generated. Further, co-generation projects are assumed to be working on co-generation mode during crushing season for period of around 180 days and on rankine cycle mode during off-season for period of around 60 days.
- (3) For the purpose of determination of tariff the normative ratio of allocation of fuel cost between power and steam shall be 60:40

52. Calorific Value

The Gross Calorific Value for Bagasse shall be considered as 2250 kCal/kg. For the use of biomass fuels other than biomass, calorific value as specified under Regulation 43 shall be applicable.

53. Fuel Cost

- (1) The price of Bagasse shall be as specified in the table below and shall be linked to index formulae as outlined under Regulation 54. 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 project developer.

State	Bagasse Price (Rs/MT)
Andhra Pradesh	845
Haryana	1327
Maharashtra	1056
Madhya Pradesh	761
Punjab	1314
Tamilnadu	1169
Uttar Pradesh	953
Other States	1094

- (2) For use of biomass other than bagasse in co-generation projects, the biomass prices as specified under Regulation 44 shall be applicable.

54. Fuel Price Indexation Mechanism

- (1) 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, in case developer wishes to opt for indexing mechanism:

$$P_{(n)} = P_{(n-1)} * \{a * (WPI_{(n)}/WPI_{(n-1)}) + b * (1+IRC)_{(n-1)} + c * (Pd_{(n)}/Pd_{(n-1)})\}$$

Where

$P_{(n)}$ = Price per ton of Bagasse for the n^{th} year to be considered for tariff determination

$P_{(n-1)}$ = Price per ton of Bagasse for the $(n-1)^{\text{th}}$ year to be considered for tariff determination. In case of $n=1$, P_{n-1} shall be equal to P_o .

a = Factor representing fuel handling cost

b = Factor representing fuel cost

c = Factor representing transportation cost

IRC_(n-1) = Average Annual Inflation Rate for indexed energy charge component in case of captive coal mine source (in %) to be applicable for (n-1)th year, as may be specified by CERC for 'Payment purpose' as per Competitive Bidding Guidelines

Pd_n = Weighted average price of HSD for nth year.

Pd_{n-1} = Weighted average price of HSD for (n-1)th year.

WPI_n = Whole sale price index for the month of April of nth year

WPI_{n-1} = Wholesale price index for month of April of (n-1)th year.

Where a, b & c will be specified by the Commission from time to time. In default, these factors shall be 0.2, 0.6 & 0.2 respectively.

(2) Variable Charge for the nth year shall be determined as under:

$$\text{i.e. } VC_n = VC_0 \times (P_n / P_0) \text{ or } VC_n = VC_0 \times (1.05)^{(n-1)} \text{ (optional)}$$

where,

VC₀ represents the Variable Charge based on bagasse Price P₀ for FY 2008-09 (i.e. beginning of Control Period) and shall be determined as under:

$$VC_0 = 60\% \times \frac{\text{Station Heat Rate (SHR)}}{\text{Gross Calorific Value (GCV)}} \times \frac{1}{(1 - \text{Aux Consum. Factor})} \times \frac{P_0}{1000}$$

55. Operation and Maintenance Expenses

(1) Normative O&M expenses during first year of the Control period (i.e. FY 2009-10) shall be 13.35 Lakh per MW.

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- (2) Normative O&M expenses allowed at the commencement of the Control Period (i.e. FY 2009-10) under these Regulations shall be escalated at the rate of 5.72% per annum.

Chapter 7: Technology specific parameters for Solar PV Power Project

56. Technology Aspects

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

57. Capital Cost

(1) The normative capital cost for setting up Solar Photovoltaic Power Project shall be Rs.1800 Lakh/MW for FY 2009-10.

Provided that the Commission may deviate from above norm in case of project specific tariff determination in pursuance of Regulation 7 and Regulation 8.

58. Capacity Utilisation Factor

(1) The Capacity utilisation factor for Solar PV project shall be 19%.

