ORISSA ELECTRICITY REGULATORY COMMISSION
BIDYUT NIYAMAK BHAVAN
UNIT-VIII, BHUBANESWAR-751012

Present : Shri B. K. Das, Chairperson
Shri K.C. Badu, Member
Shri B.K. Misra, Member

Petition No. 37/2008 (Suo Motu)

IN THE MATTER OF: **Suo-motu proceeding initiated by the Commission for finalization of Policy on Harnessing of Power from Renewable Energy Sources including Co-generation.**

IN THE MATTER OF:

OERC represented by Director (Tariff) …….**Petitioner**

Vs.

1. Commisioner cum Secretary, Department of Energy, GoO
2. O&M Solutions
3. Project Development Consultant
4. Shri R.P.Mohapatra
5. India Wind Energy Association
6. Orissa Power Generation Corporation
7. Grid Corporation of Orissa Ltd.
8. Orissa renewable Energy Development Agency
9. Orissa Power Transmission Corporation Ltd.(OPTCL)
10. Orissa hydro Power Corporation Ltd(OHPC)
11. Chief executive Officer, CESU
12. Chief executive Officer, NESCO
13. Chief executive Officer, WESCO
14. Chief executive Officer, SOUTHCO
15. Sr. G.M.(PS), SLDC …….**Respondents**

Date of hearing: 07.07.2010 **Date of order: 14.09.2010**

ORDER

In exercise of the powers vested under Section 86(1)(e), 61(h) and 62(a) of the Electricity Act 2003 (Act 36 of 2003), read with National Electricity Policy, the Tariff policy and after considering the views of the stakeholders, the Commission passes this tariff Order for the Renewable Power Projects to be set up in the State of Orissa.

Background of the order

1. The Commission had floated a Consultative Paper on Harnessing of Power from Renewable Energy Sources including co-generation during June 2008. The Commission had invited suggestions and comments on the Consultative Paper from the stakeholders and public in general.

2. The Commission thereafter registered this as a Case No.37/2008 and Director (Tariff), OERC was designated as petitioner and a Suo-motu proceeding was initiated for finalization of Policy on Harnessing of power from Renewable sources of Energy including Co-generation. A Public hearing was conducted on 19.07.2008 by the Commission to obtain views from the respondents and public on the said Consultative Paper.

The Commission in its interim order dated 19.07.2008 directed the following:

> *XXXXXX*
>
> *4. Representative of the State Government stated that the Government would abide by the decision of the Commission on this matter.*
>
> *5. Interested parties may go through the CERC's discussion paper (May, 2008) and the related TERI's paper on pricing of the renewable and offer their views on or before 16th August 2008 relating to pricing and other issues in the context of promoting renewable energy sector in the state of Orissa. The copy of the CERC discussion paper is served to all the parties concerned during the hearing. Interested parties may download the TERI's documents from its website.*
>
> *6. If necessary Commission may take up further consulting discussion with CEO, OREDA, Senior officers of the State Government, GRIDCO and other stake holders.*

3. In view of lack of proper studies on the potential of various RE sources of energy in Orissa and requisite data for the parameters required to calculate tariff for each RE source, Commission decided to appoint a Consultant to prepare an Approach Paper for enabling the Commission to notify a policy on Renewable Energy.

4. The bids were invited from the Consultants from all over the country through an open bidding process. World Institute of Sustainable Energy (WISE), Pune, was appointed as the consultant to undertake the study. After many rounds of discussion with the Commission, WISE submitted an approach paper on Tariff determination of renewable sources of energy and fixation of RPS for the State of Orissa.

5. Commission after receipt of the final Approach Paper invited suggestions, objections and views from the public through a notice in newspaper and in its own website. An abridged version of the said Approach Paper was also published for easy understanding of the public. Commission thereafter conducted an open hearing for the general public to comment on the said Approach Paper.

6. Various written and oral comments /suggestions were received on the Approach Paper of WISE. The list of objectors is as under:

   i) Orissa Power Transmission Corporation Limited (OPTCL)

   ii) M/s. Power Tech Consultants

iii) Indian Wind Energy Association

iv) M/s. Canyon Consultancy Services

v) Mr. R.P. Mahapatra

vi) NESCO

vii) Project Development Consultants

viii) WESCO

ix) O&M Solutions

7. **Views of objectors – Issue-wise**

a) Promotion and Development of RE Projects

- OREDA should be designated as a single nodal agency for all types of RE projects including small hydro which is now under the control of CE-cum-PCEI, Orissa.
- IDCO may create Land Banks by acquiring lands identified for the RE projects, develop the lands and allot to the project developer at a subsidized rate.
- A time limit should be fixed for establishment and commissioning of RE projects while signing the MOU. In case of any delay for commissioning of the RE project due to the fault of the RE developer, a penalty of Rs.1/- per Kwh may be levied on the RE developer which may be kept in a state fund for development of RE projects.
- A single window clearance system for all kinds of approval including evacuation and land related approvals should be set up to enable speedy approval and execution of RE projects.
- A single vibrant and capable agency is required to ensure appropriate development of RE sources.
- As per the Regulatory statement for the state of Orissa, the Government of Orissa may propose a green cess of 5 paise/Kwh to be levied on the electricity consumption by industrial and commercial consumers, which will be a very appreciable move for promotion of RE sources in the state. However, there is no system at present for separately assessing quantum of energy supplied to industrial/commercial consumers from the input points.

- In item 9 of approach paper, SHP in place of “certified” may be read as “approved” above 2 MW to 25 MW. Project upto 2 MW may be approved by CE, OREDA.
- The mandate should also be with OREDA to develop the Small Hydro Projects.
- OREDA may study the detailed Solar Resource Potential available in our State which will be useful for Govt. and private companies.
- Capacity building of OREDA is very much essential for development of RE sources and RE market.
- Govt. of Orissa may formulate RE Law in line with Section 3 and Section 4 of the Electricity Act, 2003 and address the needs of the consumers; so that both the green field and brown field renewable projects are fully developed.
- Support from the State Govt. for creating separate RE fund will be helpful for R&D to upgrade the existing technology and adopt innovative technology.
- OREDA should take necessary steps to set up a separate cell to monitor the compliance of RPS order.

b) **Tariff (General)**

- The Commission may ensure the specified pre-tax ROE 19% for first 10 years and 24% for the rest 15 years for solar projects.
- Line losses of 3% to 4% may be considered in the auxiliary consumption for every RE tariff determination.
- An effective MAT as 19.93% may be considered for all RE tariff determination.
- A separate tariff calculation for availing the accelerated depreciation may be considered, which may reduce the tariff by Rs.4 to 5 per KWH.
- Generic tariff may be fixed for each type of RE power projects and should remain in force for a period of ten years.
- The duration of the tariff period should be equivalent to the entire project life so as to provide more certainty to the project developers to

meet their debt service obligations and to ensure that adequate regulatory support is available to them.

