(c) Notwithstanding any moratorium period availed by project developer, 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.

15. Depreciation

(1) The value base for the purpose of depreciation shall be the capital cost of the project admitted by the Commission. The salvage value of the project shall be considered as 10% and depreciation shall be allowed up to maximum of 90% of the capital cost of the project:

Provided that, no depreciation shall be allowed to the extent of grant or capital subsidy received for the project.

(2) Depreciation rate of 4.67% per annum shall be considered for the first 15 years and remaining depreciation shall be evenly spread during remaining Useful Life of the project.

(3) Depreciation shall be computed from the first year of commercial operation:

Provided that, for determination of project specific tariff, in case of commercial operation of the project for part of the year, depreciation shall be computed on pro rata basis.

16. Return on Equity

(1) The value base for equity shall be as determined under Regulation 13.

(2) The normative Return on Equity shall be 14%. The normative Return on Equity shall be grossed up by the latest available notified Minimum Alternate Tax (MAT) rate for the first 20 years of the Tariff Period and by the latest available notified Corporate Tax rate for the remaining Tariff Period.

17. Interest on Working Capital

(1) The Working Capital requirement in respect of wind power projects, small hydro projects, solar PV power projects, floating solar projects, solar thermal power projects, and renewable energy with storage projects shall be computed in accordance with the following:

a) Operation and Maintenance expenses for one month;

b) Receivables equivalent to 45 days of tariff for sale of electricity calculated on normative Capacity Utilisation Factor or Plant Load Factor, as the case may be; and

c) Maintenance spares equivalent to 15% of Operation and Maintenance expenses.

(2) The Working Capital requirement in respect of biomass power projects with Rankine cycle technology, biogas power projects, biomass gasifier based power projects, non-fossil fuel based co-generation projects, municipal solid waste based power projects and refuse derived fuel based power projects shall be computed in accordance with the following:

a) Fuel costs for four months equivalent to normative Plant Load Factor;

b) Operation and Maintenance expense for one month;

c) Receivables equivalent to 45 days of tariff for sale of electricity calculated on the plant load factor; and

d) Maintenance spares equivalent to 15% of Operation and Maintenance expenses.

(3) In case of renewable hybrid energy projects, the Working Capital requirement shall be sum of the Working Capital requirement determined as per norms applicable for renewable energy sources, in proportion to their rated capacity in the project.

(4) Interest on Working Capital shall be at interest rate equivalent to the normative interest rate of three hundred and fifty (350) basis points above the average State Bank of India Marginal Cost of Funds based Lending Rate (MCLR) (one-year tenor) prevalent during the last available six months.

18. Calculation of capacity utilization factor and plant load factor:

The number of hours in a year for calculation of capacity utilization factor and plant load factor, as the case may be, shall be considered as 8766.

19. Operation and Maintenance Expenses

(1) Operation and Maintenance expenses shall be determined for the Tariff Period of the project based on normative O&M expenses specified in these regulations for the first year of the Control Period.

(2) Normative O&M expenses allowed during first year of the Control Period i.e. financial year 2020-21 under these regulations shall be escalated at the rate of 3.84% per annum for the Tariff Period.

20. Rebate

(1) For payment of bills of the generating company through revolving and valid letter of credit on presentation or through National Electronic Fund Transfer (NEFT) or Real Time Gross Settlement (RTGS) payment mode within a period of 5 days of presentation of bills, a rebate of 1.5% on bill amount shall be allowed.

Explanation: In case of computation of '5 days', the number of days shall be counted consecutively without considering any holiday. However, in case the last day or 5th day is official holiday, the 5th day for the purpose of rebate shall be construed as the immediate succeeding working day.

(2) Where payments are made on any day after 5 days within a period of one month from date of presentation of bills by the generating company, a rebate of 1% shall be allowed.

21. Late payment surcharge

In case the payment of any bill for charges payable under these regulations is delayed beyond a period of 45 days from the date of presentation of bills, a late payment surcharge at the rate of 1.50% per month shall be levied by the generating company.

22. Subsidy or incentive by the Central or the State Government

(1) The Commission shall take into consideration any incentive, grant or subsidy from the Central or State Government, including accelerated depreciation benefit, availed by the project, while determining the tariff under these regulations:

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

i) Assessment of benefit shall be based on normative capital cost, accelerated depreciation rate and corporate income tax rate as per relevant provisions of Income Tax Act, 1961 as amended from time to time; and

ii) Capitalization of renewable energy projects during second half of the fiscal year.

iii) Per unit benefit shall be derived on levelized basis at discount factor equivalent to weighted average cost of capital.

(2) Any grant, subsidy or incentives availed by renewable energy project, which is not considered at time of determination of tariff, shall be deducted by the beneficiary in subsequent bills after receipt of such grant, subsidy or incentive in suitable instalments or within such period as may be stipulated by the Commission.

(3) In case the Central or State Government or their agencies provide any generation-based incentive, which is specifically over and above the tariff, such incentive shall neither be taken into account while determining the tariff nor be deducted by the beneficiary in subsequent bills raised by the particular Renewable energy project.

23. Statutory Charges

The renewable energy project developer shall recover from the beneficiaries, the statutory charges imposed by the State and Central Government such as water cess, electricity duty on auxiliary consumption subject to maximum of normative auxiliary consumption.

Chapter 3: Parameters for wind power projects

24. Capital Cost

The Commission shall determine only project specific capital cost considering the prevailing market trends.

25. Capacity Utilisation Factor

(1) Capacity utilization factor norms for this Control Period shall as follows:

Annual Mean Wind Power Density (W/m2)	Capacity Utilization Factor
Upto 220	22%
221-275	24%
276-330	28%
331-440	33%
> 440	35%

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(2) The annual mean wind power density specified in sub-regulation (1) above shall be measured at 100 meter hub-height.

(3) Wind power projects shall be classified into particular wind zone site as per MNRE guidelines for wind measurement. Based on validation of wind mast by National Institute of Wind Energy, State Nodal Agency should certify zoning of the proposed wind farm complex.

26. Operation and Maintenance expenses

The Commission shall determine only project specific O&M expenses considering the prevailing market trends.

Chapter 4: Parameters for small hydro projects

27. Capital Cost

(1) The normative capital cost for small hydro projects during first year of Control Period i.e. financial year 2020-21 shall be as follows:

Region	Project Size	Capital Cost (Rs. lakh/ MW)
Himachal Pradesh, Uttarakhand, West Bengal, Union Territory of Jammu and Kashmir, Union Territory of Ladakh and North Eastern States	Below 5 MW	1100
	5 MW to 25 MW	1100
Other States	Below 5 MW	780
	5 MW to 25 MW	900

(2) The capital cost for small hydro projects as specified for first year of the Control Period shall remain valid for the entire duration of the Control Period unless reviewed earlier by the Commission.

28. Capacity Utilisation Factor

Normative capacity utilization factor for the small hydro projects located in Himachal Pradesh, Uttarakhand, West Bengal, Jammu and Kashmir, Ladakh and North-Eastern States shall be 45% and for other States, it shall be 30%:

Explanation: For the purpose of this Regulation, normative capacity utilization factor is net of free power to the home State, if any.

29. Auxiliary Consumption

Normative auxiliary consumption for the small hydro projects shall be considered as 1.0%.

30. Operation and Maintenance expenses

(1) Normative O&M Expenses for the first year of the Control Period i.e. financial year 2020-21) shall be as under:

Region	Project Size	O&M Expenses (in Rs. lakh/ MW)
Himachal Pradesh, Uttarakhand, West Bengal, Union Territory of Jammu and Kashmir, Union Territory of Ladakh and North Eastern States	Below 5 MW	41.78
	5 MW to 25 MW	31.34
Other States	Below 5 MW	33.66
	5 MW to 25 MW	24.37

(2) Normative O&M Expenses allowed at the commencement of the Control Period i.e. financial year 2020-21 under these regulations shall be escalated at the rate specified in Regulation 19 of these Regulations for Tariff Period.