Provided that the Commission may deviate from above norm in case of project specific tariff determination in pursuance of Regulation 7 and Regulation 8.

59. Operation and Maintenance Expenses

(1) The O&M Expenses shall be Rs.9 Lakhs/MW for the 1st year operation.

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

Chapter 8: Technology specific parameters for Solar Thermal Power Project

60. Technology Aspects

(1) Norms for Solar thermal power under these Regulations shall be applicable for Concentrated solar power (CSP) technologies viz. solar trough or solar tower, 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.

61. Capital Cost

(1) The normative capital cost for setting up Solar Thermal Power Project shall be Rs.1300 Lakh/MW for FY 2009-10.
Provided that the Commission may deviate from above norm in case of project specific tariff determination in pursuance of Regulation 7 and Regulation 8.

62. Capacity Utilisation Factor

(1) The Capacity utilisation factor shall be 25%.
Provided that the Commission may deviate from above norm in case of project specific tariff determination in pursuance of Regulation 7 and Regulation 8.

63. Operation and Maintenance Expenses

(1) The O&M Expenses shall be Rs 13 Lakhs/MW for 1st year operation.
(2) Normative O&M expenses allowed at the commencement of the Control Period under these Regulations shall be escalated at the rate of 5.72% per annum.

64. Auxiliary Consumption

(1) The auxiliary consumption factor shall be 10%.

Provided that the Commission may deviate from above norm in case of project specific tariff determination in pursuance of Regulation 7 and Regulation 8.

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Chapter 9: Miscellaneous

56-65. Deviation from norms

Tariff for sale of electricity by the generating company may also be determined in deviation from the norms specified in these regulations subject to the conditions that the levellised tariff over the useful life of the project on the basis of the norms in deviation does not exceed the levellised tariff calculated on the basis of the norms specified in these regulations.

Provided that the reasons for deviation from the norms specified under these Regulations shall be recorded in writing.

57-66. 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 by grant of relaxation, may relax any of the provisions of these regulations on its own motion or on an application made before it by an interested person.

(Alok Kumar)
Secretary

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Form-1.1: Form Template for (Wind Power or Small Hydro Project) : Parameter Assumptions

S. No.	Assumption Head	Sub-Head	Sub-Head (2)	Unit	Parameter values
1	Power Generation	Capacity	Installed Power Generation Capacity Capacity Utilization Factor Commercial Operation Date Useful Life	MW % mm/yyyy Years	
2	Project Cost	Capital Cost/MW	Normative Capital Cost Capital Cost Capital subsidy, if any Net Capital Cost	Rs Lakh/MW Rs Lakh Rs Lakh Rs Lakh	
3	Financial Assumptions	Debt: Equity Debt component Equity component Depreciation Incentives	Tariff Period Debt Equity Total Debt Amount Total Equity Amount Loan Amount Moratorium Period Repayment Period(incld Moratorium) Intrest Rate Equity amount Return on Equity for first 10 years Return on Equity 11th year onwards Discount Rate Depreciation Rate for first 12 years Depreciation Rate 13th year onwards Generation Based Incentives, if any Period for GBI	Years % % Rs Lacs Rs Lacs Rs Lacs years years % Rs Lacs % p.a % p.a % % % Rs L p.a. Years	
4	Operation & Maintenance		Normative O&M expense O&M expense per annum Escalation factor for O&M expense	Rs Lakh/MW Rs Lakh %	
5	Working Capital	O&M expense Maintenance Spare Receivables Interest on Working Capital	(% of O&M exepenses)	Months % Months % p.a.	

