ORISSA ELECTRICITY REGULATORY COMMISSION
BIDYUT NIYAMAK BHAVAN, UNIT – VIII, BHUBANESWAR
Website : **www.orierc.org**

In the matter of - Sou-motu proceeding for finalization of generic tariff of Renewable Energy Sources including Cogeneration for the second control period from 2013-14 to 2017-18

&

In the matter of - Director(Tariff), OERC

Vrs.

Commissioner-Cum-Secretary,

Department of Energy, Govt. of Orissa & Others

PUBLIC NOTICE

The Commission has initiated a suo-motu proceeding on the above matter and the Suo-motu petition in the matter is available in the Commission's website **www.orierc.org**. The petition can also be obtained from its office of the Commission on payment of Rs.50/- in cash.

The interested persons, organizations, stakeholders and respondents may file their comments, suggestions on the Suo-motu petition, on or before **8th November 2013.** The date of consultative hearing would be notified subsequently.

By Order of the Commission

Secretary

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

Present : Shri S.P. Nanda, Chairperson
Shri B.K. Misra, Member
Shri S.P. Swain, Member

Petition No. (Suo Motu)

IN THE MATTER OF: Suo-motu proceeding for finalization of generic tariff of Renewable Energy Sources including Co-generation for the second control period 2013-14 to 2017-18.

AND

IN THE MATTER OF:

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

Vs.

1. Commisioner cum Secretary, Department of Energy, GoO
2. Orissa Power Generation Corporation
3. Grid Corporation of Orissa Ltd.
4. Orissa Renewable Energy Development Agency (OREDA)
5. Orissa Power Transmission Corporation Ltd.(OPTCL)
6. Orissa Hydro Power Corporation Ltd(OHPC)
7. Chief Executive Officer, CESU
8. MD, NESCO
9. MD, WESCO
10. MD, SOUTHCO
11. Sr. G.M.(PS), SLDC
12. Green Energy Corporation of Odisha Ltd

…….**Respondents**

Most Respectfully Showeth: The humble petition of above named petitioner

1. 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 the Commission has initiated this tariff Order for the Renewable Power Projects to be set up in the State of Orissa for the control period 2013-14 to 2017-18.

2. Commission in its earlier Order No. 37/2008 (Suo Motu) dated 14.09.2010 approved the levelised generic tariffs applicable to the projects commissioned during the control period 2010-11 to 2012-13 which would not undergo any change for the entire tariff period of that project (except for variable component as in case of Biomass and baggasse based co-generation). The generic tariff of these renewable technologies was of ceiling

in nature and GRIDCO and Developer could negotiate lower tariff for their bilateral agreement. Subsequently Commission revised the generic tariff of following two technologies during the control period:

- Biomass vide case no. 151-155/2010 dated 23.09.2011
- Solar PV and Thermal vide case no. 1/2012 dated 20.06.2012 (Suo Motu)

3. Commission has reviewed developments of renewable energy technologies in Odisha during the last control period (2010-11 to 2012-13). The levellised Generic tariff and status of projects commissioned during the control period of various technologies prevalent upto 2012-13 are detailed below:

(A) Levellized tariff for Wind Power Projects was determined in the order No. 37/2008 (Suo Motu) dt 14.09.2010) for the last control period (2010-11 to 2012-13).

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

Status: No project was developed during last control period (2010-11 to 2012-13) nor any currently are in the development stage.

(B) Levellized tariff for SHP Projects were determined in Petition No. 37/2008 (Suo Motu dt 14.09.2010 for last control period (2010-11 to 2012-13).

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

Status: Presently 3 Nos. of Small Hydro Electric Projects (SHEPs) of 5 MW to 25 MW totaling 57 MW capacities are commissioned in the state supplying total power to the State through PTC, as detailed below:

Sl No.	Name of the Developer	Project Location	Installed Capacity (MW)	Date of Commercial Operation
1	Meenakhsi Power Ltd.	Middle Kolab, Koraput	(2 x 12.5) = 25	14.07.2009
2	Meenakhsi Power LTd.	Lower Kolab, Malkanagiri	(3 x 4) = 12	14.07.2009
3	Orissa Power Consortium Ltd. (OPCL)	Samal Barrage, Angul	(4 x 5) = 20	12.10.2009

State Technical Committee has since cleared a few SHEP Projects; but none of the Project is under construction stage. These projects will likely to come within 3-5 years.

(C) Levellized 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 variable component of tariff will be paid on the basis of the financial year of operation. The Commission first determined tariff (single part tariff with two components, fixed and variable) for biomass projects in its order No. 37/2008 (Suo Motu) dt 14.09.2010. However, this was subsequently reviewed during the control period and the following tariff was given in the case No.151-165/2010 dated 23.09.2011.

Year	**2011-12**	**2012-13**	**2013-14**	**2014-15**	**2015-16**	**2016-17**	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**
Variable tariff	2.92	3.06	3.21	3.37	3.54	3.72	3.91	4.10	4.31	4.52	4.75	4.99	5.24
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	4.87	5.01	5.16	5.32	5.49	5.67	5.86	6.05	6.26	6.47	6.70	6.94	7.19
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	4.66	4.80	4.95	5.11	5.28	5.46	5.65	5.84	6.05	6.26	6.49	6.73	6.98

Status: M/s Shalivahana Green Energy Ltd. (SGEL) is the only project which was commissioned during the first control period. M/s SGEL is the 1st Biomass power plant of the state having 20 MW installed capacity which is located at village Nimidha in district Dhenkanal. It got commissioned and commercially operated injecting power to GRIDCO with effect from 19-12-2011 as per the PPA executed with M/s SGEL on dated 30.12.2010. GRIDCO has also executed Power Purchase Agreement with the following 9 nos. of Biomass developers (including Ms SGEL) for procurement of power from their proposed Biomass power plants for a total capacity of 118 MW during the control period. The list of other Biomass developer with whom PPA is signed by GRIDCO is given below:-

Sl. No.	Name of Developer	Location / Installed Capacity (MW)	Date of Execution of PPA
1	M/s. ANDHAVARAPU PPOWER PROJECT PVT. LIMITED.	NAWARANGPUR / 10	30-12-2010
2	M/s SATYA BIO POWER (INDIA) LIMITED	GANJAM / 10	30-12-2010
3	M/s SHALIVAHAN GREEN ENERGY LIMITED	DHENKANAL / 20	30-12-2010
4	M/s RAHMEE POWER PRIVATE LIMITED	BOUDH / 10	23-12 2010
5	M/s RAKE POWER LLMITED	SUNDARGARH / 23	30-12-2010
6	M/s PRASAD BIO ENERGY PRIVATE LIMITED	RAYGADA / 10	30-12-2010
7	M/s AVN POWER PROJECTS PRIVATE LIMITED	KALAHANDI / 10	30-12-2010
8	M/s STARLIGHT ENERGY LIMITED.	NUAPADA / 15	04-01-2011
9	M/s OCTANT Industries Ltd.	SAMBALPUR / 10	21-01-2010

These projects are likely to be commissioned during the current control period i.e. 2013-14 to 2017-18.

(D) Levellized tariff for Non-fossil fuel based Co-generation (baggasse based) projects was determined in order No. 37/2008 (Suo Motu) dt 14.09.2010.

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

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

Status: No project was developed during the Control period and presently no project is also under construction stage.

(E) Levellized tariff for Solar PV Power Projects

Commission in its order No.37/2008 (Suo Motu) dtd.14.09.2010 determined the generic tariff for Solar PV and Solar Thermal Projects for the control period 2010-11 to 2012-13. In the said order the Commission mentioned that in case of Solar PV and Solar Thermal Projects the bench mark cost may be reviewed by the Commission annually. The Commission in Case No.1 of 2012 dt. 20.06.2012 re-determined the generic tariff for Solar PV and Solar Thermal Projects during the control period. The following generic tariff over the useful life was determined based on the financial and operating parameters and applicable for a period of 25 years from the date of

commercial operation. The generic tariff was determined applicable for two sub periods of 12 years and 13 years respectively.

Levellised Tariff of Solar PV Projects (Rs./kWh)	Benefit of Accelerated Depreciation (if availed (Rs./kWh)	Net Levellised Tariff (Rs./kWh)	Tariff Period (Years)
13.34	1.75	11.59	12
8.74	-	8.74	13

Status:

The following solar PV projects were commissioned during the control period 2010-11 to 2012-13.

1. 8 nos. of Solar PV projects of 1 MW each under Roof Top and Small Scale Generation Plants (RPSSGP) scheme got commissioned during FY 2011- 12 (July 2011 onwards)and are currently injecting their total power to the state Grid.
2. 5 MW Solar PV project by M/s Aftaab Solar Pvt. Ltd. located at Sadeipalli, Bolangir got commissioned on 07.02.2012 under 'New Projects Scheme', Batch-I under JNNSM & NVVN and is currently supplying 5 MW bundled power to GRIDCO out of its total allocation of 20 MW under the said scheme.
3. 5 MW Solar PV project by NTPC Ltd. located at Dadri, Gaziabad, Uttar Pradesh got commissioned on 30.03.2013 under bundling route and is currently supplying 5 MW Solar power bundled with equivalent capacity of thermal from the ER NTPC stations.

GRIDCO has Signed PPA with following Developers for the projects likely to come up during the control period 2013-14 to 2017-18.

4. M/s Alex Green Energy Ltd. on dated 26.05.2012 for setting up of 5 MW Solar PV project at Khurda under OREDA State scheme, Batch-I : 5 MW
5. M/s ACME Odisha Solar Power Pvt. Ltd. on dated 06.03.2013 for setting up 25 MW Solar PV project under OREDA State scheme, Batch-II : 25 MW

The tariff of such projects in PPA is fixed on bidding route which is at about Rs.7.50 /-KWh far below the generic tariff. Commission would determine the generic tariff of Solar PV Projects as ceiling tariff, with a stipulation that the project be selected on bidding route only within the ceiling price fixed by the Commission.

(F) Levellized tariff for Solar Thermal Power Projects (Case No.1 of 2012 dt. 20.06.2012)

Commission in its order No.37/2008 (Suo Motu) dtd.14.09.2010 determined the generic tariff for Solar Thermal Projects for the control period 2010-11 to 2012-13. No revision

of Levellised generic tariff for Solar Thermal projects has been made during the last control period. The levellized tariff over the useful life was determined based on the financial and operating parameters and the tariff was applicable for a period of 25 years from the date of commercial operation.

Levellised Tariff of Solar Thermal Projects (Rs./kWh)	Benefit of Accelerated Depreciation (if availed (Rs./kWh)	Net Levellised Tariff (Rs./kWh)	Tariff Period (Years)
14.81	1.96	12.85	First 12 yrs
10.91	-	10.91	Next 13 yrs

Status: No project was developed during this Control period. None of the project is also under the pipeline.

4. Commission in the Petition No. 37/2008 (Suo Motu) dated 14.09.2010 approved the levelised generic tariffs, to be made applicable for the projects commissioned during the control period 2010-11 to 2012-13 and defined General principles, Financial parameters, and technology-wise specific parameters.

5. The Commission now has started this proceedings to finalise this generic tariff order in respect of the following Renewable Energy (RE) power projects in the State of Orissa for the current control period 2013-14 to 2017-18:

- 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

6. The Control Period or Review Period shall be of three (3) financial years for all the RE technology projects except for Small Hydro Electric Projects (SHEP) for which the control period shall be of five (5) years. First year of the Control Period shall commence from the beginning of FY 2013-14 and the Control Period shall continue up to the end of financial year 2015-16. In case of SHEP the first year of the Control Period shall commence from the beginning of FY 2013-14 and the Control Period shall contine up to the end of financial year 2017-18.

The tariff determined 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.

In case of Solar PV and Solar thermal projects the benchmark cost may be reviewed by the Commission annually.

Tariff Period

7. 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 such as Wind, Biomass and Non Fossil Cogeneration shall be for thirteen (13) years

In case of Small hydro projects, the Tariff Period shall be thirty five (25) years to be extended upto another ten years as agreed to by the parties of PPA.

In case of Solar PV and Solar thermal power projects, the Tariff Period shall be twenty five (25) years split into two periods of Twelve (12) years and thirteen (13) years respectively .

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

Project Specific Tariff

8. The preferred route for selection of the RE project in the control period shall be through the bidding route. However the project being developed under MOU route the generic tariff so fixed by this order shall be the ceiling rate and the GRIDCO/ DISCOM and the project developer could negotiate lower tariff of their bilateral agreement. However, the project specific tariff, on case to case basis, within the ceiling tariff shall be determined for the following types of projects in case there is any filing before the Commission:

- Small Hydro Projects
- 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 paragraph 28 and 29 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 paragraph 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

9. 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

10. 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.

Taxes shall be reimbursed at actual as per audit report.

Tariff Design

11. 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 only for the fixed component of the tariff.

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.

12. 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

13. 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

14. 'Inter-connection Point' shall mean interface point of renewable energy generating facility with the transmission system or distribution system, as the case may be.

The interconnection point for different voltage level shall be as follows:

- For Rooftop based Solar installations upto 100 KW projects, the point of interconnection should be at 400 volts of DISCOM network.
- For all renewable generations of more than 100 KW and less than 5 MW projects the point of interconnection should be at 11 KV of 33/11 Kv sub-station of DISCOM network.
- For all renewable generations of 5 MW and upto 25 MW projects, the point of interconnection should be at 33 KV of either 33/11Kv substation of DISCOM or 132/33 Kv substation of OPTCL whichever is nearer.
- For all renewable generations of more than 25 MW projects the point of interconnection should be at 132 KV of 132/33 or 220/132 Kv substation of OPTCL network whichever is nearer.

The project developer may construct the dedicated line upto the nearest point of DISCOM or OPTCL network as the case may be and such line would be treated as deemed transmission line or deemed distribution line. The capital cost on account of such construction and losses are to be equally shared by the project developer and the OPTCL or DISCOM as the case may be. The metering should be at both ends of generation and Licensee side.

15. **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)

16. 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

17. 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** **25**
3	Biomass	**20**	**13**
4	Non-fossil fuel based Co-generation	**20**	**13**
5	Solar PV	**25**	**25 (split for 12 and 13 yrs)**
6	Solar Thermal	**25**	**25 (split for 12 and 13 yrs)**

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

18. The Project developer shall furnish a monthly fuel usage statement and monthly fuel procurement statement duly certified by a (registered) 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

19. **Compliance Monitoring**

- OREDA/ GEDCOL shall be responsible for monitoring compliance of Biomass/non-fossil fuel based co-generation projects with the norm specified.
- OREDA/ GEDCOL 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

20. **Financial Parameters**

The financial parameters specified hereunder shall be applicable to all RE technology covered in this paper.

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 cost indexation mechanism was not made applicable during the first control period. Commission in its order No. 37/2008 (Suo Motu) dt 14.09.2010 observed that after gaining the requisite experience in the first control period, the Commission may implement the capital cost indexation mechanism in current control period beginning from FY 2013-14. Commission therefore in the second control period from FY 2013-14 to 2017-18 would follow the Capital cost indexation mechanism for respective technology as provided in the CERC (Terms and conditions for tariff determination from Renewable Energy Sources) Regulations, 2012 dated 06.02.2012.

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 12 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 (Advance rate) specified by State Bank of India (SBI) during the first six months of the previous year plus 300 basis points.

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 (Capital Base/ Rate 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 12 years of the Tariff Period shall be 5.83% per annum and the remaining depreciation shall be spread over the remaining useful life of the project from 13th year onwards.

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 16%

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 prevalent during the first six months of the previous year plus 350 basis points.

Operation & maintenance Expenses

21. '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 2013-14) under this Tariff Order shall be escalated at the rate of 5.72% per annum over the Tariff Period.

Sharing of CDM Benefits

22. 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

23. 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 @32.455% 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 2013-14 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

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

(G) 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.**575** Lakhs/MW during the first year of the control period (2013-14)

(H) 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.

(I) Operation and Maintenance Expenses

i) O&M expenses for the first year of the Control Period (FY 2013-14) shall be Rs.9 Lakh per MW.

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

(J) 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 (Rs./kWh)	Net Levellized Tariff (Rs./kWh)	Tariff Period (Years)
5.41	(0.65)	4.76	13

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

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

(A) Capital Cost

The capital cost considered for small hydro projects during the control period (FY 2013-14 to FY 2017-18) shall be Rs. **600** Lakhs/MW for all the projects below 5 MW and for the projects between 5 MW to 25 MW.

(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 CUF is considered same for this control period as was considered for the last control period ended in 2012-13.

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 2013-14) shall be Rs.20 Lakh per MW for projects below 5 MW and Rs. 14 lakh for projects between 5 MW to 25 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 (Rs./kWh)	Net Levellized Tariff Rs./kWh)	Tariff Period (Years)
SHP projects below 5 MW capacity	3.84	(0.39)	3.46	35
SHP projects of 5 to 25 MW capacity	3.53	(0.39)	3.14	25

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

26. **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 2013-14 to 2015-16) shall be Rs.445 Lakhs/MW. The benchmark capital cost for the generic Biomass tariff for Odisha is same as that of CERC Renewable Regulation, 2012.

(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) Operation and Maintenance Expenses

i) O&M expenses for the first year of the Control Period (FY 2013-14) shall be Rs.24 Lakh per MW.

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

(E) Station Heat Rate

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

(F) 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 3300 kcal/kg and the same is used for generic tariff determination in case of biomass power projects.

(G) Fuel Price

i) Biomass fuel price during first year of the Control Period (FY 2013-14 to 2015-16) shall be Rs.**2316**/ MT (average) in consultation with experts who have conducted biomass study for OREDA and actual data collected with in the State.

ii) The Fuel price shall be revised after the control period i.e 2016-17 onwards.

(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 2013-14	Effective tariff for FY 2013-14	Benefit of Accelerated depreciation (Rs./kWh)	Net Tariff (Rs./kWh)
1.91	2.96	4.87	(0.13)	4.75

Note: The levellised fixed component of tariff shall be applicable for the entire tariff period. The variable component as fixed shall be reviewed after the current control period is over i.e after 2015-16.

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

27. **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.420 Lakh/MW for the Control Period (FY 2013-14 to 2015-16). The benchmark capital cost for the generic Non-fossil fuel based Co-generation tariff for Odisha is same as that of CERC Renewable Regulation, 2012.

(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) Operation and Maintenance Expenses

(i) O&M expenses for the first year of the Control Period (FY 2013-14) shall be Rs.16 Lakh per MW.

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

(v) 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.

(vi) Gross Calorific Value

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

(vii) Fuel Price

(i) Baggase fuel price during first year of the Control Period (FY 2013-14 to 2015-16) shall be Rs.1583/MT.

(ii) The Fuel price shall be revised after the control period i.e 2016-17 onwards.

(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 2013-14	Effective tariff for FY 2013-14	Benefit of Accelerated Depreciation (if availed) (Rs./kWh)	Net Tariff (Rs./kWh)
2.28	2.77	5.04	(0.28)	4.77

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

28. **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.900 Lakh/MW for the first year of Control Period (FY 2013-14). In subsequent years of control period 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 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 2013-14) shall be Rs10 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

periods of 12 and 13 years from the date of commercial operation as given below:-

Table - 7

Levellized Tariff (Rs./kWh)	Benefit of Accelerated Depreciation (if availed) (Rs./kWh)	Net Levellized Tariff (Rs./kWh)	Tariff Period (Years)
11.23	(1.07)	9.15	First 12 yrs
6.81	-	6.81	Next 13 yrs

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

29. **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.1300 Lakh/MW for the first year of Control Period (FY 2013-14). The benchmark capital cost for generic Solar Thermal tariff for Odisha is same as that of CERC Renewable Regulation, 2012. The Commission may review the capital cost annually based on operational experience of previous year of control period and CERC notification.

(B) **Capacity Utilisation Factor**

The normative capacity utilization factor considered for generic tariff determination for Solar Thermal power project shall be 23%. 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 2013-14) shall be Rs.15 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 two periods of 12 and 13years from the date of commercial operation as given below:-

Table - 8

Levellized Tariff (Rs./kWh)	Benefit of Accelerated Depreciation (if availed) (Rs./kWh)	Net Levellized Tariff (Rs./kWh)	Tariff Period (Years)
9.68	(1.84)	7.84	First 12yrs
5.47	-	5.47	Next 13 yrs

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

30. Based on the above observations, the summary of the Generic tariff for renewable technologies for the second control period from 2013-14 to 2017-18 is 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 current control period (Rs./kWh)	Benefit of Accelerated Depreciation (Rs./kWh)	Net Levellised Tariff (upon adjusting for Accelerated Depreciation benefit) (Rs./kWh)	Tariff Period (Years)
Wind Energy	5.41	(0.65)	4.76	13
SHP projects of 5 to 25 MW capacity	3.53	(0.39)	3.14	25
SHP projects below 5 MW capacity	3.84	(0.39)	3.46	35
Solar PV	11.23	(1.07)	9.15	First 12 yrs
	6.81	-	6.81	Next 13 yrs
Solar Thermal	9.68	(1.84)	7.84	First 12 yrs
	5.47	-	5.47	Next13 yrs

(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	Effective tariff	Benefit of Accelerated depreciation (Rs./kWh)	Net Tariff (Rs./kWh)
Biomass	1.91	2.96	4.87	(0.13)	4.75
Non-fossil fuel based co-generation	2.28	2.77	5.04	(0.28)	4.77

Note:

1. For Biomass projects the tariff approved above including levellized fixed component and variable (fuel component) for FY 2013-14 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 2013-14 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.

31. 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.

32. 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.

33. **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.

34. **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.

By the designated petitioner
(OERC)

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	20.00%	%
3	Annual Net Generation	17.52	Lakh kWhs
4	Specific Energy Generation		kWh/kWp
5	Annual Deration (after 10 yrs of operation)	0	
6	Life of Plant and Machinery / Project Life	25	years

No	*Financial Parameters*	*Value*	*Unit*
1	Project Cost of 1 MW Wind Power Plant on pro-rata basis	575	Rs Lacs/MW
2	Non depreciable cost	10.00%	% of Capital Cost
3	Depreciable Amount	517.50	lacs
4	Debt Fraction	70.00%	%
5	Debt	402.50	lacs
6	Equity	172.50	lacs
7	TOTAL	575.00	lacs
8	Interest Rate on Term Loan	12.30%	%
9	Repayment Period	12	years
10	No of installments for Interest on Term Loan	12	years
11	Moratorium Period	0	years
12	Term loan period for principal payment	12	years
13	Depreciation (Straight Line Method, Company Law) **(for first 12 years)**	5.83%	%
14	Discount Rate	10.62%	%
15	O&M + Insurance Cost	9.00	lacs/MW
16	O&M + Insurance Cost Escalation	5.72%	%
17	Return on Equity	16.00%	%
18	Annuity Factor (25 Years)	8.7	
19	Interest on working capital	12.80%	%

Outputs - Wind power project		
Levellized tariff (13 yrs)	**5.41**	Rs/kWh
Benefit under Accelerated Depreciation (if availed)	**0.65**	Rs/kWh
Levellised tariff after Accelerated Depreciation (if availed)	**4.76**	Rs/kWh

Appendix- 2

SHP

Input Technical and Financial parameters
(Projects of 5 MW to 25 MW capacity)

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 of 1 MW SHP plant	550	Rs Lacs/MW
2	Non depreciable cost	10.00%	% of Capital Cost
3	Depreciable Amount	495.00	lacs
4	Debt Fraction	70.00%	%
5	Debt	385.00	lacs
6	Equity	165.00	lacs
7	TOTAL	550.00	lacs
8	Interest Rate on Term Loan	12.30%	%
9	Repayment Period	12	years
10	No of installments for Interest on Term Loan	12	years
11	Moratorium Period	0	years
12	Term loan period for principal payment	12	years
13	Depreciation (Straight Line Method, Company Law) **(for first 12 years)**	5.83%	%
14	Discount Rate	10.62%	%
15	O&M + Insurance Cost	14	lakhs /MW
16	O&M + Insurance Cost Escalation	5.72%	%
17	Return on Equity	16.00%	%
18	Annuity Factor (35 Years)	9	
19	Interest on working capital	12.80%	%

Outputs - SHP below 5 MW to 25 MW		
Levellized tariff	**3.53**	Rs/kWh
Benefit under Accelerated Depreciation (if availed)	**0.39**	Rs/kWh
Levellised tariff after Accelerated Depreciation (if availed)	**3.14**	Rs/kWh

Note:The O&M expenses including insurance cost for projects below 5 MW is taken as Rs. 20 lakh and all other parameters as in above table (taken for projects of 5 MW to 25 MW capacity) remaining same.

Outputs - SHP below 5 MW		
Levellized tariff	**3.84**	Rs/kWh
Benefit under Accelerated Depreciation (if availed)	**0.39**	Rs/kWh
Levellised tariff after Accelerated Depreciation (if availed)	**3.46**	Rs/kWh

Appendix- 3

BIOMASS

Input Technical and Financial parameters

Technical Parameters	***Value***	***Unit***
Capacity of the Power Project	1	MW
Capacity Utilization Factor (during stabalisation)	60.00%	%
Capacity Utilization Factor (2nd year-20 year)	80.00%	%
Annual Gross energy Generation (during stabalisation)	52.56	Lakh kWhs
Annual Gross energy generation (2nd yr-20yr)	70.08	Lakh kWhs
Auxiliary energy consumption	10.00%	%
Net energy generation (during stabalisation)	47	Lakh kWhs
Net energy generation (2nd year-20 year)	63.072	Lakh kWhs
Life of Plant and Machinery / Project Life	20	years
Station Heat Rate	3800	Kcal/Kwh
Gross Calorific Value	3300	Kcal/Kg

Financial Parameters	***Value***	***Unit***
Project Cost of 1 MW Biomass pro-rata basis	445.00	Rs Lacs/MW
Non depreciable cost	10.00%	% of Capital Cost
Depreciable Amount	400.50	lacs
Debt Fraction	70.00%	%
Debt	311.50	lacs
Equity	133.50	lacs
TOTAL	445.00	lacs
Interest Rate on Term Loan	12.30%	%
Repayment Period	12	years
No of installments for Interest on Term Loan	12	years
Moratorium Period	0	years
Term loan period for principal payment	12	years
Depreciation (Straight Line Method, Company Law) **(for first 10 years)**	5.83%	%
Discount Rate	10.62%	%
O&M + Insurance Cost	24.00	lacs/MW
O&M + Insurance Cost Escalation	5.72%	%
Return on Equity	16.00%	%
Annuity Factor (20 Years)	8.17	
Interest on working capital	12.80%	%
Fuel cost	2316	Rs /MT
Annual escalation factor for fuel cost	5.00%	%

Outputs for Grid-Connected Biomass Power Plant

Year	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26
Variable tariff	2.96	2.96	2.96	-	-	-	-	-	-	-	-	-	-
Levellised fixed Tariff	1.91	1.91	1.91	1.91	1.91	1.91	1.91	1.91	1.91	1.91	1.91	1.91	1.91
Year Wise Tariff	4.87	4.87	4.87	-	-	-	-	-	-	-	-	-	-
Benefit of Accel. Deprn	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Year wise tariff after Accel Deprn	4.75	4.75	4.75	-	-	-	-	-	-	-	-	-	-

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 of 1 MW Cogeneration on pro-rata basis	420.00	Rs Lacs/MW
2	Non depreciable cost	10.00%	% of Capital Cost
3	Depreciable Amount	378.00	lacs
4	Debt Fraction	70.00%	%
5	Debt	294.00	lacs
6	Equity	126.00	lacs
7	TOTAL	420.00	lacs
8	Interest Rate on Term Loan	12.30%	%
9	Repayment Period	12	years
10	No of installments for Interest on Term Loan	12	years
11	Moratorium Period	0	years
12	Term loan period for principal payment	12	years
13	Depreciation (Straight Line Method, Company Law) **(for first 12 years)**	5.83%	%
14	Discount Rate	10.62%	%
15	O&M + Insurance Cost	16.00	lacs/MW
16	O&M + Insurance Cost Escalation	5.72%	%
17A	Return on Equity	16.00%	%
18	Annuity Factor (20 Years)	8.2	
19	Interest on working capital	12.80%	%
20	Fuel cost	1583	Rs /MT
21	Annual escalation factor for fuel cost	5.00%	%

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

Year	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26
Variable tariff	2.77	2.77	2.77	-	-	-	-	-	-	-	-	-	-
Levellised fixed Tariff	2.28	2.28	2.28	2.28	2.28	2.28	2.28	2.28	2.28	2.28	2.28	2.28	2.28
Year Wise Tariff	5.04	5.04	5.04	-	-	-	-	-	-	-	-	-	-
Benefit of 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
Yearwise tariff after Accel Deprn	4.77	4.77	4.77	-	-	-	-	-	-	-	-	-	-

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 Gross Generation	16.64	Lakh kWhs
4	Auxiliary consumption	0.00%	%
5	Annual Net Generation	16.64	Lakh kWhs
6	Life of Plant and Machinery / Project Life	25	years

No	*Financial Parameters*	*Value*	*Unit*
1	Cost of Solar PV Project	900	Rs Lacs
2	Non - Depreciable Amount	10.00%	% of Capital Cost
3	Depreciable Amount (Cap Cost Less non-depreciable Cost)	900	lacs
4	Debt Fraction	70.00%	%
5	Debt	700.00	lacs
6	Equity	300.00	lacs
7	TOTAL	1000.00	lacs
8	Interest Rate on Term Loan	12.30%	%
9	Repayment Period	12	years
10	No of installments for Interest on Term Loan	12	years
11	Moratorium Period	0	years
12	Term loan period for principal payment	12	years
13	Depreciation (Straight Line Method,Company Law) - for first 12 years	5.83%	%
14	Discount Rate	10.62%	%
15	O&M and insurance cost	10.000	Rs. Lakhs
16	O&M and insurance Cost Escalation	5.72%	%
17	Return on Equity	16.00%	%
19	Annuity Factor (25 year)	8.66	
20	Interest on working capital	12.80%	%

Outputs - Solar PV			
Levellized Tariff (Rs./kWh)	**Benefit of Accelerated Depreciation (if availed) (Rs./kWh)**	**Net Levellized Tariff (Rs./kWh)**	**Tariff Period (Years)**
11.23	(1.07)	9.15	12
6.81	-	6.81	13

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	23.00%	%
3	Annual Gross Generation	20.15	Lakh kWhs
4	Auxiliary consumption	10.00%	%
5	Annual net energy generation	18.13	kWh/kWp
6	Annual Deration	0%	%
7	Life of Plant and Machinery / Project Life	25	years

No	*Financial Parameters*	*Value*	*Unit*
1	Project Cost of 1 MW Solar Thermal Plant on pro-rata basis	1300	Rs Lacs/MW
2	Non depreciable cost	10.00%	% of Capital Cost
3	Depreciable Amount	1170.00	lacs
4	Debt Fraction	70.00%	%
5	Debt	910.00	lacs
6	Equity	390.00	lacs
7	TOTAL	1300.00	lacs
8	Interest Rate on Term Loan	12.30%	%
9	Repayment Period	12	years
10	No of installments for Interest on Term Loan	12	years
11	Moratorium Period	0	years
12	Term loan period for principal payment	12	years
13	Depreciation (Straight Line Method, Company Law) **(for first 10 years)**	5.83%	%
14	Discount Rate	10.62%	%
15	O&M + Insurance Cost	15.00	Rs lakhs/MW
16	O&M + Insurance Cost Escalation	5.72%	%
17	Return on Equity	16.00%	%
18	Annuity Factor (25 Years)	8.7	
19	Interest on working capital	12.80%	%

Outputs - Solar Thermal			
Levellized Tariff (Rs./kWh)	**Benefit of Accelerated Depreciation (if availed) (Rs./kWh)**	**Net Levellized Tariff (Rs./kWh)**	**Tariff Period (Years)**
9.68	(1.84)	7.84	12
5.47	-	5.47	13