Chapter 5: Parameters for biomass power projects based on Rankine cycle technology

31. Capital Cost

(1) The normative capital cost for first year of the Control Period i.e. financial year 2020-21 shall be as under:

Biomass power projects based on Rankine cycle technology	Capital Cost (Rs. lakhs/ MW)
Project [other than rice straw and juliflora (plantation) based project] with water-cooled condenser	559
Project [other than rice straw and Juliflora(plantation) based project] with air-cooled condenser	600
For rice straw and juliflora (plantation) based project with water-cooled condenser	611
For rice straw and juliflora (plantation) based project with air-cooled condenser	652

(2) The capital cost for biomass power projects based on Rankine cycle technology as specified for first year of the Control Period shall remain valid for the entire duration of the Control Period unless reviewed earlier by the Commission.

32. Plant Load Factor.

For the purpose of determination of tariff, the Plant Load Factor shall be considered as 80%.

33. Auxiliary Consumption

The normative auxiliary consumption shall be as follows: -

a) For projects using water-cooled condenser: 10%

b) For projects using air-cooled condenser: 12%

34. Station Heat Rate

The Station Heat Rate shall be:

a) For projects using travelling grate boilers: 4200 kCal/kWh

b) For projects using AFBC boilers: 4125 kCal/kWh

35. Operation and Maintenance expenses

Normative O&M Expenses for the first year of the Control Period i.e. financial year 2020-21 shall be Rs.46.42 lakhs per MW and shall be escalated at the rate at the rate specified in Regulation 19 of these Regulations for the Tariff Period.

36. Use of Fossil Fuel

The use of fossil fuels shall not be allowed:

Provided that for biomass power projects based on Rankine cycle technology commissioned on or before 31.03.2017, use of fossil fuels to the extent of 15% in terms of gross calorific value on annual basis, shall be allowed for the Useful Life of the project from the date of commercial operation.

37. Gross Calorific Value

The gross calorific value of biomass fuel, for the purpose of determination of tariff, shall be at 3100 kCal/kg.

38. Fuel Cost

Biomass fuel price during first year of the Control Period i.e. financial year 2020-21 shall be as specified in the table below and shall be escalated at the rate of 5% per annum to arrive at the base price for subsequent years of the Control Period, unless reviewed earlier by Commission. For the purpose of determining levelized tariff, a normative escalation factor of 5% per annum shall be applicable on biomass fuel price.

State	Biomass prices for FY 2020-21 (Rs./MT)
Andhra Pradesh	3326
Haryana	3786
Maharashtra	3872
Punjab	3960
Rajasthan	3305
Tamil Nadu	3272
Telangana	3326
Uttar Pradesh	3384
Other States	3557

Chapter 6: Parameters for non-fossil fuel based co-generation projects

39. Capital Cost

Normative capital cost for the non-fossil fuel based co-generation projects shall be Rs. 492 lakhs/MW for the first year of Control Period i.e. financial year 2020-21 and will remain valid for the entire duration of the Control Period unless reviewed earlier by the Commission.

40. Plant Load Factor

The plant load factor for different States shall be as follows:

State	Plant Load Factor (%)
Uttar Pradesh and Andhra Pradesh	45%
Tamil Nadu and Maharashtra	60%
Other States	53%

41. Auxiliary Consumption

The auxiliary consumption shall be considered as 8.5% for the computation of tariff.

42. Station Heat Rate

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

43. Gross Calorific Value

The gross calorific value for bagasse shall be considered as 2250 kCal/kg. For the use of biomass fuels other than bagasse, gross calorific value as specified under Regulation 37 shall be applicable.

44. Fuel Cost

(1) The price of bagasse for first year of the Control Period i.e. financial year 2020-21 shall be as specified in the table below and shall be escalated at the rate of 5% per annum to arrive at the base price for subsequent years of the Control Period, unless specifically reviewed by Commission. For the purpose of determining levelized tariff, a normative escalation factor of 5% per annum shall be applicable on bagasse prices.

State	Bagasse Price for FY 2020-21 (Rs. /MT)
Andhra Pradesh	1878
Haryana	2671
Maharashtra	2632
Punjab	2351
Tamil Nadu	2023
Telangana	1877
Uttar Pradesh	2095
Other States	2274

(2) For use of biomass other than bagasse in non-fossil fuel based co-generation projects, the biomass prices as specified under Regulation 38 shall be applicable.

45. Operation and Maintenance expenses

Normative O&M expenses during the first year of the Control Period, i.e. financial year 2020-21, shall be Rs. 24.52 lakhs per MW and shall be escalated at the rate specified in Regulation 19 of these Regulations for Tariff Period.

Chapter 7: Parameters for solar PV power projects, solar thermal power projects and floating solar projects

46. Capital Cost

The Commission shall determine only project specific capital cost considering the prevailing market trends.

47. Capacity Utilisation Factor

The Commission shall only approve capacity utilisation factor for project specific tariff:

Provided that the minimum capacity utilization factor for solar PV power projects shall be 21%:

Provided further that the minimum capacity utilization factor for solar thermal power projects shall be 23%:

Provided also that the minimum capacity utilisation factor for floating solar projects shall be 19%.

48. Operation and Maintenance expenses

The Commission shall determine only project specific O&M expenses considering the prevailing market trends.

49. Auxiliary Consumption

The Commission shall only approve auxiliary consumption for project specific tariff:

Provided that the maximum auxiliary consumption for solar PV power projects shall be 0.75%;

Provided further that the maximum auxiliary consumption for solar thermal power projects shall be 10%;

Provided also that the maximum auxiliary consumption for floating solar projects shall be 0.75%.

Chapter 8: Parameters for biomass gasifier based power projects

50. Capital Cost

Normative capital cost for biomass gasifier based power projects shall be Rs.593 lakhs/MW during first year of Control Period i.e. financial year 2020-21 and will remain valid for the entire duration of the Control Period unless reviewed earlier by the Commission.

51. Plant Load Factor

Plant load factor for determination of tariff shall be considered as 85%.

52. Auxiliary consumption

The auxiliary consumption shall be considered as 10% for the determination of tariff.

53. Specific fuel consumption

Normative specific fuel consumption shall be 1.25 kg per kWh.

54. Operation and Maintenance expenses

Normative O&M expenses for the first year of the Control period i.e. financial year 2020-21 shall be Rs. 61.31 lakhs per MW and shall be escalated at the rate specified in Regulation 19 of these Regulations for Tariff Period.

55. Fuel Cost

Biomass fuel price for biomass gasifier-based power projects shall be the same as for biomass power project based on Rankine cycle technology as mentioned in Regulation 38.

Chapter 9: Parameters for biogas based power projects

56. Capital Cost

Normative capital cost for biogas based power projects shall be Rs.1186 lakhs/MW for first year of the Control Period i.e. financial year 2020-21 and shall remain valid for the entire duration of the Control Period unless reviewed earlier by the Commission.

57. Plant Load Factor

Plant load factor shall be considered as 90% for determination of tariff.

58. Auxiliary Consumption

The auxiliary consumption shall be considered as 12% for determination of tariff.

59. Operation and Maintenance Expenses

Normative O&M expenses for the first year of the Control Period i.e. financial year 2020-21 shall be Rs. 61.31 lakhs per MW and shall be escalated at the rate specified in Regulation 19 of these Regulations for the Tariff Period.

60. Specific Fuel Consumption

Normative specific fuel consumption shall be 3 kg of substrate mix per kWh.

61. Fuel Cost (Feed stock Price)

Feed stock price during first year of the Control Period i.e. financial year 2020-21 shall be Rs. 1422/MT and shall be escalated at the rate of 5% per annum to arrive at the base price for subsequent years of the Control Period, unless specifically reviewed by Commission. For the purpose of determining levelized tariff, a normative escalation factor of 5% per annum shall be applicable.