- The normative capital cost specified in CERC regulation should be taken into consideration along with capital cost indexation based on the formula provided.
- The Capacity Utilization Factor (CUF) for some RE technologies given in the approach paper is different from CERC norms. The CUF as per CERC regulation may be adopted.
- Useful life of the project, debt-equity ratio, period of loan repayment, depreciation, O&M expenses and ROE as specified in the approach paper may be adopted as it is in line with CERC norms.
- The rate of interest on term loan and working capital loan may be determined as per CERC norms but based on the SBI PLR for the FY 2009-10.
- The tariff period for renewable energy project including all small hydro projects below 5 MW should also be 35 years to reduce the initial tariff burden to GRIDCO.
- Front loaded levelized tariff will be helpful for RE project developer because they can recover their cost in much earlier period and they will be interested for investment in RE projects.
- Different Renewable energy projects employ different technologies and varied capital structure, so the projects specific tariff is helpful to tap the renewable energy sources.

(i) Solar tariff

- Capacity utilization factor may be taken at 15% in place of 19% for solar projects.
- Panel degradation factor of 0.8% per annum may be considered on average basis for solar PV.
- Insurance expenses of 0.5% of the capital cost may be considered per annum for solar PV.

- The tariff for solar PV should be applicable for the entire control period subject to inflationary consideration.
- For solar PV projects of 1 MW and above, cost of connectivity upto interconnection point may be equally shared between the developer and the appropriate licensee.

(ii) Bio-mass tariff

- For Bio-mass projects capital cost per MW may be increased from Rs.5.4 cr.to Rs.5.8 cr. for determination of tariff.
- Tariff for bio-mass and non-fossil fuel based co-generation may be calculated as per CERC norms. However, single part tariff for these technologies may be determined based on the levellised tariff for the fixed cost and the cost of bio-mass fuel during the particular year.

(iii) Wind tariff

- Useful life of 20 years (instead of 25 years) may be considered for wind energy tariff as considered by C-WET for type test certification of Wind Turbine Generator (WTG).

(iv) Small Hydro tariff

- The capital cost for Small Hydro Projects of size less than 5 MW and between 5 to 25 MW has not been determined separately. In addition the normative capital cost of Rs.670 lakh per MW for SHP appears to be very high as compared to CERC figure of Rs.500 lakh to Rs.550 lakh per MW and there is no justification of such increase.
- The small hydro projects should be divided into 2 categories, one having installed capacity below 5 MW and the other from 5 MW to 25 MW.

c) Renewable Purchase Obligation

- RPO may be fixed for each renewable source separately.
- All thermal plants, EHT consumers and open access customers should also be treated as obligated entity for RPO.

d) Regulatory Issues

- In order to prevent any confusion/mis-interpretations of the provisions under these Regulations, a separate section for definitions should be included wherein all important terms used in these regulations are unambiguously defined and clearly specified.
- A separate section clearly mentioning the scope of these regulations and extent of application should be included.
- A separate regulation may be notified by OERC to incentivise the existing renewable sources of energy in the state.
- A clear cut policy for investment in RE projects, power evacuation infrastructure, concession in Open Access and wheeling charges, single window for project clearance, minimum RPO for State utilities etc. are required in order to develop the RE market.
- OERC may issue Multi-Year Tariff for renewable power projects so that cash flow is assured for the projects irrespective of technological obsolescence.

e) Issues on Connectivity and Power Evacuation

- The responsibility for creation of power evacuation infrastructure should be clearly demarcated between the developer and the utility.
- All RE generating projects must be treated as “must run” plants in order to ensure full utilization and their financial viability. However, the provision of scheduling and dispatch code should not be imposed because of lack of certain clarity in the provisions of IEGC.
- Any delay or improper construction of 33 KV systems for connectivity with RE sources should invite penalty on the concerned DISCOMs.
- All renewable energy plants except bio-mass with capacity of 10 MW and above and non-fossil fuel based co-generation plants shall be treated as “must run” and should not be subject to merit order dispatch principle. They should be allowed even under high frequency conditions which may be adjusted with the generation of major hydro power stations in the state.

- As per the guidelines of Ministry of New and Renewable Energy (MNRE), GoI and observation of OERC in Para 20 of its Order dtd. 09.09.2009 passed in Case No.62, 96& 98 of 2009, connectivity of 5 MW SPV projects shall be at 33 KV voltage level. For better reliability of power injection/drawl from the grid, SPV projects are to be connected on the 33 KV side of 132/33 KV grid sub-stations of OPTCL. In such cases 33 KV bay cost is to be borne by the SPV project developer. The PV model, electronics, cables, controls and structures shall be in accordance with the latest BIS or IEC 61215 or any international standard acceptable to OPTCL.
- The fault level at each interconnection point should be studied through system study and if the same requires replacement of existing equipment, it is to be done at the cost of the developer.
- ABT compliant (APEX Meter) shall be installed by OPTCL in its grid sub-stations and the cost will be borne by the developer.
- In case more than one developer located near each other, they can be clustered together to avail connectivity at 132 KV level with OPTCL system so that the available space inside the OPTCL switchyard could be optimally used keeping in view the future space requirement.
- Developers of co-generation and RE sources shall abide by all applicable Code, Rules, Regulations etc. in regard to operational and commercial practices.
- A time limit should be fixed for OPTCL to evacuate the power or face deemed generation.

f) Other Issues

- Rebate and late payment surcharge clause may be included under the heading O&M expenses.
- 2% rebate for payment through LC and 1% for any other mode within one month of presentation of bills.
- Late payment surcharge @1.25% per month if the payment is delayed beyond 60 days from the date of billing.