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Form-2.1: Form Template for (Biomass Power or Non-fossil fuel based Cogen) : Parameter Assumptions

S. No.	Assumption Head	Sub-Head	Sub-Head (2)	Unit	Parameter values
1	Power Generation	Capacity	Installed Power Generation Capacity Auxiliary Consumption factor PLF (during stabilisation upto 6 months) PLF (during 1st yr after stabilisation) PLF (2nd yr onwards) Commercial Operation Date Useful Life	MW % % % % mm/yyyy Years	
2	Project Cost	Capital Cost/MW	Normative Capital Cost Capital Cost Capital subsidy, if any Net Capital Cost	Rs Lakh/MW Rs Lakh Rs Lakh Rs Lakh	
3	Financial Assumptions	<u>Debt: Equity</u> <u>Debt component</u> <u>Equity component</u> <u>Depreciation</u> Incentives	Tariff Period Debt Equity Total Debt Amount Total Equity Amount Loan Amount Moratorium Period Repayment Period(incld Moratorium) Interest Rate Equity amount Return on Equity for first 10 years Return on Equity 11th year onwards Discount Rate Depreciation Rate for first 12 years Depreciation Rate 13th year onwards Generation Based Incentives, if any Period for GBI	Years % % Rs Lacs Rs Lacs Rs Lacs years years % Rs Lacs % p.a % p.a % % % Rs L p.a. Years	
4	Operation & Maintenance	Normative O&M expense O&M expense per annum Escalation factor for O&M expense		Rs Lakh/MW Rs Lakh %	
5	Working Capital	O&M expense Maintenance Spare Receivables Biomass stock Interest on Working Capital	(% of O&M expenses)	Months % Months Months % p.a.	
6	Fuel related assumptions	Station Heat Rate Fuel types & mix	during stabilisation post stabilisation Biomass fuel type -1 Biomass fuel type -2 fossil Fuel (coal) GCV of Biomass fuel type -1 GCV of Biomass fuel type -2 GCV of fossil Fuel (coal) Biomass Price (fuel type -1) : yr-1 Biomass Price (fuel type -2) : yr-1 Fossil fuel price (coal) : yr-1 Fuel price escalation factor	kcal/kWh kcal/kWh % % % kCal/kg kCal/kg kCal/kg Rs/MT Rs/MT Rs/MT % p.a.	

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Form-1.2: Form Template for (Wind Power or Small Hydro Project) : Determination of Tariff Components

Units Generation	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	Yr-15	Yr-16	Yr-17	Yr-18	Yr-19	Yr-20	Yr-21	Yr-22	Yr-23	Yr-24	Yr-25	
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	Yr-15	Yr-16	Yr-17	Yr-18	Yr-19	Yr-20	Yr-21	Yr-22	Yr-23	Yr-24	Yr-25	
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	Yr-15	Yr-16	Yr-17	Yr-18	Yr-19	Yr-20	Yr-21	Yr-22	Yr-23	Yr-24	Yr-25	
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																										
Levillised 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	Yr-15	Yr-16	Yr-17	Yr-18	Yr-19	Yr-20	Yr-21	Yr-22	Yr-23	Yr-24	Yr-25	
Discount Factors																											
Discounted Tariff components	Rs/KWh																										
Levillised Tariff	Rs/KWh																										

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Form-2.2: Form Template for (Biomass Power or Non-fossil fuel based Cogen) : Determination of Tariff Components

Units Generation	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	Yr-15	Yr-16	Yr-17	Yr-18	Yr-19	Yr-20	Yr-21	Yr-22	Yr-23	Yr-24	Yr-25
Installed Capacity	MW																									
Net Generation	MU																									
Tariff Components (Fixed charge)	Unit																									
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																									
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																									
Per Unit Tariff components (fixed)	Unit																									
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																									
Levelised Tariff	Unit																									
Discount Factors																										
Discounted Tariff components (fixed)	Rs/kWh																									
Discounted Tariff components (variable)	Rs/kWh																									
Discounted Tariff components (total)	Rs/kWh																									
Levelised Tariff (fixed)	Rs/kWh																									
Levelised Tariff (variable)	Rs/kWh																									
Levelised Tariff (total)	Rs/kWh																									