Chapter 10: Parameters for municipal solid waste based power projects and refuse derived fuel based power projects

62. Capital Cost

The Commission shall determine only project specific capital cost considering the prevailing market trends.

63. Plant Load Factor

(1) Plant load factor for determining tariff for municipal solid waste based power projects and refuse derived fuel based power projects shall be:

Sl. No.	Plant load factor	MSW	RDF
a)	During stabilisation period	65%	65%
b)	During the remaining period of the first year (after stabilization period)	65%	65%
c)	2nd year onwards	75%	80%

(2) The stabilisation period shall not be more than 6 months from the date of commercial operation of the project.

64. Auxiliary Consumption

The auxiliary consumption for determination of tariff shall be considered as 15%.

65. Station Heat Rate

The Station Heat Rate for determination of tariff shall be considered as 4200 kcal/kWh.

66. Operation and Maintenance Expenses

The Commission shall determine only project specific O&M expenses considering the prevailing market trends.

67. Gross Calorific Value

(1) The gross calorific value of RDF for the purpose of determination of tariff shall be at 2500 kcal/kg.

(2) The gross calorific value of MSW shall be determined by the Commission on a case to case basis while determining the project specific tariff.

68. Fuel Cost

(1) Price of refuse derived fuel during financial year 2020-21 shall be considered as Rs.2084 per MT and shall be escalated at the rate of 5% per annum to arrive at the base price for subsequent years of the Control Period, unless specifically reviewed by Commission. For the purpose of determining levelized tariff, a normative escalation factor of 5% per annum shall be applicable.

(2) Fuel cost shall be considered as nil for municipal solid waste:

Provided that the Commission may consider allowing transportation cost of such fuel while determining the project specific tariff.

Chapter 11: Parameters for Renewable Hybrid Energy Projects

69. Capital Cost

The capital cost shall be determined on project specific basis considering the prevailing market trends.

70. Capacity Utilisation Factor

(1) The Commission shall determine only project specific capacity utilisation factor in respect of renewable hybrid energy projects taking into consideration the proportion of rated capacity of each renewable energy source, as the case may be,

and applicable capacity utilisation factor for such renewable energy source, as the case may be:

Provided that the minimum capacity utilization factor for renewable hybrid energy project shall be 30% when measured at the inter-connection point, where the energy is injected into the grid.

71. Operation and Maintenance expenses

The Commission shall determine only project specific O&M expenses considering the prevailing market trends.

72. Tariff

The tariff for a renewable hybrid energy project shall be a composite levelised tariff for the project as a whole by factoring in the tariff components upto the minimum of the useful life of the RE technologies combined for such RE hybrid Project:

Provided that, in case any of the RE technologies combined for RE hybrid project is left with further useful life, the levelised tariff for remaining useful life of such RE technology shall be determined separately, by factoring in the tariff components for the remaining useful life.

Chapter 12: Parameters for renewable energy with storage project

73. Capital Cost

The Commission shall determine only project specific capital cost for renewable energy with storage project considering the prevailing market trends

74. Storage Efficiency

(1) The Commission shall approve the storage efficiency only for project specific tariff:

Provided that the minimum efficiency for storage based on technology of solid state batteries shall be 80%:

Provided further that the minimum efficiency for storage based on technology of pumped storage shall be 75%:

(2) Efficiency of storage component of renewable energy with storage project shall be measured as ratio of output energy received from storage and input energy supplied to the storage component of such project, on annual basis.

75. Operation and Maintenance expenses

The Commission shall determine only project specific O&M expenses considering the prevailing market trends.

76. Tariff determination for Energy Storage

The tariff for renewable energy with storage project shall be a composite tariff or differential tariff based on time of day, determined for energy supplied from the Project including the energy supplied from the storage facility:

Provided that such tariff may be determined for supply of power on round the clock basis or for time periods as agreed by Project Developer and Beneficiary.

Chapter 13: Miscellaneous

77. Deviation from norms

Tariff for electricity generated from a generating station based on renewable energy sources, may also be agreed between the generating company and beneficiary, in deviation from the norms specified in these regulations:

Provided that the levelized tariff of the project calculated on the basis of the norms specified in these regulations shall be the ceiling levelized tariff.

78. Power to Relax

The Commission may by general or special order, for reasons to be recorded in writing, and after giving an opportunity of hearing to the parties likely to be affected, may relax any of the provisions of these regulations on its own motion or on an application made before it by an interested person.

79. Power to remove difficulty

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

Sd/-

(Sanoj Kumar Jha)
Secretary

APPENDIX

Form-1.1: Template for (Wind power projects/ Small hydro projects/ Solar PV power projects/ Solar thermal power projects/ Renewable energy hybrid power projects /Renewable energy with storage projects)

Sl. No.	Assumption Head	Sub-head	Sub-head (2)	Unit	Parameter
1	Power Generation	Capacity	Installed Power Generation Capacity	MW	
			Capacity Utilization Factor (CUF)	%	
			Auxiliary Consumption	%	
			Commercial Operation Date (COD)	dd/mm/yyyy	
			Useful Life	Years	
2	Project Cost	Capital Cost	Normative Capital Cost	Rs. Crore/ MW	
			Capital Cost	Rs. Crore	
			Capital Subsidy, if any	Rs. Crore	
			Net Capital Cost	Rs. Crore	
3	Financial Assumption	Debt Equity	Tariff Period	Years	
			Debt	%	
			Equity	%	
		Debt Component	Total debt amount	Rs. Crore	
			Total equity amount	Rs. Crore	
			Loan Amount	Rs. Crore	
			Moratorium Period	Years	
			Repayment Period (incl moratorium)	Years	
			Interest Rate	%	
		Equity Component	Equity Amount	Rs. Crore	
			Return on Equity for First 20 years	% p.a.	
			Return on Equity after 20 years	% p.a.	
			Discount Rate	%	
		Depreciation	Dep Rate for 1st 15 years	%	
			Dep rate 16th year onwards	%	
		Incentives	GBI, if any	Rs. Crore	
			Period for GBI	Years	
4	O& M Expenses	Normative O&M Expense		Rs. Lakh/MW	
		O&M Expenses p.a.		Rs. Crore	
		Escalation Factor		%	
5	Working Capital	O&M Expenses		Month	
		Maintenance Spares	% of O&M Expenses	%	
		Receivables		Days	
		Interest on Woking Capital		% per annum	

Form-1.2: Template for (Biomass/MSW/RDF)

Sl. No.	Assumption Head	Sub-head	Sub-head (2)	Unit	Parameter
1	Power Generation	Capacity	Installed Power Generation Capacity	MW	
			Aux Consumption	%	
			PLF (1st year)	%	
			PLF (2nd year onwards)	%	
			Commercial Operation Date	dd/mm/yyyy	
			Useful Life	Years	
2	Project Cost	Capital Cost/ MW	Normative Capital Cost	Rs. Crore /MW	
			Capital Cost	Rs. Crore	
			Capital Subsidy, if any	Rs. Crore	
			Net Capital Cost	Rs. Crore	
3	Financial Assumption	Debt Equity	Tariff Period	Years	
			Debt	%	
			Equity	%	
		Debt Component	Total debt amount	Rs. Crore	
			Total equity amount	Rs. Crore	
			Loan Amount	Rs. Crore	
			Moratorium Period	Years	
			Repayment Period (including moratorium)	Years	
			Interest Rate	%	
		Equity Component	Equity Amount	Rs. Crore	
			Return on Equity for First 20 years	% p.a.	
			Return on Equity after 20 years	% p. a.	
			Discount Rate	%	
		Depreciation	Dep Rate for 1st 15 years	%	
			Dep rate 16th year onwards	%	
		Incentives	GBI, if any	Rs. Crore	
			Period for GBI	Years	
4	O&M Expenses	Normative O&M Expenses		Rs. Lakh/MW	
		O&M Expenses p.a.		Rs. Crore	
		Escalation Factor		%	
5	Working Capital	O&M Expenses		Month	
		Maintenance Spares	% of O&M Expenses	%	
		Receivables		Days	
		Interest on WC		%	