- Provision for banking of energy should be allowed for RE projects on annual basis and 2.5% energy may be deducted towards banking charges.
- RE developers should be exempted from payment of all types of taxes and duties.
- Wheeling and Banking facility will enable better participation from captive and open access consumers.
- The RE developer should be allowed to retain the entire proceeds of CDM benefits.
- The DRI (Sponge Iron) units generating power through waste heat recovery boilers should not be considered as co-generation plants under renewable energy. Only non-fossil fuel based co-generation projects using topping cycle mode of co-generation may be considered under renewable energy.
- In complying the RPO, the average tariff as projected by NESCO for the FY 2011-12 comes around Rs.11.10 per Kwh.
- At the present BSP of 218.50 p/Kwh, GRIDCO is under pressure for meeting the input cost and minimum expenses like employee cost, R&M cost and interest on loan etc.
- Hike in tariff on account of complying the RPO may give rise to discontentment among the consumers.
- At present the top most priority on the part of DISCOMs is to strengthen the system network and arrange resources for the same. Any extra financial burden imposed on this stage may collapse the entire system.
- In our state the industrial and commercial sector are already overburdened with high amount of cross\subsidy. Hence imposition of new cess will adversely affect the growth of industrial and commercial activities in Orissa.
- Subsidies and incentives should be given for development of RE projects based on available capacity instead of installed capacity so that the tariff will be less and the general consumers will benefit.

Commission's Observations:

8. Commission has taken note of the views of the objectors as discussed above and have addressed the same while designing tariff of various renewable sources of energy. However, as regards the issue of Renewable Purchase Obligation (RPO), Commission would address this issue separately in the OERC (Renewable Purchase Obligation and its Compliance) Regulation, 2010.

9. Based on the study and recommendations made by the WISE and taking into account the views expressed by the objectors during the public hearing as well as under the written submission, the Commission has finalized this generic tariff order in respect of the following Renewable Energy (RE) power projects in the State of Orissa:

- Wind Power Projects
- Solar PV Projects
- Solar Thermal Power projects
- Small hydro projects
- Biomass projects
- Non-fossil fuel based cogeneration projects

General principles

Control Period and Review period

10. The Control Period or Review Period shall be of three (3) financial years. First year of the Control Period shall commence from the FY 2010-11 and the Control Period shall cover up to the end of financial year 2012-13.

The tariff determined for the RE projects, as detailed in Section 9 of this Order, commissioned during the Control Period, shall continue to be applicable for the RE projects for the entire duration of the Tariff Period.

In case of Solar PV and Solar thermal projects the benchmark cost may be reviewed by the Commission annually. The generic tariff determined for Solar PV projects based on the capital cost and other norms applicable for the year 2010-11 shall also apply for such projects commissioned during the year 2011-12; and the generic tariff determined for solar thermal projects based on the capital cost and other norms for the year 2010-11 shall also apply for such projects commissioned during the years 2011-12 and 2012-13.

Provided that (i) the Power Purchase Agreements in respect of the Solar PV projects and Solar thermal projects as mentioned in this clause are signed on or before 31st March, 2011; and (ii) the entire capacity covered by the Power Purchase Agreements is commissioned on or before 31st March, 2012 in respect of Solar PV projects and on or before 31st March, 2013 in respect of Solar thermal projects.

Tariff Period

11. Tariff determined based on the principles enumerated in this order shall be applicable for Renewable Energy power projects commissioned during the control period and shall continue for the entire duration of the Tariff Period as stipulated below:

The Tariff Period for Renewable Energy power projects shall be for thirteen (13) years except in case of Small hydro projects below 5 MW, Solar PV and Solar thermal power projects.

In case of Small hydro projects below 5 MW, the Tariff Period shall be thirty five (35) years.

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

Tariff Period shall be considered from the date of commercial operation of the renewable energy generating stations.

Project Specific Tariff

12. Project specific tariff, on case to case basis, shall be determined for the following types of projects in case there is any filing before the Commission:

- Municipal Solid Waste to Energy Projects;
- Solar PV and Solar Thermal Power projects: if a project developer opts for project specific tariff, provided that the Commission while determining the project specific tariff for Solar PV and Solar Thermal projects shall be guided by the provisions enumerated in para 32 and 33 of this order.
- Hybrid Solar Thermal Power plants;
- Any other new renewable energy technologies approved by MNRE in future.

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 para 24 to 27 of this order, except for capital cost, shall be ceiling norms while determining the project specific tariff. However, the parties are free to agree in the PPA for any relaxed norms.

Petition and Proceedings for Determination of Tariff

13. A petition for determination of project specific tariff shall be accompanied by such fee as may be determined under the relevant Notification following OERC (Conduct of Business) Regulation, 2004 and shall be accompanied by:

- Information regarding financial parameters and technology specific parameters as the case may be;
- Detailed project report outlining technical and operational details, site specific aspects, premise for capital cost and financing plan, etc.
- A Statement of all applicable terms and conditions and expected expenditure for the period for which tariff is to be determined.
- 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.
- Any other information that the Commission requires the Petitioner to submit.
- The proceedings for determination of tariff shall be in accordance with the OERC (Conduct of Business) Regulations, 2004.

Tariff Structure

14. The tariff structure for renewable energy technologies shall be “Single part tariff”. The tariff for renewable energy technologies, viz. wind, solar, SHP having no fuel component, shall be single-part tariff with one component consisting of the following fixed components:

- Return on equity,
- Interest on loan capital,
- Depreciation,
- Interest on working capital,
- Operation and maintenance expenses.

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

Tariff Design

15. The generic tariff shall be determined on levellised basis, except for biomass and non-fossil fuel based co-generation technologies, for the useful life of the plant, as specified in this order.

Provided that for renewable energy technologies like biomass and non-fossil fuel based co-generation having single-part tariff with two components, levellised tariff is calculated by carrying out levellisation over useful life of each technology considering the discount factor.

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'.**

Subsidy/ Incentive by the Government of India/State Govt.

16. The Commission shall take into consideration any incentive or subsidy offered by the Government of India/State Govt. including accelerated depreciation benefit if to be availed by the developer for the renewable energy power plants while determining tariff.

Dispatch principles for electricity generated from Renewable Energy Sources

17. All renewable energy power plants except biomass power plants and non-fossil fuel based co-generation plants with installed capacity of 10 MW and above, shall be treated as 'MUST RUN' power plants and shall not be subject to 'merit order dispatch' principles.

However, the renewable energy power projects shall be subject to scheduling and dispatch code as specified under the Orissa Grid Code (OGC) / Indian Electricity Grid Code (IEGC) as the case may be including amendments thereto.

Interconnection Point

18. '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 PV 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 projects, interconnection point shall be line isolator on outgoing feeder on HV side of generator transformer.

Responsibility for development of evacuation infrastructure up to inter-connection point shall be entrusted to project developer while appropriate licensee would be responsible for development of evacuation infrastructure beyond inter-connection point.

