ODISHA ELECTRICITY REGULATORY COMMISSION
PLOT NO. - 4, CHUNUKOLI, SHAILASHREE VIHAR,
BHUBANESWAR-751021
****

Present: Shri U. N. Behera, Chairperson
Shri A. K. Das, Member
Shri S. K. Parhi, Member

Case No. 46/2018

IN THE MATTER OF: Suo-Motu proceeding for finalization of tariff of Renewable Energy Sources including Co-generation for the third control period 2018-19 to 2020-21.

AND

IN THE MATTER OF:

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

Vs.

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

For Petitioner: Priyabrata Patnaik, Dir(RA), OERC the designated petitioner,

For Respondents: Shri S. K. Puri, Sr. GM(RT&C), OPTCL, Ms. Sasmita Patjoshi, CLD, GRIDCO Ltd., Shri R. Sharma & Shri S. K. Tripathy, Director, GEDCOL, Shri Ananda Kumar Mohapatra, Shri Bibhu Charan Swain authorized representative of M/s. Power Tech Consultants, Shri K. C. Mohapatra, Chairman of M/s. PDC, Shri R. P. Mahapatra and Ms. Niharika Pattanayak, ALO, DoE, GoO are present. Nobody is present on behalf of M/s. OHPC Ltd., CESU, the Administrator of WESCO, NESCO & SOUTHCO Utilities, M/s. Baitarani Power Project Ltd. and M/s. Shalivahana Green Energy Ltd.

ORDER

Date of Hearing: 06.11.2018 **Date of Order:16.02.2019**

In exercise of the powers conferred under Section 86(1)(e), 61(h) and 62(1)(a) of the Electricity Act 2003 read with National Electricity Policy, the Tariff policy, the Commission has initiated this proceeding to determine generic tariff for the power to be procured by

GRIDCO from Renewable Power Projects to be set up in the State of Odisha for the control period 2017-18 to 2019-20.

2. This proceedings has been initiated to finalise the generic tariff for following Renewable Energy (RE) power projects in the State of Odisha for the period FY 2017-18 to 2019-20:

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

3. The above Renewable projects shall be governed by the principle of tariff determination stated in this order. A consultative paper was placed (suo-motu petition) for this purpose in the commission's website and opinion/suggestions/objections were invited from the interested persons, organizations, stakeholders and respondents. The public hearing was conducted on 6.11.2018 and participating parties were heard at length.

4. The following opinion/suggestions/objections were received and have been summarized below:

1. **M/s. Shalivahana Green Energy Ltd.**

Control Period: The period for the third control period may be considered as 2018-19 to 2020-21and not 2017-18 to 2019-20 since, there is an overlap of the year 2017-18 from the previous control period (2nd control period).

Variable (fuel) component: The Commission may determine variable (fuel) component of tariff for Bio-mass power projects for FY 2016-17 & 2017-18 in view of the Commission's order dated 15.01.2014 in Case No. 80/2013.

The Commission in Case No.11 of 2016 order dt.14.09.2017 has stated that the variable tariff shall be reviewed at the time of determination of tariff for 3rd Control period basing on prevailing fuel price at that point of time. There has been no revision of tariff by GRIDCO from the FY 2016-17 even if there is a provision of escalation of 5% on variable cost in terms of the Commission's order dated 23.9.2011 in Case No.151-155/2010.

GCV : The following GCV may be considered:
GCV of 3174 Kcal/Kg. for FY 2016-17
GCV of 3100 Kcal/Kg. for FY 2017-18
GCV of 3100 Kcal/Kg. for FY 2018-19

SHR: The following SHR may be considered:
SHR of 4063 Kcal/Kwh for FY 2016-17
SHR of 4125 Kcal/Kwh for FY 2017-18
SHR of 4125 Kcal/Kwh for FY 2018-19

Fuel Price: The following fuel prices may be considered:
Rs.3003/MT for 2016-17
Rs.3073.05/MT for 2017-18
Rs.3400/MT for 2018-19

Scheduled Energy Principles: Since biomass projects are unorganized, they may not be subjected to scheduled energy principles.

Must Run Principles: The plant may be kept out of Regulations governing merit order dispatch. The plant must be allowed to run on Must Run Principles.

2. **GEDCOL**

Procurement of Solar Power: GEDCOL Supports the proposal of procurement of Solar power through competitive bidding route only. The commission may recognize Roof-top Solar projects as a separate sub-category apart from ground mounted projects.

Inter-connection Point: The inter-connection point as defined in OERC (Procurement of Energy from Renewable sources and its compliances) Regulations, 2015 would also apply to gross metered model where rooftop solar project directly sells electricity to utility.