Sl. No.	Assumption Head	Sub-head	Sub-head (2)	Unit	Parameter
6	Fuel Related assumptions	Station Heat Rate	During 1st year	kcal/kWh	
			2nd year onwards	kcal/kWh	
		Fuel Type and mix	Biomass Fuel Type-1	%	
			Biomass Fuel Type-2	%	
			Municipal Solid Waste	%	
			Refuse Derived Fuel	%	
			Fossil Fuel (Coal)	%	
			GCV of Biomass Fuel Type-1	kcal/kWh	
			GCV of Biomass Fuel Type-2	kcal/kWh	
			GCV of MSW	kcal/kWh	
			GCV of RDF	kcal/kWh	
			GCV of Fossil Fuel (Coal)	kcal/kWh	
			Biomass Price (Fuel Type-1)/ Yr 1	Rs./MT	
			Biomass Price (Fuel Type-2)/ Yr 1	Rs./MT	
			MSW Price/ Yr 1	Rs./MT	
			RDF Price/ Yr 1	Rs./MT	
			Fossil Fuel (Coal) Price)/ Yr 1	Rs./MT	
			Fuel Price Escalation Factor	% p.a.	

Form-2.1: Template for (Wind power projects or Solar PV power projects /Solar thermal power projects): Determination of Tariff Components

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

Units Generation	Unit	Yr-13	Yr-14	Yr-15	Yr-16	Yr-17	Yr-18	Yr-19	Yr-20	Yr-21	Yr-22	Yr-23	Yr-24	Yr-25
Installed Capacity	MW													
Net Generation	MU													

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

Tariff Components (Fixed charge)	Unit	Yr-13	Yr-14	Yr-15	Yr-16	Yr-17	Yr-18	Yr-19	Yr-20	Yr-21	Yr-22	Yr-23	Yr-24	Yr-25
O&M Expenses	Rs Lakh													
Depreciation	Rs Lakh													
Interest on term loan	Rs Lakh													
Interest on working Capital	Rs Lakh													
Return on Equity	Rs Lakh													
Total Fixed Cost	Rs Lakh													

Per Unit Tariff components	Unit	Yr-1	Yr-2	Yr-3	Yr-4	Yr-5	Yr-6	Yr-7	Yr-8	Yr-9	Yr-10	Yr-11	Yr-12
PU O&M expenses	Rs/kWh												
PU Depreciation	Rs/kWh												
PU Interest on term loan	Rs/kWh												
PU Interest on working capital	Rs/kWh												
PU Return on Equity	Rs/kWh												
PU Tariff Components	Rs/kWh												

Per Unit Tariff components	Unit	Yr-13	Yr-14	Yr-15	Yr-16	Yr-17	Yr-18	Yr-19	Yr-20	Yr-21	Yr-22	Yr-23	Yr-24	Yr-25
PU O&M expenses	Rs/kWh													
PU Depreciation	Rs/kWh													
PU Interest on term loan	Rs/kWh													
PU Interest on working capital	Rs/kWh													
PU Return on Equity	Rs/kWh													
PU Tariff Components	Rs/kWh													

Levelized Tariff	Unit	Yr-1	Yr-2	Yr-3	Yr-4	Yr-5	Yr-6	Yr-7	Yr-8	Yr-9	Yr-10	Yr-11	Yr-12
Discount Factors													
Discounted Tariff components	Rs/kWh												
Levelized Tariff	Rs/kWh												

Levelized Tariff	Unit	Yr-13	Yr-14	Yr-15	Yr-16	Yr-17	Yr-18	Yr-19	Yr-20	Yr-21	Yr-22	Yr-23	Yr-24	Yr-25
Discount Factors														
Discounted Tariff components	Rs/kWh													
Levelized Tariff	Rs/kWh													

Form-2.2: Template for (Biomass power projects, municipal solid waste based power projects, refuse derived fuel based power projects or non-fossil fuel based co-generation plants): Determination of Tariff Components

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

Units Generation	Unit	Yr-13	Yr-14	Yr-15	Yr-16	Yr-17	Yr-18	Yr-19	Yr-20	Yr-21	Yr-22	Yr-23	Yr-24	Yr-25
Installed Capacity	MW													
Net Generation	MU													

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

Tariff Components (Fixed charge)	Unit	Yr-13	Yr-14	Yr-15	Yr-16	Yr-17	Yr-18	Yr-19	Yr-20	Yr-21	Yr-22	Yr-23	Yr-24	Yr-25
O&M Expenses	Rs Lakh													
Depreciation	Rs Lakh													
Interest on term loan	Rs Lakh													
Interest on working Capital	Rs Lakh													
Return on Equity	Rs Lakh													
Total Fixed Cost	Rs Lakh													

Tariff Components (Variable Charge)	Unit	Yr-1	Yr-2	Yr-3	Yr-4	Yr-5	Yr-6	Yr-7	Yr-8	Yr-9	Yr-10	Yr-11	Yr-12
Biomass Fuel Type-1	Rs Lakh												
Biomass Fuel Type-2	Rs Lakh												
Fossil Fuel (coal)	Rs Lakh												
Municipal Solid Waste	Rs Lakh												
Refuse Derived Fuel	Rs Lakh												
Sub-total (Fuel Costs)	Rs Lakh												
Fuel cost allocable to power	%												
Total Fuel Costs	Rs Lakh												

Tariff Components (Variable Charge)	Unit	Yr-13	Yr-14	Yr-15	Yr-16	Yr-17	Yr-18	Yr-19	Yr-20	Yr-21	Yr-22	Yr-23	Yr-24	Yr-25
Biomass Fuel Type-1	Rs Lakh													
Biomass Fuel Type-2	Rs Lakh													
Fossil Fuel (coal)	Rs Lakh													
Municipal Solid Waste	Rs Lakh													
Refuse Derived Fuel	Rs Lakh													
Sub-total (Fuel Costs)	Rs Lakh													
Fuel cost allocable to power	%													
Total Fuel Costs	Rs Lakh													

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

Per Unit Tariff components (Fixed)	Unit	Yr-13	Yr-14	Yr-15	Yr-16	Yr-17	Yr-18	Yr-19	Yr-20	Yr-21	Yr-22	Yr-23	Yr-24	Yr-25
PU O&M expenses	Rs/kWh													
PU Depreciation	Rs/kWh													
PU Interest on term loan	Rs/kWh													
PU Interest on working capital	Rs/kWh													
PU Return on Equity	Rs/kWh													
PU Tariff Components (Fixed)	Rs/kWh													
PU Tariff Components (Variable)	Rs/kWh													
PU Tariff Components (Total)	Rs/kWh													

Levelized Tariff	Unit	Yr-1	Yr-2	Yr-3	Yr-4	Yr-5	Yr-6	Yr-7	Yr-8	Yr-9	Yr-10	Yr-11	Yr-12
Discount Factors													
Discounted Tariff components (Fixed)	Rs/kWh												
Discounted Tariff components (Variable)	Rs/kWh												
Discounted Tariff components (Total)	Rs/kWh												
Levelized Tariff (Fixed)	Rs/kWh												
Levelized Tariff (Variable)	Rs/kWh												
Levelized Tariff (Total)	Rs/kWh												

Levelized Tariff	Unit	Yr-13	Yr-14	Yr-15	Yr-16	Yr-17	Yr-18	Yr-19	Yr-20	Yr-21	Yr-22	Yr-23	Yr-24	Yr-25
Discount Factors														
Discounted Tariff components (Fixed)	Rs/kWh													
Discounted Tariff components (Variable)	Rs/kWh													
Discounted Tariff components (Total)	Rs/kWh													
Levelized Tariff (Fixed)	Rs/kWh													
Levelized Tariff (Variable)	Rs/kWh													
Levelized Tariff (Total)	Rs/kWh													

Form-2.3: Template for (Small Hydro projects): Determination of Tariff Components