19. **Eligibility criteria for RE projects**

a) Wind:

The wind power projects set up at the site approved by Centre for Wind Technology , Government of India / Orissa Renewable Energy Development Agency(OREDA) and have not opted for the pricing mechanism under the REC mechanism are eligible for getting the generic tariff under these norms.

b) **SHP**:

The SHP projects identified / approved by the Engineer in Chief, Electricity – cum Principal Chief Electrical Inspector, Government of Orissa with installed capacity of 25 MW or below which are commissioned during the control period and have not opted for the tariff under the REC mechanism are eligible for getting the generic tariff under these norms.

c) Biomass Power projects

The biomass power projects based on Rankine cycle technology application using water cooled condenser using biomass fuel sources are eligible for getting the generic tariff under these norms. Provided that the use of fossil fuel in such projects is restricted to 15% of total fuel consumption on annual basis as proposed by Ministry of New and Renewable Energy (MNRE), Government of India and the projects should not have opted for the pricing mechanism under the REC mechanism

d) Non-fossil fuel based cogeneration projects

A project shall qualify to be termed as a co-generation project, if it is in accordance with the definition specified by the Ministry of Power, Government of India 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 outputs is greater than 45% of the facility's energy consumption, during season**.**

Provided such projects should not have opted for the pricing mechanism under the REC mechanism.

e) Solar PV and Solar Thermal projects

The solar power technologies (PV & Thermal) approved by MNRE and connected to 33 KV or above voltage level shall be eligible for getting the generic tariff under these norms.

Water Royalty Charges (in case of SHP)

20. Water royalty charges shall not be internalised in tariff. However, the actual amount of water royalty charges as levied by the Govt. of Orissa shall be allowed as pass through component.

RE Technology-wise Project Life/ Tariff Period

21. Details of RE Technology-wise Useful life/ Tariff period considered for levellised Tariff calculation is given in the following table:

Table -1

S.No.	Technology	Useful Life (Years)	Tariff period (Years)
1	Wind	**25**	**13**
2	SHP a. Below 5MW b. 5 to 25 MW	 **35** **35**	 **35** **13**
3	Biomass	**20**	**13**
4	Non-fossil fuel based Co-generation	**20**	**13**
5	Solar PV	**25**	**25**
6	Solar Thermal	**25**	**25**

Monitoring Mechanism for the use of fossil fuel (in case of Biomass & non- fossil fuel based co-generation power projects)

22. 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 –

- Quantity of fuel (in tonnes) for each fuel type (biomass/ Non-fossil fuel based co-generation fuels and fossil fuels)consumed and procured during the month for power generation purposes,
- Cumulative quantity (in tonnes) of each fuel type consumed and procured till the end of that month during the year,
- Actual (gross and net) energy generation (denominated in units) during the month,
- Cumulative actual (gross and net) energy generation (denominated in units) until the end of that month during the year,
- Opening fuel stock quantity (in tonnes),
- Receipt of fuel quantity (in tonnes) at the power plant site and
- Closing fuel stock quantity (in tonnes) for each fuel type (biomass/ Non-fossil fuel based co-generation fuels and fossil fuels) available at the power plant site.

Non-compliance with the condition of fossil fuel usage by the project developer, during any financial year, shall render such biomass/non-fossil fuel based co-generation projects to be ineligible for preferential tariff determined from the date of default

23. **Compliance Monitoring**

- OREDA shall be responsible for monitoring compliance of Biomass/non-fossil fuel based co-generation projects with the norm specified.
- OREDA shall maintain such data including technical and commercial details of Biomass/Non-fossil fuel based co-generation projects in the State and shall make the data available in the public domain by publishing the same on its website with quarterly updation.

Applicability of Tariff Order

24. **Financial Parameters**

The financial parameters specified hereunder shall be applicable to all RE technology covered in the order.

i) **Capital Cost**

The norms for the Capital Cost as specified in the subsequent technology specific sections 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.

ii) **Capital Cost Indexation Mechanism**

Capital indexation mechanism would not be applicable in the first control period. It is observed that after gaining the requisite experience in the first control period, the Commission may implement the capital cost indexation mechanism in next control period beginning from FY 2013-14.

iii) **Debt-Equity ratio**

For determination of generic tariff, the debt-equity ratio shall be 70: 30.

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.

iv) **Loan and Finance charges**

a) **Loan Tenure**: For the purpose of determination of tariff, loan tenure of 10 years is considered.

b) **Interest Rate**

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.

The normative interest rate considered for the purpose of computation of tariff in this order is based on the Base Rate specified by State Bank of India (SBI).

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.

v) **Depreciation**

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.

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.

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.

vi) **Return on Equity**

The value base for the equity shall be 30% of the capital cost or actual equity (in case of project specific tariff determination) as specified under Debt-Equity Ratio provisions.

The normative Return on Equity shall be:

- Pre-tax 19% per annum for the first 10 years.
- Pre-tax 24% per annum 11th year onwards.

vii) **Interest on Working Capital**

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:

- Operation & Maintenance expenses for one month;
- Receivables equivalent to 2 (Two) months of energy charges for sale of electricity calculated on the normative Capacity Utilisation Factor (CUF);
- Maintenance spare @ 15% of operation and maintenance expenses

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

- Fuel costs for four months equivalent to normative Plant Load Factor (PLF);
- Operation & Maintenance expense for one month;
- Receivables equivalent to 2 (Two) months of fixed and variable charges for sale of electricity calculated on the target PLF;
- Maintenance spare @ 15% of operation and maintenance expenses

Interest on Working Capital is determined on the basis of Base Rate specified by State Bank of India.

Operation & maintenance Expenses

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

Operation and maintenance expenses shall be determined for the Tariff Period based on normative O&M expenses specified under this tariff order for the first Year of Control Period.

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

Sharing of CDM Benefits

26. The proceeds of carbon credit from approved CDM projects shall be shared between generating company and concerned beneficiaries in the following manner:

- 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;
- 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 between the generating company and the beneficiaries.

Benefit under Income Tax Act

27. For the purpose of tariff determination of RE sources, assessment of benefit towards accelerated depreciation as per relevant provisions under Income Tax Act and Corporate Income Tax rate has been calculated on the normative capital cost approved in this order for each RE technology. Accelerated depreciation has been calculated for each RE technology based on the existing corporate tax rate, surcharge and education cess. The benefit of accelerated depreciation shall be taken into consideration for Project Developers opting for the scheme and such benefits shall be internalized in the applicable generic tariff i.e. the effective tariff in such cases shall be equal to the difference between the applicable generic tariff and the benefit accruing on account of accelerated depreciation.