Connectivity with Grid: The commission may consider for interconnection of rooftop solar projects under Gross Metering Arrangement. The following voltage levels for various capacities may be considered:

a. Upto 5 KW at 230 V single phase

b. Above 5 kw to 100 kw at 400 V three phase

c. Above 100 kw and less than 5 MW projects the point of interconnection should be at 11 kV

Dispatch Principles for RE sources: The rooftop solar projects connected to grid and contracted to sell power to utilities be covered under the "MUST RUN" category and should not be subjected to Merit Order Dispatch Principles irrespective of capacities.

Sealing Arrangement: The DISCOMS to seal the meter/metering cubicle/metering panel only and not the ACDB/Breaker Panel.

Type of Meters: The Commission may specify the type of meters to be used – unidirectional or bi-directional for project under both Gross Metering and Net Metering arrangement.

3. **Baitarani Power Project Pvt. Ltd.**

Tariff period for SHE Projects: To specify tariff period for SHEP 35 years.

Reimbursement of Income Tax: The reimbursement of income taxes may be claimed from time to time for assessment of advance taxes and self assessment tax as and when paid.

Interest rate for Term Loan: To consider the interest for Term loan at 11.25% as the provision of average SBI marginal cost of funds based on lending rate (MCLR) (1 year tenure) prevalent during the first 6 months of the previous year + 200 basis points works out to be less at 10.66%.

4. **Shri R. P. Mahapatra**

Control Period: The period for the third control period may be considered as 2018-19 to 2020-21and not 2017-18 to 2019-20 since, there is an overlap of the year 2017-18 from the previous control period (2^{nd}).

Tariff of RE sources having two components: May be determined for FY 2016-17 & 2017-18 based on the principles adopted by CERC.

Determination of variable costs: The variable component of tariff shall be based on fuel prices, GCV of fuel and SHR.

Inter-connection Point: The para 24 of the suo motu petition may provide that for the projects commissioned during 3^{rd} Control period, the expenditure incurred by the developer in construction of EHT or HT lines and Bays for availing construction power supply and subsequently used as evacuation system from the interconnection point to the grid shall be reimbursed to the developer.

Tariff period: The tariff period shall be same as the useful life for wind, SHP, Biomass and non-fossil fuel based co-generation.

Taxes and other charges: The tariff as determined shall be exclusive of income tax, water cess and electricity duty.

5. **OPGC & Power Tech Consultants**

Return on Equity: In order to attract investment in RE projects, a suitable RoE may be considered since such projects require long term equity commitment, high payback period and risk involved. RoE of 24% may be considered.

Interest on working capital: The working capital requirement is computed taking into account receivables equivalent to two months of energy charges. Since, DISCOM and

GRIDCO pay the money to the developer after considerable delay the receivable may be considered equivalent to three months of energy charges.

Control period: The period for the third control period may be considered as 2018-19 to 2020-21and not 2017-18 to 2019-20. Since, there is an overlap of the year 2017-18 from the previous control period (2^{nd}).

Generic Tariff: The proposed generic tariff will be of ceiling nature and GRIDCO and developer can negotiate lower tariff based on their bi-lateral arrangement. The Commission may finalise appropriate generic tariff at which GRIDCO shall procure RE and at which GRIDCO shall sign PPA with developer with detailed terms and conditions of PPA.

Micro & Mini Hydro Projects: The Govt. of Odisha has issued a revised policy guideline for execution of mini/micro/small hydro electric projects by private developers dt.23.06.2003.The micro and mini projects which are upto 2000 KW capacity generally have higher cost with respect to operation and maintenance. The Commission may, therefore, define the generic tariff for micro and mini hydro plant in line with the GoO notification, which is in the range of Rs.7 /KW(Micro) and Rs.7.50/KW (Mini).

6. **OPTCL**

Evacuation arrangement: The developer/generating company should construct the evacuation infrastructure beyond the interconnection point to the nearest EHV grid s/s of OPTCL. This would reduce the mis-match of timing between the construction of evacuation infrastructure and commissioning of the plant. The whole responsibility of evacuation infrastructure should be entrusted to the developer.

Interconnection point: It is suggested that

(i) The open access transaction shall be as per OERC Open Access Regulation, 2006. In absence of PPA or non-validity of open access permission, the developer shall not claim compensation for any inadvertent power flow or injection to the grid.

(ii) The expenses towards addition /commissioning of new bay in the grid s/s under STU shall be borne by the developer.

(iii) The STU shall claim the expenses towards the infrastructure for s/s augmentation, implementation of innovative/new technologies for facilitating the RE integration from Odisha RE Development Fund(OREDF) or such other funds as per OERC direction.

(iv) The OPTCL shall realize from the project developer a supervision charge of 6% on the 100% estimated cost of the construction of dedicated line.