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

Units Generation	Unit	Yr-14	Yr-15	Yr-16	Yr-17	Yr-18	Yr-19	Yr-20	Yr-21	Yr-22	Yr-23	Yr-24	Yr-25	Yr-26
Installed Capacity	MW													
Net Generation	MU													

Units Generation	Unit	Yr-27	Yr-28	Yr-29	Yr-30	Yr-31	Yr-32	Yr-33	Yr-34	Yr-35	Yr-36	Yr-37	Yr-38	Yr-39	Yr-40
Installed Capacity	MW														
Net Generation	MU														

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

Tariff Components (Fixed charge)	Unit	Yr-14	Yr-15	Yr-16	Yr-17	Yr-18	Yr-19	Yr-20	Yr-21	Yr-22	Yr-23	Yr-24	Yr-25	Yr-26
O&M Expenses	Rs Lakh													
Depreciation	Rs Lakh													
Interest on term loan	Rs Lakh													
Interest on working ,pital	Rs Lakh													
Return on Equity	Rs Lakh													
Total Fixed Cost	Rs Lakh													

Tariff Components (Fixed charge)	Unit	Yr-27	Yr-28	Yr-29	Yr-30	Yr-31	Yr-32	Yr-33	Yr-34	Yr-35	Yr-36	Yr-37	Yr-38	Yr-39	Yr-40
O&M Expenses	Rs Lakh														
Depreciation	Rs Lakh														
Interest on term loan	Rs Lakh														
Interest on working Capital	Rs Lakh														
Return on Equity	Rs Lakh														
Total Fixed Cost	Rs Lakh														

Per Unit Tariff components	Unit	Yr-1	Yr-2	Yr-3	Yr-4	Yr-5	Yr-6	Yr-7	Yr-8	Yr-9	Yr-10	Yr-11	Yr-12	Yr-13
PU O&M expenses	Rs/kWh													
PU Depreciation	Rs/kWh													
PU Interest on term loan	Rs/kWh													
PU Interest on working capital	Rs/kWh													
PU Return on Equity	Rs/kWh													
PU Tariff Components	Rs/kWh													

Per Unit Tariff components	Unit	Yr-14	Yr-15	Yr-16	Yr-17	Yr-18	Yr-19	Yr-20	Yr-21	Yr-22	Yr-23	Yr-24	Yr-25	Yr-26
PU O&M expenses	Rs/kWh													
PU Depreciation	Rs/kWh													
PU Interest on term loan	Rs/kWh													
PU Interest on working capital	Rs/kWh													
PU Return on Equity	Rs/kWh													
PU Tariff Components	Rs/kWh													

Per Unit Tariff components	Unit	Yr-27	Yr-28	Yr-29	Yr-30	Yr-31	Yr-32	Yr-33	Yr-34	Yr-35	Yr-36	Yr-37	Yr-38	Yr-39	Yr-40
PU O&M expenses	Rs/kWh														
PU Depreciation	Rs/kWh														
PU Interest on term loan	Rs/kWh														
PU Interest on working capital	Rs/kWh														
PU Return on Equity	Rs/kWh														
PU Tariff Components	Rs/kWh														

Levelized Tariff	Unit	Yr-1	Yr-2	Yr-3	Yr-4	Yr-5	Yr-6	Yr-7	Yr-8	Yr-9	Yr-10	Yr-11	Yr-12	Yr-13
Discount Factors														
Discounted Tariff components	Rs/kWh													
Levelized Tariff	Rs/kWh													

Levelized Tariff	Unit	Yr-14	Yr-15	Yr-16	Yr-17	Yr-18	Yr-19	Yr-20	Yr-21	Yr-22	Yr-23	Yr-24	Yr-25	Yr-26
Discount Factors														
Discounted Tariff components	Rs/kWh													
Levelized Tariff	Rs/kWh													

Levelized Tariff	Unit	Yr-27	Yr-28	Yr-29	Yr-30	Yr-31	Yr-32	Yr-33	Yr-34	Yr-35	Yr-36	Yr-37	Yr-38	Yr-39	Yr-40
Discount Factors															
Discounted Tariff components	Rs/kWh														
Levelized Tariff	Rs/kWh														

Annexure R

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Central Electricity Regulatory Commission

New Delhi

Explanatory Memorandum

On

Draft Central Electricity Regulatory Commission (Terms and Conditions for Tariff Determination from Renewable Energy Sources) Regulations, 2020

May, 2020

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LIST OF ABBREVIATIONS

AERC	Assam Electricity Regulatory Commission
BERC	Bihar Electricity Regulatory Commission
BSE	Bombay Stock Exchange
CAPM	Capital Asset Pricing Model
CEA	Central Electricity Authority
CERC	Central Electricity Regulatory Commission
COD	Commercial Operation Date
CPI	Consumer Price Index
CSERC	Chhattisgarh State Electricity Regulatory Commission
CSP	Concentrated Solar Power
CUF	Capacity Utilisation Factor
DSCR	Debt Service Coverage Ratio
EOI	Expression of Interest
ESS	Energy Storage System
ERCs	Electricity Regulatory Commissions
GBI	Generation Based Incentive
GCV	Gross Calorific Value
GERC	Gujarat Electricity Regulatory Commission
GOI	Government of India
GST	Goods and Services Tax
HERC	Haryana Electricity Regulatory Commission
HPERC	Himachal Pradesh Electricity Regulatory Commission
H&M	Hydro Mechanical
IDC	Interest During Construction
IEGC	Indian Electricity Grid Code
IoWC	Interest on Working Capital
IREDA	Indian Renewable Energy Development Agency
JERC	Joint Electricity Regulatory Commission
KERC	Karnataka Electricity Regulatory Commission
Kg	Kilogram
kWh	Kilowatt Hour
LC	Letter of Credit
MAT	Minimum Alternate Tax
MCLR	Marginal Cost of Fund Based Lending Rate
MERC	Maharashtra Electricity Regulatory Commission
MNRE	Ministry of New and Renewable Energy
MPERC	Madhya Pradesh Electricity Regulatory Commission
MSW	Municipal Solid Waste
NIWE	National Institute of Wind Energy
NLDC	National Load Despatch Centre
O&M	Operation & Maintenance
PFC	Power Finance Corporation Limited
PLF	Plant Load Factor
PLCC	Power Line Carrier Communication

PLR	Prime Lending Rate
POSOCO	Power System Operation Corporation Limited
PPA	Power Purchase Agreement
PSERC	Punjab State Electricity Regulatory Commission
RDF	Refuse Derived Fuel
RES	Renewable Energy Sources
REC	Rural Electrification Corporation
RERC	Rajasthan Electricity Regulatory Commission
RES	Renewable Energy Sources
RfS	Request for Selection
ROE	Return on Equity
RPO	Renewable Purchase Obligation
R&R	Rehabilitation & Resettlement
SBI	State Bank Of India
SECI	Solar Energy Corporation of India Limited
SERC	State Electricity Regulatory Commission
SHR	Station Heat Rate
TNERC	Tamil Nadu Electricity Regulatory Commission
TSERC	Telangana State Electricity Regulatory Commission
UERC	Uttarakhand Electricity Regulatory Commission
WACC	Weighted Average Cost of Capital
WPG	Wind Power Generator
WPI	Wholesale Price Index
WTE	Waste to Energy

1 BACKGROUND

1.1 BACKGROUND

Central Electricity Regulatory Commission (CERC or the Commission) is a statutory body constituted under the Electricity Regulatory Commission Act, 1998 and continues to be recognised under the Electricity Act, 2003 ("the Act"). CERC has been vested with the functions under the Act, inter alia to regulate the tariff of the Generating Companies owned or controlled by Central Government and Generating Companies having a composite scheme for generation and sale of electricity in more than one State, to regulate inter-State transmission of electricity and to determine the tariff for inter-State transmission of electricity.