The net depreciation benefit has been derived as per the following method:

- For the projects availing benefits of accelerated depreciation as per applicable Income Tax rate @33.99% (30% IT rate + 10% surcharge + 3% Education cess) has been considered.
- For the purpose of determining net depreciation benefits, depreciation @5.28% as per straight line method (Book depreciation as per Companies Act, 1956) has been compared with depreciation as per Income Tax rate i.e. 80% of the written down value method.
- Depreciation for the 1st year i.e. FY 2010-11 has been calculated @50% of 80% i.e. 40% as the projects are expected to be capitalized during the second half of the financial year.
- The per unit levellised accelerated depreciation benefit has been computed considering the weighted average cost of capital as discount factor.

RE Technology-wise Specific Parameters

28. **Technology specific parameters for Wind Power Projects**

(A) Capital cost

i) 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 up to inter-connection point, financing charges and Interest during Construction (IDC).

ii) The capital cost for wind energy projects shall be Rs.467.13 Lakhs/MW during the Control Period (FY 2010-11 to FY 2012-13).

(B) Capacity Utilization Factor

i) The annual wind power density (Watt per Sq.m.) at C-WET certified six locations (Chandipur, Chatrapur, Damanjodi, Gopalpur, Paradip and Puri) in the State is below 200 Watt per sq.m.

ii) The normative Capacity Utilization Factor (CUF) considered for determination of generic tariff for procurement of electricity from the wind power project in the State of Orissa shall be 19 %. The normative CUF arrived is based on simulation carried out for CUF determination for the range of different wind turbines at the above six locations in the State of Orissa.

(C) Operation and Maintenance Expenses

i) O&M expenses for the first year of the Control Period (FY 2010-11) shall be Rs.6.87 Lakh per MW.

ii) O&M expenses allowed subsequently shall be escalated at the rate of 5.72% per annum.

(D) Levellized tariff for Wind Power Projects

i) The levellized tariff over the useful life is determined based on the financial parameters and operating parameters as discussed above and be applicable for a period of 13 years from the date of commercial operation.

Table -2

Levellized Tariff (Rs./kWh)	Benefit of Accelerated depreciation (if availed) (Rs./kWh)	Net Levellized Tariff (Rs./kWh)	Tariff Period (Years)
5.31	(0.83)	4.48	13

The Input Technical and Financial parameters for tariff computation are attached to this order at Appendix - 1

29. **Technology specific parameters for Small Hydro projects (SHP)**

(A) Capital Cost

The capital cost considered for small hydro projects during the control period (FY 2010-11 to FY 2012-13) shall be Rs.600 Lakhs/MW for the projects below 5 MW and Rs. 550 laks/MW for the projects between 5 MW to 25 MW. The benchmark capital cost for the generic SHP tariff is derived after studying the following state specific and other aspects:

a) Study of characteristics of identified SHP sites in the state reveals that most of the SHP schemes are identified on irrigation facilities like dam foot and canal. The data of the identified SHP sites is provided by Engineer-in-Chief (Electricity), Government of Orissa.

b) The approximate capital cost of identified 206 potential SHP projects in the State as computed by using SHP cost benchmark Report developed by IIT Roorkee.

c) The study of DPR approved by Engineer-in-Chief (Electricity), Government of Orissa.

(B) Capacity Utilisation Factor

The normative Capacity Utilization Factor of 35% for the generic tariff determination in case of SHP is considered after studying the design energy generation quoted in detailed project reports submitted by the investors and operational experiences of similar SHPs in the country.

The normative CUF as mentioned above is net of free power to the home State if any, and any quantum of the power if committed by the developer over and above the normative CUF shall not be factored into the tariff.

(C) Auxiliary Consumption

Auxiliary Consumption for the small hydro projects shall be 1.0%.

(D) Operation and Maintenance Expenses

i) O&M expenses for the first year of the Control Period (FY 2010-11) shall be Rs.12.69 Lakh per MW.

ii) O&M expenses allowed subsequently shall be escalated at the rate of 5.72% per annum.

(E) Levellized tariff for SHP Projects

The levellized tariff over the useful life is determined based on the financial and operating parameters as discussed above and will be applicable for a period of 13 years for the projects of 5 to 25 MW capacity. In case of SHP below 5 MW capacity the tariff will be applicable for 35 years from the date of commercial operation.

Table -3

Particular	Levellized Tariff (Rs./kWh)	Benefit of Accelerated depreciation (if availed) (Rs./kWh)	Net Levellized Tariff Rs./kWh)	Tariff Period (Years)
SHP projects of 5 to 25 MW capacity	3.64	(0.55)	3.09	13
SHP projects below 5 MW capacity	3.91	(0.60)	3.31	35

The Input Technical and Financial parameters for tariff computation are attached to this order at Appendix–2

30. **Technology specific parameters for Biomass based projects**

(A) Capital Cost

The capital cost for Biomass projects based on Rankine Cycle Technology application using water cooled condenser during the control period (FY 2010-11 to FY 2012-13) shall be Rs.450 Lakhs/MW.

(B) Plant Load Factor

The Plant Load Factor for determining generic tariff shall be

i) During stabilization 60%

ii) During the remaining period of the 1st year (after stabilization) 70%

iii) From 2nd year onwards 80%

(C) Auxiliary Consumption

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

(D) Station Heat Rate

The Station Heat Rate for biomass power projects shall be 3800 kcal/kWh.

(E) Gross Calorific Value

The gross calorific value for biomass in a particular state depends upon the type and quality of the surplus biomass available in that State. Before arriving at the normative calorific value of biomass for Orissa, the availability and characteristics of surplus biomass in the State has been taken into consideration. The normative gross calorific value is computed at 3522kcal/kg and the same is used for generic tariff determination in case of biomass power projects.

(F) Fuel Price

i) Biomass fuel price during first year of the Control Period (FY 2010-11) shall be Rs.1785/MT. The fuel price is based on CERC recommendation, consultation with experts who have conducted biomass study for OREDA and actual data collected with in the State.

ii) The Fuel price shall be escalated at the rate of 5% per annum.

(G) Operation and Maintenance Expenses

i) O&M expenses for the first year of the Control Period (FY 2010-11) shall be Rs.21.41 Lakh per MW.

ii) O&M expenses allowed subsequently shall be escalated at the rate of 5.72% per annum.

(H) Fuel Mix

i) 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.