(v) OPTCL may not pay any compensation for any interruption in evacuation of power due to breakdown /snapping of conductor /puncture of insulator beyond the interconnection point to the nearest EHV grid s/s of OPTCL due to reasons beyond the control of OPTCL.

(vi) The length of power evacuation line should be decided based on the cost benefit analysis.

7. **GRIDCO**

Small Hydel Projects (SHP): The Control period for Small Hydel Projects may be considered 5 years instead of 3 years since such projects take longer period for completion due to procedural delay for signing of PPA, signing of implementation agreement. The SHP projects have longer gestation periods and once the PPA is executed with specific tariff those norms and parameters must not be deviated. The levellalised tariff considered for SHP projects of 5 MW to 25 MW is about 40% more than the tariff considered in earlier control period. The PLF considered as 30% is much lower since 45% PLF is achievable in Odisha.

Biomass projects: The 20 MW Biomass Power Projects of Ms Shalivahana Green Energy Ltd. was commissioned during the 1st Control period and the norms and parameters applicable to such projects shall be in terms of the Commission's order dt.14.09.2010 in case No.37 of 2008. The increase in variable component of the cost by 5% annually shall only be upto the tariff period. OREDA shall be vested with the responsibility of compliance monitoring of Biomass/non-fossil based cogeneration projects as envisaged in the Odisha RE Policy, 2016.

MSW: Keeping in the view that there are few operational MSW based Energy plants in the country and no such plant in our State there is need of generic tariff for sourcing power from MSW plants. Since the setting up of MSW projects requires multi department approvals, sourcing power only through competitive bidding process may not be much encouraging. A levellised tariff may be given which can be reviewed every year until competitive bidding process is taken up.

Payment of bills: The two working days for availing 2% rebate is practically difficult for GRIDCO which may be extended to between 4-7 working days.

Commission's view

General principles

5. Now we proceed to determine the tariff of the renewable sources taking into consideration our staff paper and objection/suggestions given by the stakeholders. While doing so we have also relied upon relevant CERC Regulation and orders wherever necessary.

Control Period and Review period

As suggested by stakeholders the Control Period or Review Period shall be of three (3) financial years for all the RE projects except small hydro projects. The last control period was from 2013-14 to 2017-18. Therefore, Control Period for this order shall be reckoned from FY 2018-19 to FY 2020-21. However, in case of SHEP the control period shall be of five years. The control period for SHEP shall commence from FY 2018-19 and continue upto FY 2022-23.

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

Tariff Period

6. Tariff determined based on the principles laid 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. The Tariff Period shall be same as their useful life and shall be reckoned from the date of commercial operation of the generating stations.

7. The Commission observed that there is a decline in per unit cost of energy from all the renewable energy sources due to improvements in technology, efficiency, development of necessary infrastructure and competition. It is expected that the trend will persist for some time. Therefore no generic tariff should be determined for RE sources such as wind, solar PV, solar thermal, biomass, non-fossil fuel based cogeneration and MSW projects. The DISCOMs/GRIDCO shall procure RE power through competitive bidding process from these sources considering prevailing market trends. Any incentive subsidy provided by Central Govt. or State Govt. shall be taken into consideration.

8. But there are some cases where the capital cost is site specific or generation cost is fuel specific. In such cases the Commission may determine project specific tariff in fulfilling its obligation under 86(1)(e) of Electricity Act, 2003, National Electricity Policy and Tariff Policy to meet the renewable energy percentage requirement in total consumption of electricity. These sources may be as follows:

a) Small hydro projects

b) Municipal solid waste based energy projects

c) Bio-mass projects

d) Hybrid projects of solar PV and solar thermal with wind.

e) Any other new renewable energy technology approved by MNRE.

The project specific tariff for generation of electricity from such renewable energy sources shall be determined in accordance with the procedures stipulated under this order of the Commission provided that the financial and operational norms specified under para 20 and 21 of this order, except for capital cost, shall be the ceiling norms.

9. All RE project shall be guided by the provisions of para 14 of this order regarding interconnection point. The interconnection point and grid connectivity mechanism of RE sources with OPTCL or DISCOMs shall be guided by provisions under OERC (Procurement of Energy from Renewable Sources and its Compliance) Regulations, 2015. The Licensee can also assign the work to the Developer on their behalf for installing power evacuation facilities beyond the inter-connection point. No supervision charges shall be levied by the Licensee on the developer for carrying out the work on his behalf. All necessary assistance shall be provided to the developer by the Licensee.

Petition and Proceedings for Determination of Tariff

10. 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

11. The tariff structure for renewable energy technologies shall be "Single part tariff" except for Co-generation (bagasse based) projects, biomass and MSW. The components of single part tariff which is fixed now shall consist of the following:

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

Provided that for renewable energy technologies in municipal solid waste projects, biomass power projects and non-fossil fuel based co-generation projects having fuel cost component, single part tariff with two components of tariff, i.e. fixed cost component and fuel cost component shall be determined. Taxes, cess and duties shall be reimbursed to the generators at actual as per audit report.