In accordance with Section 61 of the Act, the Central Commission has to specify the terms and conditions for determination of tariff. Further, in accordance with sub-clause (s) of Clause (2) of Section 178 of the Act, Central Commission is empowered to determine terms and conditions for the determination of Renewable Energy tariff. Accordingly, the Commission, while determining the tariff, takes into account objectives of safeguarding consumer's interest as well as ensuring recovery of the cost of electricity in a reasonable manner.

To achieve these objectives, the Commission undertakes various regulatory measures, which are in consonance with the principles set out under Section 61 of the Act. The terms and conditions of Renewable Energy tariff specified by the Commission also act as guiding principles for SERCs.

The Commission, since 2009, has been issuing Regulations for Terms and Conditions for Tariff determination from Renewable Energy sources based on multi-year tariff principles over the various Control Periods as under:

Table 1- Issuance of RE Tariff Regulations

Tariff Regulations	Issuance	Control Period
Central Electricity Regulatory Commission (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2009	September 16, 2009	2009-2012
Central Electricity Regulatory Commission (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2012	February 6, 2012	2012-2017
Central Electricity Regulatory Commission (Terms and Conditions for Tariff determination from Renewable Energy Sources Regulations, 2017 (CERC RE Tariff Regulations, 2017)	April 17, 2017	2017-2020

After notification of CERC RE Tariff Regulations, 2017, CERC issued three (3) Orders on Determination of levellised generic tariff for FY 2017-18, FY 2018-19 and FY 2019-20 on May 31, 2017; March 28, 2018; and March 19, 2019 respectively.

The Commission vide Order dated March 24, 2020 in Petition No. 3/SM/2020 (Suo-Motu) has extended the applicability of CERC RE Tariff Regulations, 2017 for a further period of three (3) months i.e., from April 1, 2020 upto June 30, 2020. Accordingly, the next Control Period shall commence from July 1, 2020. The Commission has prepared this Draft Regulation [Draft CERC (Terms and Conditions for Tariff Determination from Renewable Energy Sources) Regulations, 2020] for laying down the Terms and conditions for Tariff Determination from Renewable Energy Sources for next Control Period.

During the Control Period 2017-2020, Renewable Energy technologies have matured and the gap between the cost of generation using conventional sources of energy and Renewable Energy sources (especially wind and solar) have reduced. The total installed capacity of grid-interactive Renewable Energy in India stands at 86,321 MW as on January 31, 2020, with the largest share of Wind Energy at 37,608 MW, followed by Solar Energy at 34,036 MW[1]. The share of grid-interactive renewable capacity in total generation installed capacity mix is around 23%[2]. As of 2019, India is ranked 4th in Wind Energy, 5th in Solar Energy and 5th in Renewable Energy installed capacity.

The Government of India has set an ambitious target to have 175 GW of Installed Capacity from Renewable Energy Sources (RES) by March 2022.

The Commission has been determining the tariff of the grid interactive power projects based on Renewable Energy sources through transparent and participative process. The Commission has deemed it necessary to consider the developments in the sector while framing the fresh terms and conditions of tariff for Control Period commencing from July 1, 2020.

This Explanatory Memorandum is being issued with the intent of explaining the rationale behind Draft CERC (Terms and Conditions for Tariff Determination

[1]Data from Ministry of New and Renewable Energy
[2]Data from Central Electricity Authority

from Renewable Energy Sources) Regulations, 2020. ("Draft CERC RE Tariff Regulations, 2020").

While preparing the Draft CERC RE Tariff Regulations, 2020 data has been obtained from Indian Renewable Energy Development Agency (IREDA) and Power Finance Corporation Limited (PFC) about the Renewable Energy Projects funded/executed for the last three years. The details of the data received from different agencies are as follows:

Table 2- Data Received from Different Agencies

Technology	No. of Projects for which data was received	Projects Not Considered due to some discrepancy in data	Projects Considered for Analysis
Wind	32	10	22
Small Hydro Projects	16	3	13
Solar	88	10	78
Biomass	16	3	13
Cogeneration	1	-	1
MSW Projects	12	1	11
Total	165	27	138

The data has also been received from National Institute of Wind Energy (NIWE) for wind projects and from Power System Operation Corporation (POSOCO) for various RE projects which has been duly considered while framing Draft CERC RE Tariff Regulations, 2020.

The information received from the above agencies has been analysed in the Explanation Memorandum.

2 SCOPE OF RE TARIFF REGULATIONS

2.1 APPLICABILITY OF REGULATIONS

In accordance with Section 79 read with Section 62 of the Act, the Commission is required to determine the tariff for the central sector generating stations or the generating stations with composite scheme for sale of electricity to more than one State. Accordingly, it is proposed that CERC RE Tariff Regulations, 2020 shall be applicable in all cases where tariff for a generating station or a unit thereof is based on renewable sources of energy, and are covered under Section 79(1)(a) & (b) read with Section 62 of the Act.

Section 6.4 (3) of Tariff Policy notified on January 28, 2016 empowers the Commission to lay down the guidelines for pricing of non-firm power. The Para 6.4 (3) reads as under:

> *"The Central Commission should lay down guidelines for pricing intermittent power, especially from Renewable Energy sources, where such procurement is not through competitive bidding. The tariff stipulated by CERC shall act as a ceiling for that category."*

In cases of Wind power projects, Small hydro projects, Biomass power project with Rankine cycle technology, Non-fossil fuel based co-generation projects, Solar PV power projects, Floating Solar projects, Solar thermal power projects, Renewable Hybrid Energy projects, Renewable Energy with Storage projects, Biomass gasifier based power project, Biogas based power project, Municipal solid waste based power projects and Refuse derived fuel based power projects, these regulations shall apply subject to the fulfilment of eligibility criteria as specified under the Regulations.

2.2 ELIGIBILITY CRITERIA

The tariff determined under these Regulations shall be applicable in respect of RE technologies meeting specific Eligibility Criteria. The Commission proposes to retain the Eligibility Criteria as specified in RE Tariff Regulations, 2017 for the Wind power project, Small hydro project, Biomass power project with Rankine

Cycle Technology; Non-fossil fuel based Co-generation project, Biomass gasifier based power project, Biogas based power project, Municipal Solid Waste based project, Refuse Derived Fuel based power project, Solar PV power project and Solar Thermal Power project.

The Commission proposes to specify the parameters for new Renewable Energy technologies such as Floating Solar Project, Renewable Hybrid Energy Project and Renewable Energy Project with Storage in the Draft CERC RE Tariff Regulations, 2020.

For the purpose of these Regulations, Renewable Hybrid Energy Project and Renewable Project with Storage have been treated separately.

2.3 APPROACH FOR DEVELOPMENT OF TARIFF NORMS

While determining the tariff norms, the following approaches have been considered:-

a) Detailed review of the Tariff Orders / Regulations notified by various SERCs and the approaches considered in determining the norms for tariff for a specific RE technology.
b) Review and analysis of the actual project cost details and information about performance parameters in respect of existing RE projects based on information received from financial institutions, public agencies and other State Electricity Regulatory Commissions.
c) Comparative analysis of project cost and performance parameters in respect of similar RE technology applications in the international context.
d) Feedback/views/comments of the various stakeholders received on the RE Tariff Regulations, 2017.

The tariff norms have been categorized broadly under three Sections, namely General Principles, Financial Principles and Technology Specific Parameters. On the basis of RE technologies covered under the Regulations, the Explanatory Memorandum has been divided into the following sections:

a) General Principles
b) Financial Principles
c) Parameters for wind power projects

d) Parameters for Small hydro project
e) Parameters for biomass power projects based on Rankine cycle technology
f) Parameters for non-fossil fuel based co-generation projects
g) Parameters for solar PV power projects, solar thermal power projects and floating solar projects
h) Parameters for biomass gasifier based power projects
i) Parameters for biogas based power projects
j) Parameters for municipal solid waste based power projects/ refuse derived fuel based power projects
k) Parameters for Renewable hybrid energy projects
l) Parameters for Renewable energy with storage projects

The comprehensive approach adopted for development of norms for the purpose of tariff determination for power in respect of various Renewable Energy technologies has been presented below and the same has been elaborated under subsequent sections.