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

(I) Use of Fossil Fuel

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

(J) Tariff for Biomass Power Projects

In case of Biomass Project, the fixed component of tariff is levellised over the useful life and paid accordingly year-wise, whereas the fuel component of tariff will be paid on the basis of financial year of operation.

Table - 4

Levellized fixed component of Tariff (Rs./kWh)	Variable(Fuel) Component of tariff for FY 2010-11	Effective tariff for FY 2010-11	Benefit of Accelerated depreciation (if availed) (Rs./kWh)	Net Tariff (Rs./kWh)
1.95	2.14	4.09	(0.21)	3.88

The Input Technical and Financial parameters for tariff computation are attached to this order at Appendix -3

31. **Technology specific parameters for Non-fossil fuel based Co-generation Projects**

(i) Capital Cost

The normative capital cost for the non-fossil fuel based co-generation projects shall be Rs.398.07 Lakh/MW for the Control Period (FY 2010-11 to FY 2012-13).

(ii) Plant Load Factor

i) For the purpose of determination of tariff, 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 below and load factor of 92%.

ii) The number of operating days shall be as follows:

Table - 5

Sr. No.	Operating Days	Plant Load factor
1.	150 days (crushing) + 60 days (off season) = 210 operating days	53%

(iii) Auxiliary Consumption

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

(iv) Station Heat Rate

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

(v) Gross Calorific Value

The gross calorific value for baggase shall be 2250 kcal/kg which is used for bagasse based co-generation tariff determination.

(vi) Fuel Price

(i) Baggase fuel price during first year of the Control Period (FY 2010-11) shall be Rs.1221/MT.

(ii) The Fuel price shall be escalated at the rate of 5% per annum.

(vii) Operation and Maintenance Expenses

(i) O&M expenses for the first year of the Control Period (FY 2010-11) shall be Rs.14.11 Lakh per MW.

(ii) O&M expenses for subsequent period shall be escalated at the rate of 5.72% per annum.

(viii) Use of Fossil Fuel

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

(ix) Tariff for Non-fossil fuel based Co-generation Projects

In case of Non-fossil fuel based Co-generation Projects the fixed component of tariff is levellised over the useful life and paid accordingly year-wise, whereas the fuel component of tariff will be paid on the basis of financial year of operation.

Table -6

Levellized fixed component of Tariff (Rs./kWh)	Variable(Fuel) Component of tariff for FY 2010-11	Effective tariff for FY 2010-11	Benefit of Accelerated Depreciation (if availed) (Rs./kWh)	Net Tariff (Rs./kWh)
2.26	2.14	4.40	(0.28)	4.12

The Input Technical and Financial parameters for tariff computation are attached to this order at Appendix-4.

32. **Technology specific parameters for Solar PV Power Projects**

(A) Capital Cost

The normative capital cost for setting up Solar PV power projects shall be Rs.1690 Lakh/MW for the first year of Control Period (FY 2010-11). In subsequent years of control period the Commission may review the capital cost annually based on operational experience of previous year of control period and CERC notification in this regard.

(B) Capacity Utilisation Factor

The normative capacity utilization factor considered for generic tariff determination for Solar PV power project shall be 19%. The normative CUF is determined on the basis of solar radiation data at five potential locations in the State namely Angul, Dhenkanal, Jharsuguda, Talcher & Titlagarh.

(C) Operation and Maintenance Expenses

(i) O&M expenses for the first year of the Control Period (FY 2010-11) shall be Rs. 9.514 Lakh per MW.

(ii) O&M expenses for the subsequent year shall be escalated at the rate of 5.72% per annum.

(D) Levellized tariff for Solar PV Power Projects

The levellized tariff over the useful life is determined based on the financial and operating parameters as discussed above and will be applicable for a period of 25 years from the date of commercial operation.

Table - 7

Levellized Tariff (Rs./kWh)	Benefit of Accelerated Depreciation (if availed) (Rs./kWh)	Net Levelized Tariff (Rs./kWh)	Tariff Period (Years)
17.80	(3.03)	14.77	25

The Input Technical and Financial parameters for tariff computation are attached to this order at Appendix-5

33. **Technology specific parameters for Solar Thermal Power Projects**

(A) **Capital Cost**

The normative capital cost for setting up Solar Thermal power projects shall be Rs.1530 Lakh/MW for the first year of Control Period (FY 2010-11). Thereafter, the Commission may review the capital cost annually based on operational experience of previous year of control period.

(B) **Capacity Utilisation Factor**

The normative capacity utilization factor considered for generic tariff determination for Solar Thermal power project shall be 24%. The normative CUF is determined on the basis of solar radiation data at five potential locations in the State namely Angul, Dhenkanal, Jharsuguda, Talcher and Titlagarh and taking into account the possible solar thermal technology.

(C) **Operation and Maintenance Expenses**

i. O&M expenses for the first year of the Control Period (FY 2010-11) shall be Rs.13.74 Lakh per MW.

ii. O&M expenses for subsequent years shall be escalated at the rate of 5.72% per annum.

(D) **Auxiliary Consumption**

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

(E) **Levellized tariff for Solar Thermal Power Projects**

The levellized tariff over the useful life is determined based on the financial and operating parameters as discussed above and the tariff will be applicable for a period of 25 years from the date of commercial operation.

Table - 8

Levellized Tariff (Rs./kWh)	Benefit of Accelerated Depreciation (if availed) (Rs./kWh)	Net Levellized Tariff (Rs./kWh)	Tariff Period (Years)
14.73	(2.41)	12.32	25

The Input Technical and Financial parameters for tariff computation are attached to this order at Appendix – 6.

34. Based on the above observations, the Commission directs as follows:

(i) The levellized generic tariff for various renewable sources of energy having "Single part tariff' is approved as in the following table:

Table - 9

Particular	Levellised Total Tariff (for the control period 2010-11 to 2012-13) (Rs./kWh)	Benefit of Accelerated Depreciation (if availed) (Rs./kWh)	Net Levellised Tariff (upon adjusting for Accelerated Depreciation benefit) (if availed) (Rs./kWh)	Tariff Period (Years)
Wind Energy	5.31	(0.83)	4.48	13
SHP projects of 5 to 25 MW capacity	3.64	(0.55)	3.09	13
SHP projects below 5 MW capacity	3.91	(0.60)	3.31	35
Solar PV	17.80	(3.03)	14.77	25
Solar Thermal	14.73	(2.41)	12.32	25

(ii) The levellized generic tariff for various renewable sources of energy having "Single part tariff with two components " is approved as in the following table:

Table - 10

Particular	Levellized fixed component of Tariff (Rs./kWh)	Variable(Fuel) Component of tariff for FY 2010-11	Effective tariff for FY 2010-11	Benefit of Accelerated depreciation (if availed) (Rs./kWh)	Net Tariff (Rs./kWh)
Biomass	1.95	2.14	4.09	(0.21)	3.88
Non-fossil fuel based co-generation	2.26	2.14	4.40	(0.28)	4.12

Note:
1. For Biomass projects the tariff approved above including levellized fixed component and variable (fuel component) for FY 2010-11 has been shown. The approved tariff year-wise for entire tariff period i.e.13 years is shown in the output table at Appendix-3.
2. For Non-fossil fuel based co-generation projects the above approved tariff including levellized fixed component and variable (fuel component) for FY 2010-11 has been shown. The approved tariff year-wise for entire tariff period i.e.13 years is shown in the output table at Appendix-4.