Tariff Design

12. The generic tariff shall be determined on levellised basis for the useful life of the plant, specified in this order. Provided that renewable energy technologies having single part tariff with two components of tariff shall be determined on levellised basis considering the year of commissioning of the project for the fixed cost component while the fuel cost component shall be specified on the year of operation basis. For the purpose of levellised tariff calculation, the discount factor equivalent to post tax weighted average cost of capital shall be considered. Levellisation shall be carried out for the 'useful life' of the Renewable Energy project and the tariff shall be specified for the 'Tariff Period" which shall be same as useful life. The above principles shall also apply for project specific tariff.

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

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

Dispatch principles for electricity generated from Renewable Energy Sources

All renewable energy power plants, except biomass power plants and non-fossil fuel based co-generation plants with installed capacity of 1 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) and other regulations of the commission as the case may be including amendments thereto.

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 OERC (Procurement of Energy from Renewable Sources and its Compliance) Regulations, 2015 at Regulation 2 provides definitions and interpretation of Inter-connection Point'. In this regulation 'Inter-connection Point' has been defined as follows:

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

(i) in relation to wind energy projects and Solar Photovoltaic Projects, inter-connection point shall be line isolator of the outgoing feeder on HV side of the pooling sub-station;

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

(ii) in relation to small hydro power, biomass power, renewable based co-generation power projects, solar thermal power projects and Municipal Solid Waste based projects the inter-connection point shall be line isolator of outgoing feeder on HV side of the generator transformer;

(iii) Provided that in relation to Renewable Energy Sources having installed capacity of less than 1 MW the interconnection point shall be the nearest distribution system as agreed by the Licensee.

The OERC (Procurement of Energy from Renewable Sources and its Compliance) Regulations, 2015 at Regulation 10 provides mechanism of connectivity of RE sources plant with the GRID in the following manner:

10. Connectivity with the Grid

10.1 Any person generating electricity from Renewable Energy Sources, irrespective of installed capacity, shall have open access to any Licensee's transmission system and/or distribution system as the case may be.

10.2 On an application from such person, the transmission licensee or distribution licensee shall provide appropriate interconnection facilities before Commercial

Operation Date of the Renewable Energy Project. Such interconnection shall follow the grid connectivity Standards as specified in the Central Electricity Authority (Technical Standards for Connectivity of the Distributed Generation Resources) Regulations, 2013 or State Grid Code as the case may be. The Transmission Licensee / Distribution Licensee shall provide meters and associated facilities at interconnection point.

10.3 The licensees shall be responsible for development of evacuation infrastructure beyond the inter-connection point while the developer /generating company will have to develop evacuation infrastructure from generating facility up to the inter connection point at its own expense:

Provided that in case of Renewable Energy Sources having installed capacity of less than 1 MW the developer shall provide evacuation infrastructure upto the interconnection point:

Provided that if any dispute arises regarding connectivity with the Grid the matter shall be referred to the Commission whose decision in this regard shall be final.

10.4 Roof-top Solar PV sources shall be allowed connectivity at LV or MV or at 11 KV of the distribution system of the licensee as considered technically and financially suitable by the licensee and the developer:

Provided that the Commission shall time to time issue specific order on such connections and commercial arrangement:

Provided further that if any dispute arises about connectivity of such sources with the grid, the matter shall be referred to the Commission whose decision in this regard shall be final.

10.5 Communication system, if required by SLDC, between grid sub-station and generating station shall be developed by the developer (s) at its own cost. Developers of Renewable Energy Sources shall abide by all applicable codes, rules, regulations etc. in regard to operational and commercial practices.

10.6 Wherever Renewable Energy Sources have already been connected to the State Grid at a voltage level lower than the voltage level specified in these Regulations and wherever such State Grid connection causes any bottleneck in capacity addition or causes avoidable discontinuance of generation or low voltage during peak hours or frequent outage of line or sufficient redundancy, such grid connection shall be converted into suitable voltage level and cost for such conversion shall be borne by the developer.

15. GEDCOL has submitted before the Commission to adopt inter-connection point of roof top solar projects under gross metering arrangement similar to inter-connection arrangement mentioned in OERC RPO Regulation 2015. Solar roof top inter-connection mechanism has already been dealt by the Commission in a separate order. In view of this GEDCOL may approach the Commission with their request separately.

16. **Eligibility criteria for RE projects**

The following projects shall be considered for this order as mentioned earlier.

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) that have not opted for the pricing mechanism under the REC mechanism.

b) **SHP**:

The SHP projects identified / approved by the Engineer in Chief, Electricity –cum Principal Chief Electrical Inspector, Government of Odisha 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 tariff under these norms.

c) Biomass Power projects

The biomass power projects based on Rankine cycle technology application using water cooled condenser.

The use of other fossil fuels except biomass is not permissible in bio-mass power projects.

d) Non-fossil fuel based cogeneration projects

A project shall qualify to be 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. To qualify under topping cycle mode, the project is to qualify the criteria that the sum of useful power output and one half the useful thermal outputs is greater than 45% of the facility's energy consumption, during the season**.**

Provided that 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) based on the technology approved by the MNRE.

f) Municipal Solid waste based Projects

A project shall qualify to be termed as a Municipal Solid Waste based (MSW) power project if it is using new plant and machinery basing on Rankine cycle technology and using Municipal solid waste (MSW) as fuel source as approved by MNRE.

17. **RE Technology-wise Project Life/ Tariff Period**

Details of RE Technology-wise Useful life/ Tariff period considered for levellised Tariff calculation based on views of respondents is given in the following table:

Table -1

Sl. No.	Technology	Useful Life (Years)	Tariff period (Years)
1	Wind	**25**	**25**
2	Small Hydro Plant a. Below 5MW b. 5 to 25 MW	 **35** **35**	 **35** **35**
3	Biomass	**20**	**20**
4	Non-fossil fuel based Co-generation	**20**	**20**
5	Solar PV	**25**	**25**
6	Solar Thermal	**25**	**25**
7	Municipal Solid Waste	**20**	**20**

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 (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 tones) 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 tones) 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 tons),

- Receipt of fuel quantity (in tons) at the power plant site and
- Closing fuel stock quantity (in tons) 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 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.

20. **Financial Parameters**

The financial parameters specified hereunder shall be applicable to all RE technologies covered in this order.

(a) **Capital Cost**

The norms for the Capital Cost as specified in the subsequent technology specific sections of this order shall be inclusive of all new capital works including plant and machinery, civil work, erection and commissioning, financing and interest during construction, and evacuation infrastructure upto inter-connection point.

Provided that for project specific tariff determination, the generating company shall submit the break-up of capital cost of all components along with its petition.

(b) **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.

(c) **Loan and Finance charges**

(i) Loan Tenure: For the purpose of determination of tariff, loan tenure of 13 years is to be considered.

(ii) 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 average State Bank of India (SBI) Marginal Cost of Funds based on Lending Rate (MCLR) (One year tenor) prevalent during the last availale six months of the previous year plus 200 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.

(d) **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% of the capital cost 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 13 years of the Tariff Period shall be 5.28% 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.

(e) **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 14% to be grossed up by prevailing Minimum Alternate Tax (MAT) as on 1st April of previous year for the entire useful life of the project.

(f) **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, MSW 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 to be determined on the basis of the average State Bank of India (SBI) Marginal Cost of Funds based Lending Rate (MCLR) (One year tenor) prevalent during the last available six months of the previous year plus 300 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 2018-19) 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.

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

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

(b) In case of capitalization of RE projects during second half of the fiscal year, per unit benefit shall be derived on levellised basis at discount factor equivalent to weighted average cost of capital.

RE Technology-wise Specific Parameters

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

The CERC has notified CERC (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2017 and has done away with specification of generic capital cost for the Wind power projects and has made following provision in the regulations.

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

In Odisha very little development in wind power sector is visible at present. The Commission therefore decides that procurement of power from all wind based projects be made through competitive bidding process only during the control period 2018-19 to 2020-21. However project specific tariff on the case to case basis may be determined by the Commission in contingency condition with reasons recorded after hearing parties. The financial and operational norms as specified under paragraph 20 to 21 of this order, except for capital cost, shall be ceiling norms while determining the project specific tariff.

(g) **Capital cost**

i) The capital cost for wind energy projects shall include Wind turbine generator including its auxiliaries, land cost, site development charges, 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 determined on project specific basis only and based on the prevailing market trends.

(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 Odisha shall be 18 %. 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 Odisha.

(i) **Operation and Maintenance Expenses** shall be determined on project specific cases based on the prevailing market conditions.

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

(a) **Capital Cost**

The capital cost considered for small hydro projects during the control period shall be Rs. 779 Lakhs/MW for all the projects below 5 MW and Rs.707 Lakhs/MW for the projects between 5 MW and 25 MW.

(b) **Capacity Utilisation Factor**

The normative Capacity Utilization Factor of 30% 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 control period ended in 2017-18.