3 GENERAL PRINCIPLES

3.1 CONTROL PERIOD

The existing provisions in the RE Tariff Regulations, 2017 specifies Control Period or Review Period of three (3) years viz. FY 2017-18 to FY 2019-20.

The Commission observes that most of the ERCs have adopted a three year control period, except for States like Maharashtra, Madhya Pradesh, Chhattisgarh which have opted for Control Period of 5 years. In case of Rajasthan, different Control Period has been adopted for various technologies as per the maturity level of the technology.

During the Control Period from FY 2017-20, the maturity level of Renewable Energy technologies has grown significantly. In addition, majority of the capacity addition through Solar PV technology and Wind Technologyis are taking place through the competitive bidding route.

Considering the discovery of lower tariff regimes through competitive bidding and with due regard to frequent changes in market dynamics in all upcoming technologies, the Commission proposes to continue with the short duration of Control Period of three (3) years from FY 2020-21 (1st July 2020) to FY 2022-23.

3.2 TARIFF PERIOD

In the RE Tariff Regulations 2017, it is specified that Tariff Period for all Renewable Energy power projects shall be same as useful life. In case of Small Hydro projects, the tariff period shall be thirty five (35) years. For Wind, Solar PV and Solar Thermal projects, the Tariff Period shall be twenty five (25) years. In case of Biomass based projects with Rankine cycle technology, Biomass Gasifier, Non fossil-fuel co-generation projects, Biogas based projects, Municipal Solid Waste and Refuse Derived Fuel based projects the tariff period shall be twenty (20) years.

The Commission proposes to continue with the existing provisions of Tariff Period equal to useful life of the project. Since, the tariff period is equal to useful life of the project, tit will enable the Project Developers to ensure returns from projects and will help in reasonable tariff discovery as the benefits of the same can be passed to end consumers.

In case of Renewable Hybrid Energy projects, the Commission proposes that the Useful life of the project shall be the minimum of the useful life of different Renewable Energy technologies combined for Renewable Hybrid Energy Project and the same shall be considered as Tariff Period. For Renewable energy with storage project, the Commission proposes that the Useful life shall be same as useful life of project assuming that there is no storage.

In case of Floating Solar PV Project, the Commission proposes to keep Tariff Period of 25 years as technology of Floating Solar is same as Solar PV and Solar Thermal.

3.3 GENERIC TARIFF AND PROJECT SPECIFIC TARIFF

RE Tariff Regulations, 2017 specify determination of Project Specific Tariff for Solar PV and Solar Thermal, Wind Energy (including on-shore and off-shore), Biomass Gasifier based projects, Biogas based projects, Municipal Solid Waste and Refuse Derived Fuel based projects with Rankine cycle technology, Hybrid Solar Thermal Power Projects and other Hybrid Project.

The Commission observes that many SERCs are still continuing with the determination of RE Generic Tariff for most of the technologies. However, Himachal Pradesh and Maharashtra have adopted the approach for specifying the generic tariff for only few technologies.

In line with the existing RE Tariff Regulations, 2017, the Commission proposes to continue with the determination of Generic Tariff for Small Hydro Power Projects, Biomass Power Projects with Rankine Cycle technology, Non-fossil fuel-based co-generation Plants, Biomass Gasifier based power projects and Biogas based power projects.

Regarding the determination of project specific tariff, the Commission proposes to continue with RE Technologies specified in RE Tariff Regulations, 2017. Also, the Commission has included the provisions of new RE Technologies such as Floating Solar projects, Off-shore wind power projects, Renewable Hybrid Energy projects and Renewable energy Project with storage under the project specific tariff determination.

3.4 PETITION FOR PROCEEDINGS FOR DETERMINATION OF TARIFF

Regulation 8 of RE Tariff Regulations, 2017 specifies proceedings of determination of Tariff. The Regulations specify that the Commission shall determine the generic tariff on the basis of suo-motu petition six months in advance at beginning of each year of the Control Period. In the proposed draft, the Commission proposes to determine the generic tariff on the basis of suo-motu petition one month before commencement of tariff for each year of the Control Period. However, as first year of Control Period is from 1.7.2020, the Commission proposes to determine the Generic Tariff prior to 30.6.2020 for the period 1.7.2020 to 31.3.2021.

The list of documents to be submitted with Petition for determination of project specific tariff are also specified. Further, the Commission is of the view that the application for project specific tariff determination should be filed based on consent from the Beneficiary that they will procure the power at the project specific tariff determined by the Commission. Hence, the Commission has proposed to include this condition of consent from the Beneficiary along with the Petition for project specific tariff determination.

As discussed earlier, most of the Wind and Solar capacity addition is taking place through competitive bidding and hence, in case the project specific tariff is to be determined for these RE technologies for which the competitive bidding is taking place, it becomes important to assess the reasonableness of tariff proposed with the tariffs discovered through competitive bidding. Hence, the Commission has proposed to include specific provisions in this regard in the Petition to be filed for project specific tariff determination.

3.5 TARIFF STRUCTURE AND TARIFF DESIGN

The Tariff structure and design as per the existing provisions in the RE Tariff Regulations, 2017 are as follows:

"9.Tariff Structure

The tariff for renewable energy technologies shall be single part tariff consisting of the following fixed cost components:

(a) Return on equity;

(b) Interest on loan capital;

(c) Depreciation;

(d) Interest on working capital;

(e) Operation and maintenance expenses;

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

10. Tariff Design

1) *The generic tariff shall be determined considering the year of commissioning of the project, on levellised basis for the Tariff Period. Provided that for Renewable Energy technologies having single part tariff with two components, tariff shall be determined on levellised basis considering the year of commissioning of the project for fixed cost component while the fuel cost component shall be specified on year of operation basis.*
2) *For the purpose of levellised tariff computation, the discount factor equivalent to Post Tax weighted average cost of capital shall be considered.*
3) *Levellisation shall be carried out for the 'useful life' of the Renewable Energy project.*
4) *The above principles shall also apply for project specific tariff. "*

For Renewable Energy technologies having fuel cost component, like biomass power projects and non-fossil fuel based cogeneration, single part tariff with two components, i.e. fixed cost component and fuel cost component, was specified. The Commission considered that for RE technologies involving no fuel cost component, single part tariff structure is the simplest method to operationalize considering number of projects and unit size of each project. Also, the same has been in practice for RE technologies for long time.

The Commission proposes to continue with the same tariff structure for the next Control Period (2020-2023).

While specifying the tariff for all RE Technologies, Levellised tariff approach is a balanced approach amongst various tariff determination mechanisms like front loaded tariff, back loaded tariff, etc. The Commission has also considered Levellised tariff with appropriate discount rate representing weighted average cost of capital on the basis of normative debt-equity ratio as specified in the Regulations. The discount rate used for Renewable Energy tariff determination was the pre-tax Weighted Average Cost of Capital (WACC). The WACC was computed as under:

Post Tax WACC = Cost of Debt + Cost of Equity

Where,

Cost of Debt = Normative Debt X (Normative Rate of Interest) X (1-Corporate Tax Rate)

Cost of Equity= Normative Equity X (Post Tax Return on Equity)

The Commission proposes to continue with Levellisation of tariff for the useful life of the Renewable Energy project.

3.6 TREATMENT FOR OVER-GENERATION

The Commission is of the view thatas the entire costs are allowed to be recovered through tariff at normative capacity utilisation factor or plant load factor considered for tariff determination, the tariff applicable for over-generation in excess of normative capacity utilisation factor or plant load factor should not be same as tariff determined for full recovery at normative capacity utilisation factor or plant load factor and benefits of over-generation needs to be shared with the beneficiaries. Further, the renewable energy project should be free to sell such excess energy to any other entity and at the same time priority should be given to the concerned beneficiary for procuring the energy generated in excess of normative capacity utilisation factor or plant load factor. The Commission observed that similar provision has been made by the Ministry of Power in Guidelines for tariff based competitive bidding process for procurement of power from grid connected wind power projects and solar PV power projects. The relevant provision of guidelines for wind power projects are as follows:

"7.2.3 In case of availability of power more than the maximum CUF specified, WPG will be able to free to sell it to any other entity provided first right of refusal will vest with the

Procurer(s). In case the Procurer purchases the excess generation, the same may be done at 75% of the PPA tariff, and provision of this effect shall be clearly indicated in the RfS document."