35. The Commission directs that the nodal agencies responsible for development of RE projects in Orissa (OREDA/EIC, Electricity as the case may be) to expedite issuance of clearance to the pending viable renewable projects and the project proposals submitted during the control period of three years starting from FY 2010-11.

36. The Commission also directs GRIDCO to sign Power Purchase Agreements with the renewable project developers soon after the projects get clearance from STC. The signing of PPAs has to be expedited keeping in view the OERC directive/Regulation relating to RPO obligations as amended from time to time.

37. The impact of additional power purchase cost arising out of meeting the RPO obligation shall be factored in to the ARR of GRIDCO each year.

38. The Commission shall take into consideration any incentive or subsidy offered by the Government of India/State Govt. including accelerated depreciation benefit if to be availed by the developer for the renewable energy power plants and such benefits shall be passed on to the consumers of the State.

39. **Rebate:** For payment of bills of the RE Power Projects through letter of credit or by cash within two working days (except holidays under N.I. Act), a rebate of 2% shall be allowed. 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.

40. **Late Payment Surcharge:** In case the payment of any bill for charges payable under these Guidelines is delayed beyond a period of 60 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.

41. Accordingly the case is disposed of.

Sd/-	**Sd/-**	**Sd/-**
(B. K. Misra)	**(K. C. Badu)**	**(B. K. Das)**
Member	**Member**	**Chairperson**

Appendix-1

WIND

Input Technical and Financial parameters

No	*Technical Parameters*	*Value*	*Unit*
1	Capacity of the Power Project	1	MW
2	Capacity Utilization Factor	19 %	%
3	Annual Net Generation	16.73	Lakh kWhs
4	Life of Plant and Machinery / Project Life	25	years

No	*Financial Parameters*	*Value*	*Unit*
1	Project Cost	467.13	Rs Lacs/MW
2	Non depreciable cost	10.00	% of Capital Cost
3	Debt	350.00	lacs
4	Equity	150.00	lacs
5	Interest Rate on Term Loan	12.50	%
6	Repayment Period	10	years
7	Depreciation (Straight Line Method, Company Law) (for first 10 years)	7.00	%
8	Discount Rate	15.35	%
9	O&M	6.87	lacs/MW
10	O&M Cost Escalation	5.72	%
11A	Return on Equity (Pre Tax) - in case of MAT (1-10 year)	19.00	%
11B	Return on Equity (Pre Tax) - in case of corporate tax (11-25 year)	24.00	
12	Interest on working capital	12.00	%

Outputs - Wind power project		
Levellized tariff (13 yrs)	**5.31**	Rs/kWh
Benefit under Accelerated Depreciation (if availed)	**0.83**	Rs/kWh
Levellised tariff after Accelerated Depreciation (if availed)	**4.48**	Rs/kWh

Appendix- 2

SHP

Input Technical and Financial parameters

No	*Technical Parameters*	*Value*	*Unit*
1	Capacity of the Power Project	1	MW
2	Capacity Utilization Factor	35.00	%
3	Annual gross energy Generation	30.66	Lakh kWhs
4	Auxiliary consumption	1.00	%
5	Net energy generation	30.35	Lakhs
6	Life of Plant and Machinery / Project Life	35	Years

No	*Financial Parameters*	*Value*	*Unit*
1	Project Cost for projects below 5 MW *	600	Rs Lacs/MW
2	Non depreciable cost	10.00	% of Capital Cost
3	Debt	420.00	Lacs
4	Equity	180.00	Lacs
5	Interest Rate on Term Loan	12.50	%
6	Repayment Period	10	Years
7	Depreciation (Straight Line Method, Company Law) (for first 10 years)	7.00	%
8	Discount Rate	15.52	%
9	O&M	12.69	lakhs /MW
10	O&M Cost Escalation	5.72	%
11A	Return on Equity (Pre Tax) - in case of MAT (1-10 year)	19.00	%
11B	Return on Equity (Pre Tax) - in case of corporate tax (11-35 year)	24.00	
12	Interest on working capital	12.00	%

** Project cost for projects between 5 MW to 25 MW is approved at Rs. 550 lakhs/MW and all other parameters as in above table remaining same.*

Outputs - SHP below 5 MW to 25 MW		
Levelized tariff	**3.64**	Rs/kWh
Benefit under Accelerated Depreciation (if availed)	**0.55**	Rs/kWh
Levellised tariff after Accelerated Depreciation (if availed)	**3.09**	Rs/kWh

Outputs - SHP below 5 MW		
Levelized tariff	**3.91**	Rs/kWh
Benefit under Accelerated Depreciation (if availed)	**0.60**	Rs/kWh
Levellised tariff after Accelerated Depreciation (if availed)	**3.31**	Rs/kWh

Appendix- 3

BIOMASS

Input Technical and Financial parameters

No	*Technical Parameters*	*Value*	*Unit*
1	Capacity of the Power Project	1	MW
2	Capacity Utilization Factor (2nd year-20 year)	80.00	%
3	Annual Gross energy Generation (during stabilization period)	56.94	Lakh kWhs
3a	Annual Gross energy generation (2nd yr-20yr)	70.08	Lakh kWhs
4	Auxiliary energy consumption	10.00	%
5	Net energy generation (during stabilization period)	51.24	Lakh kWhs
5a	Net energy generation (2nd year-20 year)	63.07	Lakh kWhs
6	Life of Plant and Machinery / Project Life	20	years
7	Station Heat Rate	3800	Kcal/Kwh
8	Gross Calorific Value	3522	Kcal/Kg

No	*Financial Parameters*	*Value*	*Unit*
1	Project Cost	450.00	Rs Lacs/MW
2	Non depreciable cost	10.00	% of Capital Cost
3	Debt	315.00	lacs
4	Equity	135.00	lacs
5	Interest Rate on Term Loan	12.50	%
6	Repayment Period	10	years
7	Depreciation (Straight Line Method, Company Law) **(for first 10 years)**	7.00	%
8	Discount Rate	15.20	%
9	O&M	21.41	lacs/MW
10	O&M Cost Escalation	5.72	%
11A	Return on Equity (Pre Tax) - in case of MAT (1-10 year)	19.00	%
11B	Return on Equity (Pre Tax) - in case of corporate tax (11-20 year)	24.00	
12	Interest on working capital	12.00	%
13	Fuel cost	1785	Rs /MT
14	Annual escalation factor for fuel cost	5.00	%

Outputs for Grid-Connected Biomass Power Plant

Year	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Variable tariff	2.14	2.25	2.36	2.48	2.60	2.73	2.87	3.01	3.16	3.32	3.49	3.66	3.84
Levellised fixed Tariff	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95
Year Wise Tariff	4.09	4.20	4.31	4.43	4.55	4.68	4.82	4.96	5.11	5.27	5.44	5.61	5.80
Benefit of Accel. Deprn	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21
Yearwise tariff after Accel Deprn	3.88	3.99	4.10	4.22	4.34	4.47	4.61	4.75	4.90	5.06	5.23	5.40	5.59

Appendix- 4

NON-FOSSIL FUEL BASED COGENERATION

Input Technical and Financial parameters

No	*Technical Parameters*	*Value*	*Unit*
1	Capacity of the Power Project	1	MW
2	Capacity Utilization Factor	53.00	%
3	Annual Gross energy Generation	46.43	Lakh kWhs
4	Auxiliary energy consumption	8.50	%
5	Net energy generation	42.48	Lakh kWhs
6	Life of Plant and Machinery / Project Life	20	years
7	Station Heat Rate	3600	Kcal/Kwh
8	Gross Calorific Value	2250	Kcal/Kg

No	*Financial Parameters*	*Value*	*Unit*
1	Project Cost	398.07	Rs Lacs/MW
2	Non depreciable cost	10.00	% of Capital Cost
3	Debt	278.65	lacs
4	Equity	119.42	lacs
5	Interest Rate on Term Loan	12.50	%
6	Repayment Period	10	years
7	Depreciation (Straight Line Method, Company Law) **(for first 10 years)**	7.00	%
8	Discount Rate	15.20	%
9	O&M	14.11	lacs/MW
10	O&M Cost Escalation	5.72	%
11A	Return on Equity (Pre Tax) - in case of MAT (1-10 year)	19.00	%
11B	Return on Equity (Pre Tax) - in case of corporate tax (11-20 year)	24.00	
12	Interest on working capital	12.00	%
13	Fuel cost	1221	Rs /MT
14	Annual escalation factor for fuel cost	5.00	%
15	Percentage of fuel cost attributed to power generation	60.00	%

Outputs for Grid-Connected cogeneration (non-fossil fuel) Power Plant

Year	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Variable tariff	2.14	2.24	2.35	2.47	2.60	2.72	2.86	3.00	3.15	3.31	3.48	3.65	3.83
Levellised fixed cost	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26
Year- Wise Tariff	4.40	4.50	4.61	4.73	4.85	4.98	5.12	5.26	5.41	5.57	5.73	5.91	6.09
Benefit under Accel. Deprn	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
Year wise tariff under Accel. Deprn	4.12	4.22	4.33	4.45	4.57	4.70	4.84	4.98	5.13	5.29	5.45	5.63	5.81

Appendix- 5

SOLAR PV

Input technical and financial parameters

No	*Technical Parameters*	*Value*	*Unit*
1	Capacity of the Power Project	1	MW
2	Capacity Utilization Factor	19.00	%
3	Annual Net Generation	16.64	Lakh kWhs
4	Life of Plant and Machinery / Project Life	25	years

No	*Financial Parameters*	*Value*	*Unit*
1	Project Cost	1690	Rs Lacs
2	Non - Depreciable Amount	10.00	% of Capital Cost
3	Debt	1183.00	lacs
4	Equity	507.00	lacs
5	Interest Rate on Term Loan	12.50	%
6	Repayment Period	10	years
7	Depreciation (Straight Line Method,Company Law) - for first 10 years	7.00	%
8	Discount Rate	15.35	%
9	O&M	9.514	Rs. Lakhs
10	O&M Cost Escalation	5.72	%
11A	Return on Equity - pretax (1-10 years)	19.00	%
11B	Return on Equity - pretax (11-25 years)	24.00	%
12	Interest on working capital	12.00	%

Outputs - Solar PV		
Levelized tariff (25 yrs)	**17.80**	Rs/kWh
Benefit under Accelerated Depreciation (if availed)	**3.03**	Rs/kWh
Levellised tariff after Accelerated Depreciation (if availed)	**14.77**	Rs/kWh

Appendix- 6

SOLAR THERMAL

Input technical and financial parameters

No	*Technical Parameters*	*Value*	*Unit*
1	Capacity of the Power Project	1	MW
2	Capacity Utilization Factor	24.00	%
3	Annual Gross Generation	21.02	Lakh kWhs
4	Auxiliary consumption	10.00	%
5	Annual net energy generation	18.92	kWh/kWp
6	Life of Plant and Machinery / Project Life	25	years

No	*Financial Parameters*	*Value*	*Unit*
1	Project Cost	1530	Rs Lacs/MW
2	Non depreciable cost	10.00	% of Capital Cost
3	Debt	1071.00	lacs
4	Equity	459.00	lacs
5	Interest Rate on Term Loan	12.50	%
6	Repayment Period	10	years
7	Depreciation (Straight Line Method, Company Law) (for first 10 years)	7.00	%
8	Discount Rate	15.35	%
9	O&M	13.74	Rs lakhs/MW
10	O&M Cost Escalation	5.72	%
11A	Return on Equity (Pre Tax) - in case of MAT (1-10 year)	19.00	%
11B	Return on Equity (Pre Tax) - in case of corporate tax (11-25 year)	24.00	
12	Interest on working capital	12.00	%

Outputs - Solar Thermal		
Levelized tariff (25 yrs)	**14.73**	Rs/kWh
Benefit under Accelerated Depreciation (if availed)	**2.41**	Rs/kWh
Levellised tariff after Accelerated Depreciation (if availed)	**12.32**	Rs/kWh