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 2018-19) shall be Rs.30.66 Lakh per MW for projects below 5 MW and Rs.22.20 lakh for projects between 5 MW and 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 basing 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 -2

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	6.05	(0.46)	5.59	35
SHP projects of 5 MW above to 25 MW capacity	5.07	(0.42)	4.65	35

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

Technology specific parameters for Biomass based projects

26. The procurement of power from all Biomass based projects shall be made through competitive bidding process only during the control period. The project specific tariff on the case to case basis may be determined by the commission taking into account the financial and operational norms as specified under paragraph 20 to 21 and technology specific parameters as defined in succeeding paragraphs applicable for Biomass based projects with reasons recorded in writing after hearing parties.

(a) Capital Cost

The capital cost for Biomass projects based on Rankine Cycle Technology application using water cooled condenser for FY 2018-19 shall be Rs.559.03 Lakhs/MW. No capital cost indexation would be done by the commission during the control period.

(b) Plant Load Factor

The Plant Load Factor for determining generic tariff shall be

i) During stabilization 60%

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

iii) From 2nd year onwards 80%

(c) Auxiliary Consumption

The auxiliary power consumption factor shall be 11% during the first year of operation and 10% from second year onwards 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 2018-19) shall be Rs.42.29 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 4125 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 Odisha, the availability and characteristics of surplus biomass in the State has been taken into consideration. The normative gross calorific value is computed at 3100 kcal/kg and the same is used for generic tariff determination in case of biomass power projects.

(g) Fuel Price

Biomass fuel price during first year of the Control Period (FY 2018-19) shall be **Rs.3226.70/**MT (average) which would be escalated @ 5% every year during the control period.

(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

No use of fossil fuel would be allowed for the projects commissioned during this control period. However those projects which were commissioned or have signed PPA with GRIDCO on or before 31.03.2018 would be allowed use of fossil fuel upto

15% of the total fuel consumption on annual basis in terms of the last generic order in Case No. 80 of 2013.

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

In Odisha at present no bagasse based cogeneration project supplying power to Grid is in operation. The procurement of power from all bagasse based cogeneration projects shall be made through competitive bidding process only during the control period. The commission is also not specifying any generic tariff for the Non-fossil fuel based Co-generation Projects. However project specific tariff on the case to case basis may be determined by the commission with reasons recorded after hearing parties. The financial and operational norms as specified under paragraph 19 to 20 of this order, except for capital cost, shall be ceiling norms while determining the project specific tariff by the Commission.

(a) **Capital Cost**

The normative capital cost for the non-fossil fuel based co-generation projects shall be Rs.492.5 Lakh/MW for FY 2018-19 during the control period (FY 2018-19 to 2020-21).

(b) **Plant Load Factor**

a) 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.

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

Table - 3

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

(c) **Auxiliary Consumption**

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

(d) **Operation and Maintenance Expenses**

(i) O&M expenses for the first year of the Control Period (FY 2018-19) shall be Rs.22.34 Lakh per MW.

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

(e) **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.

(f) **Gross Calorific Value**

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

(g) **Fuel Price**

Baggase fuel price during first year (FY 2018-19) of the control period (FY 2018-19 to 2020-21) shall be Rs.2062.95/MT which would be escalated @ 5.72% every year during the control period.

(h) **Use of Fossil Fuel**

No use of fossil fuel would be allowed. However for use of biomass as fuel the price of biomass as determined in this order shall be applicable.

28. **Solar PV Power Projects and Solar Thermal Power Projects**

The tariff of solar power is falling quite rapidly in the country and price of power generated from Solar PV now being discovered is almost in parity with the price of conventional power. The examples of such discovered price is given below:

Table - 4

Sl No.	Name of the Developer	Project Location	Capacity (MW)	Price (in Rs/kwh)
1	Sunedison	AP	500	4.63
2	Softbank	AP	350	4.63
3	Shapoorji	Rajasthan	130	4.35
4	Fortum	Rajasthan	420	4.34
5	Mahindra	MP	750	3.3
6	Solairedirect	AP	250	3.15
7	SECI	Bhadla, Rajasthan	5500	2.97, 2.62

In view of the price of the solar power being discovered at much lower rate in the country through competitive bidding process, the determination of generic tariff is losing its relevance. The Govt. of Odisha through its recently notified 'Odisha Renewable Energy policy 2016' has announced several incentives under IPR-2015, Viability Gap Funding (VGF) for RE projects, tax exemptions, concessions, development of Land banks and Solar parks with requisite infrastructure for RE projects which should be considered in bidding.

The commission therefore in the control period 2018-19 to 2020-21 decides not to determine generic tariff for Solar PV and Solar Thermal projects and stipulates that all the procurement of solar power be made through competitive bidding route only.

29. **Technology specific parameters for Municipal Solid waste based projects.**

The technological norms are accordingly given as below:

(a) Capital Cost

The normative capital cost for the Municipal Solid based projects shall be Rs.1877 Lakh/MW for FY 2018-19 during the control period. There would be no indexation of the capital cost during the control period.

(b) Plant Load Factor

The Plant Load Factor for determining project specific tariff shall be

i) During stabilization 65%

ii) During the first year of the remaining period (after stabilization) 65%

iii) From 2nd year onwards 75%

The stabilization period shall not be more than 6 months from the date of commissioning of the projects.

(c) Auxiliary Consumption

The auxiliary power consumption factor shall be 16% of the gross energy generation for computation of tariff.

(d) Operation and Maintenance Expenses

6.5% of the capital cost for 1st Year and with an escalation of 5% per year thereafter.

(e) Station Heat Rate

The Station Heat Rate for Municipal Solid based projects shall be 3587 kcal/kWh for power generation component alone and shall be considered for computation of tariff.

(f) Gross Calorific Value

The gross calorific value for MSW fuel shall be 1650 kcal/kg.

(g) Fuel Price

No fuel price is envisaged for Municipal Solid waste based projects.

(h) Use of Fossil Fuel

No fossil fuel use would be allowed. However for use of biomass as fuel the price of biomass as determined in this order shall be applicable.

30. Based on the above observations, the summary of the Generic tariff for renewable technologies for the control period from 2018-19 to 2020-21 (for Small Hydro projects from 2018-19 to 2022-23) is as follows:

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

Table – 5

Particular	Levellised Total Tariff (for the control period above (Rs./kWh)	Benefit of Accelerated Depreciation (Rs./kWh)	Net Levellised Tariff (upon adjusting for Accelerated Depreciation benefit) (Rs./kWh)	Tariff Period (Years)
Wind Energy	To be procured only through competitive bidding process			
SHP projects of 5 to 25 MW capacity	5.07	(0.42)	4.65	35
SHP projects below 5 MW capacity	6.05	(0.46)	5.59	35
Solar PV	To be procured only through competitive bidding process			
Solar Thermal				
Biomass				
Non-fossil fuel based co-generation				
MSW				

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 availed by the developer for the renewable energy power plants and such benefits shall be passed on to the consumers of the State. Developer and GRIDCO are directed to bring such evidence to the notice of the Commission.

Water Royalty Charges (in case of SHP and Others, if any)

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

34. **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.

35. **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.

36. **Taxes and duties:** Any tax and duty levied by the Government shall be reimbursed by the beneficiary to the developer as yearend charges.

37. Accordingly, the case is disposed of.

Sd/-	**Sd/-**	**Sd/-**
(S. K. Parhi)	**(A. K. Das)**	**(U. N. Behera)**
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	18.00%	%
3	Annual Net Generation	15.77	Lakh kWhs
4	Specific Energy Generation		kWh/kWp
5	Annual Duration (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		Rs Lacs/MW
2	Non depreciable cost	10.00	% of Capital Cost
3	Depreciable Amount		lacs
4	Debt Fraction	70.00	%
5	Debt		lacs
6	Equity		lacs
7	TOTAL		lacs
8	Interest Rate on Term Loan	9.97	%
9	Repayment Period	13	years
10	No of instalments for Interest on Term Loan	13	years
11	Moratorium Period	0	years
12	Term loan period for principal payment	13	years
13	Depreciation (Straight Line Method, Company Law) **(for first 13 years)**	5.28	%
14	Discount Rate	9.15	%
15	O&M + Insurance Cost		lacs/MW
16	O&M + Insurance Cost Escalation		%
17	Return on Equity	17.56	%
18	Annuity Factor (25 Years)		
19	Interest on working capital	10.97	%

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	30.00%	%
3	Annual gross energy Generation	26.28	Lakh kWhs
4	Auxiliary consumption	1.00	%
5	Net energy generation	26.02	Lakhs
6	Life of Plant and Machinery / Project Life	35	years
No	**Financial Parameters**	**Value**	**Unit**
1	Project Cost of 1 MW SHP plant	707	Rs Lacs/MW
2	Non depreciable cost	10.00	% of Capital Cost
3	Depreciable Amount	636.30	lacs
4	Debt Fraction	70.00	%
5	Debt	494.90	lacs
6	Equity	212.10	lacs
7	TOTAL	707.00	lacs
8	Interest Rate on Term Loan	9.97	%
9	Repayment Period	13	years
10	No of installments for Interest on Term Loan	13	years
11	Moratorium Period	0	years
12	Term loan period for principal payment	13	years
13	Depreciation (Straight Line Method, Company Law) (for first 13 yrs)	5.28	%
14	Discount Rate	9.15	%
15	O&M + Insurance Cost	22.20	lakhs /MW
16	O&M + Insurance Cost Escalation	5.72	%
17	Return on Equity	17.56	%
18	Annuity Factor (35 Years)		
19	Interest on working capital	10.97%	%

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	6.05	(0.46)	5.59	35
SHP projects of 5 MW above to 25 MW capacity	5.07	(0.42)	4.65	35

Note: For projects below 5 MW the Capital cost is taken as 779 lakh/MW and the O&M expense including insurance cost is taken as Rs.30.66 lakh. All other parameters as in above table (taken for projects of 5 MW to 25 MW capacity) remaining same.

Appendix- 3

BIOMASS

Input Technical and Financial parameters

Technical Parameters	Value	Unit
Capacity of the Power Project	1	MW
Capacity Utilization Factor (during stabilisation)	60.00	%
Capacity Utilization Factor (2nd year-20 year)	80.00	%
Annual Gross energy Generation (during stabilisation)		Lakh kWhs
Annual Gross energy generation (2nd yr-20yr)		Lakh kWhs
Auxiliary energy consumption (1st yr -11% and 2nd yr onwards -10%)	11.00	%
Net energy generation (during stabilisation)		Lakh kWhs
Net energy generation (2nd year-20 year)		Lakh kWhs
Life of Plant and Machinery / Project Life	20	years
Station Heat Rate	4125	Kcal/Kwh
Gross Calorific Value	3100	Kcal/Kg

Financial Parameters	Value	Unit
Non depreciable cost	10.00	% of Capital Cost
Depreciable Amount		lacs
Debt Fraction	70.00	%
Debt		lacs
Equity		lacs
TOTAL		lacs
Interest Rate on Term Loan	9.97	%
Repayment Period	13	years
No of instalments for Interest on Term Loan	13	years
Moratorium Period	0	years
Term loan period for principal payment	13	years
Depreciation (Straight Line Method, Company Law) **(for first 13 years)**	5.28	%
Discount Rate	9.15	%
O&M + Insurance Cost	42.29	lacs/MW
O&M + Insurance Cost Escalation	5.72	%
Return on Equity	17.56	%
Annuity Factor (20 Years)		
Interest on working capital	10.97	%
Fuel cost	3226.70	Rs /MT
Annual escalation factor for fuel cost	5.00	%

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		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	492.50	Rs Lacs/MW
2	Non depreciable cost	10.00	% of Capital Cost
3	Depreciable Amount		lacs
4	Debt Fraction	70.00	%
5	Debt		lacs
6	Equity		lacs
7	TOTAL		lacs
8	Interest Rate on Term Loan	9.97	%
9	Repayment Period	13	years
10	No of instalments for Interest on Term Loan	13	years
11	Moratorium Period	0	years
12	Term loan period for principal payment	13	years
13	Depreciation (Straight Line Method, Company Law) **(for first 13 years)**	5.28	%
14	Discount Rate	9.15	%
15	O&M + Insurance Cost	22.34	lacs/MW
16	O&M + Insurance Cost Escalation	5.72	%
17A	Return on Equity	17.56	%
18	Annuity Factor (20 Years)		
19	Interest on working capital	10.97	%
20	Fuel cost	2062.95	Rs /MT
21	Annual escalation factor for fuel cost	5.00%	%

Appendix- 5

MUNICIPAL SOLID WASTE

Input Technical and Financial parameters

Technical Parameters	**Value**	**Unit**
Capacity of the Power Project	1	MW
Capacity Utilization Factor (during stabilisation)	65.00%	%
Capacity Utilization Factor (2nd year-20 year)	75.00%	%
Annual Gross energy Generation (during stabilisation)		Lakh kWhs
Annual Gross energy generation (2nd yr-20yr)		Lakh kWhs
Auxiliary energy consumption	16.00%	%
Net energy generation (during stabilisation)		Lakh kWhs
Net energy generation (2nd year-20 year)		Lakh kWhs
Life of Plant and Machinery / Project Life	20	years
Station Heat Rate	3587	Kcal/Kwh
Gross Calorific Value	1650	Kcal/Kg

Financial Parameters	**Value**	**Unit**
Project Cost of 1 MW MSW pro-rata basis	1877	Rs Lacs/MW
Non depreciable cost	10.00%	% of Capital Cost
Depreciable Amount		lacs
Debt Fraction	70.00%	%
Debt		lacs
Equity		lacs
TOTAL		lacs
Interest Rate on Term Loan	9.97	%
Repayment Period	13	years
No of instalments for Interest on Term Loan	13	years
Moratorium Period	0	years
Term loan period for principal payment	13	years
Depreciation (Straight Line Method, Company Law) **(for first 13 years)**	5.28	%
Discount Rate	9.15	%
O&M + Insurance Cost	6.5% of capital cost	lacs/MW
O&M + Insurance Cost Escalation	5.72	%
Return on Equity	17.56	%
Annuity Factor (20 Years)	9	
Interest on working capital	10.97	%
Fuel cost		Rs /MT
Annual escalation factor for fuel cost	5.00	%

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