Accordingly, the Commission proposes to add provisions regarding Treatment for Over- Generation for Renewable Energy Technologies in the Draft CERC RE Tariff Regulations, 2020, on above lines.

4 FINANCIAL PRINCIPLES

4.1 DEBT - EQUITY RATIO

As per the existing provisions in the RE Tariff Regulations, 2017, Debt Equity ratio is specified as follows:

1. *"For generic tariff to be determined based on suo-motu petition, the debt equity ratio shall be 70:30.*
2. *For Project specific tariff, the following provisions shall apply:-*
   a. *If the equity actually deployed is more than 30% of the capital cost, equity in excess of 30% shall be treated as normative loan.*
   b. *Provided that where equity actually deployed is less than 30% of the capital cost, the actual equity shall be considered for determination of tariff.*
   c. *Provided further that the equity invested in foreign currency shall be designated in Indian rupees on the date of each investment. "*

For analysing the trend in the Debt-Equity ratio of various Renewable Energy projects, comparison of debt-equity ratio considered by various SERCs has been done and the Commission observed that most of the SERCs have adopted the normative Debt Equity ratio of 70:30.

The analysis of actual Debt-Equity Ratio of the Renewable Energy projects funded during the last 3 years is summarised in Table below:

Table 3-Actual Debt Equity ratio of projects

Technology	Actual Funding Pattern
Wind Projects	• Maximum Debt Equity Ratio of 79.97:20.03 and Minimum Debt Equity Ratio of 60.61:39.39. • 16 projects out of total 22 projects have been funded with Debt more than 70% of Project Cost
Small Hydro Projects	• Maximum Debt Equity Ratio of 75:25 and Minimum Debt Equity Ratio of 62.54:37.36. • Two Projects with 70:30 Ratio and one Project with Debt more than 70% (Total 13 Projects)
Solar Projects	• Maximum Debt Equity Ratio of 79.95:20.05 and Minimum Debt Equity Ratio of 36.54:63.46. • 50 projects out of total 78 projects have been funded with Debt more than 70% of Project Cost
MSW Projects	All projects (10) are having Debt Equity Ratio 70:30
Cogeneration Projects	1 project with Debt Equity Ratio 46.49:53.51

Source: Data received from IREDA and PFC

The Commission observed that for most of the projects in Renewable Energy, debt financing is more than normative debt of 70% with few exceptions. The Commission proposes to continue with the existing approach of normative Debt Equity ratio of 70:30.

Further, the Commission notes that, in case of project specific Tariff, the project may have opted for Capital Subsidy. Hence, it is proposed that Debt Equity ratio shall be considered after reduction of capital subsidy from capital cost of the project.

4.2 RETURN ON EQUITY (ROE)

Return on equity (RoE) is one of the key components of tariff determination. As per the existing provisions in the RE Tariff Regulations, 2017, RoE is specified as follows:

"

1. *The value base for the equity shall be 30% of the capital cost or actual equity (in case of project specific tariff determination) as determined under Regulation.*
2. *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."*

For analysing the recent trend in the Return on Equity (RoE) of various Renewable Energy projects, comparison of Return on Equity (RoE) considered by various SERCs has been done and the Commission observed that most of SERCs have specified the rate of Return on Equity in the range of 14% to 16%.

Table 4-Comparison of Rate of Return on Equity for SERCs

ERC Name	Rate of Return of Equity
MERC	14% grossed up with the tax rate equivalent to MAT rate as on 1st April of previous financial year
JERC	14% for mainland areas and 16% for Island area. Grossed up by MAT as on 1st April of available year
UERC	16% post tax for RE power Projects, 20% (Pre-tax) for first 10 years considering Avg MAT rate and 22% (Pre-tax) from 11th year onwards considering Avg Corporate Tax.
GERC	14% post tax (grossed up with base rate); Tax Rate- MAT at 21.34% for first 10 years from COD, Corporate tax rate at 34.61% from 11th year onwards.

ERC Name	Rate of Return of Equity
RERC	14% grossed up with the tax rate equivalent to MAT rate.
MPERC	20% p.a. pre-tax RoE for first 10years, 24% pre-tax RoE from 11th year onwards.
KERC	14% grossed up with the tax rate equivalent to MAT rate
TNERC	17.60% pre-tax RoE
TSERC	16% pre-tax to be grossed up with actual tax rate
CSERC	20% per annum for the first 10 years; 24% per annum 11th year onwards.
HPERC	The normative return on Equity shall be 17% per annum on pre-tax basis and shall not be subject to any adjustment on account of any taxes

There are various methods of determining the cost of equity such as the Arbitrage Pricing Model, Dividend Growth Model, and Capital Asset Pricing Model (CAPM). The appropriate model may be used to benchmark the cost of equity. Among all the above models, CAPM is the most preferred model for determination of cost of equity in the Country where limited companies are listed and traded on the stock exchange. CAPM has also been accepted by various Regulators internationally. Further, CAPM model has also been adopted in specifying the Return on Equity for Conventional Generating Stations and Transmission Business.

Further, CAPM also captures issues related to expected risk premium for the market over the risk free rate. In order to arrive at the risk free rate historical trends of various benchmarks rates such as Bank Rate, SBI PLR, Deposit Rates and Government Securities rate can be considered. In order to assess the market risk premium, the returns provided by the market over the historical period can be considered. Based on the above analysis, the market risk premium has been derived.

The Commission has reviewed the 10 year G-Sec rates for the past six months and considered the average of the same as the Risk free Rate. The Commission has considered the average return of BSE Sensex over 20 years and considered the average of the same as Market Return Rate. The Commission has considered the measure of volatility of security in comparison to market as a whole.

The cost of equity through CAPM model has been worked out as follows:

Required/Expected Return = Risk Free Rate Rf + (Market Return Rm – Risk Free Rate Rf) x Beta,

Where Rf = average 10-year yield of zero coupon G-Sec, i.e., 6.71%;

Rm = average return of BSE Sensex over 20 years, i.e., 14%;

Beta = measure of volatility of security in comparison to market as a whole, i.e., around 1.01

With this approach the Cost of equity works out to be around 13.95% i.e., ~14%.

Considering the present market scenario, wherein competitively bid tariffs in solar and wind projects over the last couple of years have shown declining trends, the Commission has inferred that the market expectation of ROE has come down. Further, as compared to conventional Generation projects, the gestation period of RE project is significantly lower. Hence, RE projects are exposed to lower risk during the construction phase compared to conventional generation projects.

However, these regulations are applicable to other technologies such as Small Hydro, Biomass, Bagasse based Co-generation, MSW, etc. Therefore, the Commission proposes that prevailing rate of RoE of 14% should be continued with grossing up with MAT Rate for the entire life of the project. Going forward, Minimum Alternate Tax/ Corporate Tax are expected to be lowered and the Commission has observed that the effective tax rate is lower than the Corporate Tax rate. Hence, for certainty of regulatory principles, the Commission proposes that the return on equity shall be grossed up by Minimum Alternate Tax prevailing as on 1st April of the previous financial year for the entire useful life of the project.

4.3 LOAN TENURE

The loan tenure is the key component of tariff determination, as per the existing provisions in the RE Tariff Regulations, 2017, loan tenure is as follows:

"Loan Tenure: - For the purpose of determination of tariff, loan tenure of 13 years shall be considered. "

For analysing the present market conditions, the prevailing loan terms stipulated by REC, PFC and IREDA are summarised as shown in the following Table: