

**CENTRAL ELECTRICITY REGULATORY COMMISSION
NEW DELHI**

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Date: 18.04.2017

STATEMENT OF REASONS

**Central Electricity Regulatory Commission (Terms and Conditions for Tariff determination
from Renewable Energy Sources) Regulations, 2017**

In exercise of powers conferred under Section 178 of Electricity Act, 2003 (the Act), the Commission has issued draft Central Electricity Regulatory Commission (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2017 for the control period 2017-2020. Comments were invited from all stakeholders till 8th March, 2017.

In response, written comments/suggestions/objections were received from the following stakeholders:

1. AA Energy Ltd.
2. Adani Green Energy Ltd.
3. Astha Green Energy Venture India Ltd.
4. Bonafide Himachali's Hydro Power Developers Association
5. Cargo Solar Power (Gujarat) Pvt. Ltd.
6. Chhattisgarh Biomass Energy Developers Association
7. Continuum Wind Energy (India) Pvt. Ltd
8. Customized Energy Solutions/Indian Energy Storage Alliance
9. Devi Energies Pvt. Ltd.
10. Ecogreen Energy Pvt. Ltd.
11. Gujarat Urja Vikas Nigam Ltd. (GUVNL)
12. Hero Future Energies Pvt Ltd
13. Him Urja (P) Ltd.
14. Himachal Pradesh State Electricity Board Limited (HPSEB Ltd.)
15. Himalaya Power Producers Association (HPPA)
16. Himachal Pradesh Electricity Regulatory Commission (HPERC)
17. Alternate Hydro Energy Centre (AHEC), IIT Roorkee
18. Indian Biomass Power Association (IBPA)
19. Indian Renewable Energy Development Agency (IREDA)
20. Indian Sugar Mills Association (ISMA)
21. Indian Wind Energy Association (InWEA)
22. Indian Wind Power Association (IWPA)

23. Indian Wind Turbine Manufacturers Association (IWTMA)
24. Inox Renewables Ltd.
25. Madhya Pradesh Power Management Company Limited (MPPCL)
26. Ministry of New and Renewable Energy (MNRE)
27. Mittal Processors
28. Mytrah Energy (India) Pvt. Ltd
29. National Thermal Power Corporation (NTPC)
30. Nanti Hydro Power Pvt. Ltd.
31. National Federation of Cooperative Sugar Factories Ltd. (NFCSF)
32. National Solar Energy Federation of India
33. Prayas (Energy Group)
34. Power & Energy Consultants
35. Rai Bahadur Narain Singh Sugar Mills Ltd.
36. Ranga Raju Warehousing Pvt. Ltd./Greenko Energies Pvt. Ltd.
37. ReGen Powertech
38. Renew Power
39. Sandhya Hydro Power Projects Balargha Pvt. Ltd.
40. Shalivahana (MSW) Green Energy Ltd.
41. Shree Bhavani Power Projects Pvt. Ltd.
42. Solar Thermal Power Association of India
43. South Indian Sugar Mills Association (SISMA)
44. Suryakanta Hydro Energies Pvt. Ltd.
45. Telangana Sugar Mills Association (TSMA)
46. Taranda Hydro Power Pvt. Ltd.
47. Uttarakhand Jal Vidyut Nigam Ltd.
48. Shri Shanti Prasad
49. Shri K.C. Mohapatra
50. Dr. Anoop Singh (IIT Kanpur)
51. Shri B.B.L Gupta

Issues raised by the stakeholders are presented in the subsequent sections.

1. Definitions and Interpretation

Commission's Proposal:

As per Regulation 2 (1) of Draft Regulations, various definitions have been proposed.

Comments Received

1.1. **ReGen Powertech** has suggested including the definition of Hybrid Wind Solar Power Plant, as given below, under this clause:

“Hybrid Wind Solar Power Plant’ means Integration of Wind & Solar complimentary RE sources to facilitate Grid in balancing and addressing the variability issue with overall combined generation capacity is maintained within the power evacuation limits.”

They have cited that MNRE has rolled out draft Wind-Solar Hybrid Policy, followed by AP & GJ, therefore an explicit definition of the Wind-Solar Hybrid technology will align the Regulation with the National & States Wind-Solar Hybrid draft policy under consideration. A corresponding change in Regulation 2 (1) (x) is suggested.

1.2. Continuum Wind Energy (India) Pvt. Ltd. and Sandhya Hydro Power Projects Balargha Pvt. Ltd.

have proposed that under Regulation 2 (cc) (d), the useful life of SHP be revised to 40 years.

1.3. NTPC has commented that run of the river hydro resources with installed capacity of less than 100 MW may be declared as renewable hydro project.

1.4. HPSEB Ltd. has submitted that the State Commission has defined the useful life of Small Hydro Power Projects as 40 years, Moreover, in Himachal Pradesh, the implementation agreement by Govt. of HP and the PPA agreement are being executed for 40 years.

Analysis and Decision:

ReGen has suggested including the definition of wind-solar hybrid. The Commission would like to clarify that the category (vii) under Regulation 7(a) 'Other hybrid projects include renewable-renewable...' covers such projects.

NTPC has suggested that run of the river hydro resources with installed capacity of less than 100 MW should be classified as renewable hydro project. The Commission has followed MNRE's criterion of considering projects upto 25MW as renewable hydro projects and the criterion shall be the same for the Control Period 2017-20, unless reviewed and changed by MNRE. As regards useful life of SHP, the Commission feels that any change in this regard can be considered only after detailed study. As such, the useful life of SHP shall be same as 35 years for control period 2017-20.

2. Eligibility Criteria

Commission's Proposal:

In this section, the eligibility criteria for different RE technologies covered under the Regulations were discussed. Few of them are reproduced below:

- a) **Wind power project** – using new wind turbine generators, located at the sites approved by State Nodal Agency/ State Government (only for zoning purpose).
- c) **Biomass power project based on Rankine cycle technology** – Biomass power projects using new plant and machinery based on Rankine cycle technology and using biomass fuel sources, without use of fossil fuel.

d) **Non-fossil fuel based co-generation project:** The project shall qualify to be termed as a non-fossil fuel based co-generation project, if it is using new plant and machinery and is in accordance with the definition and also meets the qualifying requirement outlined below:

Topping cycle mode of co-generation – Any facility that uses non-fossil fuel input for the power generation and also utilizes the thermal energy generated for useful heat applications in other industrial activities simultaneously.

Provided that for the co-generation facility to qualify under topping cycle mode, the sum of useful power output and one half the useful thermal output be greater than 45% of the facility's energy consumption, during season.

Explanation- For the purposes of this clause,

(a) 'Useful power output' is the gross electrical output from the generator. There will be an auxiliary consumption in the cogeneration plant itself (e.g. the boiler feed pump and the FD/ID fans). In order to compute the net power output it would be necessary to subtract the auxiliary consumption from the gross output. For simplicity of calculation, the useful power output is defined as the gross electricity (kWh) output from the generator.

(b) 'Useful Thermal Output' is the useful heat (steam) that is provided to the process by the cogeneration facility.

(c) 'Energy Consumption' of the facility is the useful energy input that is supplied by the fuel (normally bagasse or other such biomass fuel).

(d) 'Topping Cycle' means a co-generation process in which thermal energy produces electricity followed by useful heat application.

Comments Received

2.1. **ReGen Powertech** has suggested to remove the "(only for zoning purpose)" from the Eligibility Criteria of Wind power project as the zoning (CUF) has been addressed in detail under Regulation 26 of Draft RE Tariff Regulations.

2.2. **MPPPCL** has proposed that for the co-generation facility to qualify under topping cycle mode, the sum of useful power output and one half the useful thermal output be greater than 50 % of the facility's energy consumption, during season. It is suggested that the above qualifying criteria may also be elaborated with a suitable example taking values for each of the component, for clarity. Also, need is there to elaborate in respect of Bagasse based Cogeneration Projects that plant capacity should be such that a minimum % the steam coming out of the Steam Turbine is used in production of sugar (process) in true sense as per norms / applicable standards, only then plant will qualify as a cogeneration plant.

Analysis and Decision:

The Commission has noted the comments on the Eligibility Criteria and has decided to remove the Phrase '(only for zoning purpose)' in the final regulation.

For Eligibility Criteria of Non-fossil fuel based co-generation projects, the Commission has decided to continue with the definition provided in the Draft Regulations as there is no substantive reasoning provided to revise it.

3. Control Period or Review Period

Commission's Proposal:

The Control Period or Review Period under these Regulations shall be of three (3) years, of which the first year shall be the financial year 2017-18.

Comments Received

- 3.1. **Prayas (Energy Group)** has welcomed the decision of reducing the control period from five to three years.
- 3.2. **ReGen Powertech** has suggested retaining the control period to 5 years.
- 3.3. **ReNew Power Ventures Private Ltd. and Mytrah Energy (India) Pvt. Ltd.** have requested to keep control period of these regulations for 5 (five) years to impart long term visibility to investors and developers to confidently invest in the sector.

Analysis and Decision:

The Commission has received mixed comments on the Control Period. Some stakeholders have requested to retain the Control Period of 5 years and some have welcomed the Commission's proposal of 3 years as Control Period. The Commission is of the view that with the current market scenario where technologies evolve very fast, with improving equipment efficiency and decreasing prices, 5 years is too long as control period. For example, price of utility scale solar PV has dropped by over 60% over last 5 years. Thus, the Commission has decided to retain the Control Period as 3 years as specified in the Draft Regulations.

4. Tariff Period

Commission's Proposal:

- a) The Tariff Period for Renewable Energy power projects except in case of Small hydro projects below 5 MW, Solar PV, Solar thermal, Biomass Gasifier and Biogas, Municipal solid waste and Refuse derived fuel based power projects shall be thirteen (13) years.
- b) In case of Small hydro projects below 5 MW, the tariff period shall be thirty five (35) years.

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

d) In case of Biomass gasifier, Biogas based power projects, Municipal solid waste and Refuse derived fuel based power projects, the Tariff Period shall be twenty years (20) years.

e) Tariff period under these Regulations shall be considered from the date of commercial operation of the renewable energy generating stations.

f) Tariff determined as per these Regulations shall be applicable for Renewable Energy power projects, only for the duration of the Tariff Period as stipulated under Regulation 6 (a), (b), (c), (d) & (e).

Comments Received

4.1. **GUVNL** has sought the rationale for the minimum tariff period for Wind Energy projects and Small Hydro projects of 5 to 25 MW as 13 years against their useful life of 25 years & 35 years respectively unlike other RE projects where tariff period has been kept equivalent to their useful life. Further, it has commented that the levelized tariff determined considering various parameters for useful life of the project should be recovered during the useful life of project and there should be no window for reopening of tariff.

4.2. **MPPCL** has requested to continue with the normative/ generic tariff model for wind projects till such guidelines are issued and adequately implemented on ground to give stakeholder necessary confidence for transition from generic/normative tariff to project specific tariff model. It has also cited that as per Section 63 of the Electricity Act, Appropriate Commission shall adopt tariff discovered through competitive bidding in accordance with competitive bidding guidelines issued by Central Government.

4.3. **Mytrah Energy (India) Pvt. Ltd.** has requested the Commission to keep the tariff period for complete life of the project only as the proposed clause is creating uncertainty in tariff after a period of 13 years.

4.4. **Prayas (Energy Group)** has commented that ideally there should not be such wide variation in tariff periods across technologies since that creates distortions across technologies and has requested to reconsider setting more uniform tariff periods.

4.5. **IESA** has requested the Commission to specify renewable energy with energy storage on similar lines. For ex. Solar power with energy storage could be specified to have a tariff period of 25 years which provides a certainty to the project investment.

4.6. **Continuum Wind Energy (India) Pvt. Ltd.** has proposed to revise the Tariff Period of Small hydro projects below 5MW, Solar PV, Solar thermal, Biomass Gasifier and Biogas, Municipal solid waste and Refuse derived fuel based power projects to 25 years.

4.7. **Sandhya Hydro Power Projects Balargha Pvt. Ltd.** has submitted that the tariff period of 13 years is very less and it creates uncertainty for tie-up of power after 13 years. They have requested the tariff period not less than 25 years. They have also submitted that they understand “below 5 MW” in the following clause as “Above 5 MW” and consider it as a typographical error. *Clause (6) (a) “The Tariff Period for renewable energy power projects except in case of small hydro projects below 5 MW, Solar PV, Solar thermal, Biomass Gasifier and Biogas, Municipal Solid Waste and Refuse Derived Fuel based power projects shall be thirteen (13) years.”*

Analysis and Decision:

The Commission has considered the comments and suggestions submitted by the stakeholders. Most of the stakeholders have suggested to keep tariff period same as that of project’s useful life for the particular technology. The Commission in the previous control periods had prescribed tariff period to provide certainty to the project developer to meet its debt service obligation and also to outline preferential treatment to renewable energy projects till RE technologies are able to compete in the market. The tariff methodology includes levellisation for the useful life of the plant. At the same time, the buyer and the seller are free to decide a mutually agreeable tariff period while signing the PPA. With the current market scenario, the Commission is of the view that the distinction between ‘tariff period’ and ‘useful life’ is not required anymore. Accordingly, the Commission has decided to set ‘Tariff Period’ equal to ‘Useful Life’ of a plant in RE Tariff Regulations 2017. Regulation 6 stands now revised as follows:

“The Tariff Period for Renewable Energy power projects will be same as their Useful Life as defined in Regulation 2 (1) (cc). “

5. Project Specific tariff

Commission’s Proposal:

- a) Project specific tariff, on case to case basis, shall be determined by the Commission for the following types of projects:-
 - i. Solar PV and Solar Thermal;
 - ii. Wind Energy (including on-shore and off-shore);
 - iii. Biomass Gasifier based projects; if a project developer opts for project specific tariff.
 - iv. Biogas based projects; if a project developer opts for project specific tariff.
 - v. Municipal Solid Waste and Refuse Derived Fuel based projects with Rankine cycle technology;
 - vi. Hybrid Solar Thermal Power Projects;
 - vii. Other hybrid projects include renewable–renewable or renewable– conventional sources, for which renewable technology is approved by MNRE;

- viii. Any other new renewable energy technologies approved by MNRE.
- b) Determination of Project specific tariff for generation of electricity from such renewable energy sources shall be in accordance with such terms and conditions as stipulated under relevant Orders of the Commission.
- c) No annual generic tariff shall be determined for the technologies mentioned in Clause (a) of this Regulation. Financial and Operational norms as may be specified would be the ceiling norms while determining the project specific tariff.

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

Comments Received

- 5.1. **Adani Green Energy Limited, National Solar Energy Federation of India and Shri B.B.L Gupta** have appreciated the Commission's decision of not determining the generic tariff for Solar PV Projects and other RE technologies.
- 5.2. **ReGen Powertech, IWTMA and InWEA** have suggested to exclude the "*Wind Energy (including on-shore and off-shore)*" technology from the Project specific tariff determination list and include it in the annual generic tariff determination list. The following major reasons have been cited by them:
- a) Para 6.4 (2) of Tariff Policy 2016 states that "*States shall endeavor to procure power from renewable energy sources through competitive bidding to keep the tariff low, except from the waste to energy plants. Procurement of power by Distribution Licensee from renewable energy sources from projects above the notified capacity, shall be done through competitive bidding process, from the date to be notified by the Central Government. However, till such notification, any such procurement of power from renewable energy sources projects, may be done under Section 62 of the Electricity Act, 2003. While determining the tariff from such sources, the Appropriate Commission shall take into account the solar radiation and wind intensity which may differ from area to area to ensure that the benefits are passed on to the consumers.*"
- b) Highlighting above that as on date, standard notified central Guidelines for Tariff based Competitive Bidding Process for procurement of power from Wind Power projects is not in practice.
- c) Further, they cited that since CERC's determined tariff and technology specific parameters (Capital cost/ O&M) are considered as benchmark by SERC's whilst determining the RE tariff for the control /review period , henceforth in the absence of any determined capital & O&M cost by CERC would impact SERC's also going forward whilst discharging their mandated functions as EA 2003

- d) Further ReGen Powertech has highlighted that Wind energy, unlike Solar, hasn't seen capacity addition/ power procurement through competitive bidding route, except for SECI's 1000 MW which is still underway.
- e) Further, ReGen Powertech has proposed for generic hybrid (Wind-Solar) tariff determination and also option at hands of developer for project specific tariff in case they want to opt for this approach.
- 5.3. **IWTMA and InWEA** have proposed to continue with Preferential Tariff approach under Cost Plus regime for wind projects.
- 5.4. **NTPC** has requested to continue with the practice of Bench mark Capital Cost determination of capital cost & annual generic tariff in case of Solar PV as Annual generic tariff based on benchmark capital cost notified by CERC becomes a benchmark for the industry as a whole and provides the direction in which the tariff (specially solar) is moving in the coming years.
- 5.5. **NTPC** has also commented that issue of additional capitalization if tariff of the project is determined by CERC, is not addressed.
- 5.6. **Shalivahana (MSW) Green Energy Limited** has proposed to fix the tariff guidelines for MSW/RDF based power projects.
- 5.7. **GUVNL** has commented that the provisions for determining generic tariff under Regulation 10 and 13 are contradicting the provisions of Regulation 7 and the same should be removed. They have further stated that RE technologies like wind and solar are proven technologies and have reached a maturity stage. The competitive bidding in these technologies is picking up and the recent tariffs discovered in these technologies are as low as Rs 3.46 / unit for Wind and Rs 3.32 / unit for Solar. Therefore, the proposal of determining project specific Feed In Tariffs (FITs) should be reviewed as FITs are detrimental to competitiveness / efficiency in equipment procurement, O&M etc.
- Further, GUVNL** has also commented that major parameters like capital cost and O&M expenses should not be kept open ended otherwise it would give rise to lot of subjectivity when the actual tariff is determined. In view of the same, Commission may specify some ceiling rates for these parameters which can be reduced by the Commission based on the market rates at the time of determination of tariff.
- 5.8. **IESA** has requested the Commission in considering determining an annual generic tariff for renewable energy project with energy storage. Solar Energy Corporation of India (SECI) is currently evaluating integration of energy storage with solar power. Determining an annual generic tariff for renewable energy with energy storage will enable the State Electricity Regulatory Commissions (SERC) in setting similar tariffs at state level to procure firm renewable energy in the state grid.

5.9. **Ecogreen Energy Pvt. Ltd.** has suggested that there is an imperative need of determination of generic tariff for MSW/RDF as various states have declared the norms for WtE Plants after amendments in CERC RE Tariff Regulations 2012.

5.10. **Shri Shanti Prasad** has submitted that the major contribution in wind power development and somewhat on lower scale in solar power development has been through small investors. For them to seek project specific approval will add to the cost of project and also workload of the Commission. If SERCs align with CERC provision, major investor category may leave RE sector. From this angle, generic tariff needs to be specified for small investors, to have whatever investment feasible from them.

It is suggested to specify that “Commission may notify the generic tariff for RE power plants of the technologies mentioned in Clause (a) of the Regulation 7 and having capacity not exceeding 10 MW, based on project specific tariff determined under these regulations or tariff adopted under section 63 of the Act. Such generic tariff shall be valid for projects having executed PPA within say 6 months of the notification”.

5.11. **Dr. Anoop Singh ,IIT Kanpur**, has commented that it may be useful to continue with the generic tariff determination for RE based projects with higher operational norms and lower benchmark costs. Under such conditions, the project developers would either find it profitable enough to adopt a generic tariff for making investment decisions, or make separate application for project specific tariff only if the economics of the 'process of tariff application' could be justified due to significant differences in benchmark costs and operational parameters.

Analysis and Decision:

The Commission has received a mix of comments on Project Specific Tariff Regulation. Some stakeholders have welcomed the Commission’s step to not define generic tariff for Wind and Solar projects and some have requested to continue with the generic tariff for them. Under the prevailing market conditions, where most of the solar projects have come up primarily through competitive bidding and similar trend is anticipated for wind projects, the Commission is of the view that setting generic tariff based on norms does not provide the right price signals. Also, the MNRE is in the process of finalizing the Guidelines for Tariff based Competitive Bidding Process for Wind projects.

The Revised Tariff Policy of 2016 stated the following in Clause 6.4(3):

“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 a ceiling for that category.”

It is understood that GERC has already directed its distribution licensees to procure electricity from wind and solar power projects through competitive bidding. Thus, the Commission concludes that States shall act in accordance with guidelines of Tariff Policy, thereby eliminating the need for generic tariff for solar and wind plants. However, if due to special site conditions, regulated tariff is warranted, the Commission's proposal allows for project specific tariff to be determined.

Shri Shanti Prasad has specifically requested for notifying a generic tariff for small scale solar projects (capacity of less than 10 MW). His suggestion is appreciated, however, not applicable to ISTS projects. This request may be considered by State Commissions.

IESA has suggested notifying generic tariff for systems incorporating energy storage. However, it is worthwhile to note that for the first two demonstration projects by SECI, the method adopted was competitive bidding. Since application and technology of energy storage varies a lot, it would not be advisable to determine generic tariff. Project specific tariff shall be an option for these projects.

A couple of stakeholders have underscored the need for tariff determination for MSW/RDF. Here it is worthwhile to mention that a few States that have invited tenders for setting up of MSW/RDF plants have done so under competitive bidding framework. The Commission has therefore decided to keep tariff determination as project specific.

6. Petition and proceedings for determination of tariff

Commission's Proposal:

- (1) The Commission shall determine the generic tariff on the basis of suo-motu petition six months in advance at the beginning of each year of the Control period for renewable energy technologies for which norms have been specified under the Regulations.
- (2) A petition for determination of project specific tariff shall be accompanied by such fee as may be determined by regulations and shall be accompanied by:
 - a) Information in forms 1.1, 1.2, 2.1 and 2.2 as the case may be, and as appended in these regulations;
 - b) Detailed project report outlining technical and operational details, site specific aspects, premise for capital cost and financing plan etc.
 - c) A statement of all applicable terms and conditions and expected expenditure for the period for which tariff is to be determined.
 - d) 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.

e) Any other information that the Commission requires the petitioner to submit.

The proceedings for determination of tariff shall be in accordance with the Conduct of Business Regulations.

Comments Received

6.1. **Adani Green Energy Limited and National Solar Energy Federation of India** have requested to retain the Regulation 8 of the RE Tariff Regulation 2012, which states that if the PPA is signed before 31st March of control period, the determined tariff for Solar PV Projects for the same Control Period will also be applicable for the next year. It protects the investor in case the PPA is signed in the last quarter. References have been submitted from the Draft Guidelines for Tariff based Competitive Bidding Process for Grid Connected Solar PV Projects issued by MNRE on 27.02.2017, SECI and NTPC PPA Documents and have also submitted the month wise and activity wise stages of project development and it is argued that it is difficult to execute the solar project in less than 12 months.

Analysis and Decision:

As the Commission has not specified a generic tariff for Solar plants, the aforementioned Regulation is not relevant anymore. In case of competitive auctions or project specific tariff determination, the developer can factor in time duration for implementation while arriving at a tariff number.

7. Tariff Structure

Commission's Proposal:

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

- (a) Return on equity;
- (b) Interest on loan capital;
- (c) Depreciation;
- (d) Interest on working capital;
- (e) Operation and maintenance expenses;

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

Comments Received

7.1. **IWTMA and InWEA** have proposed to introduce Two-Part Tariff for Wind energy generators as wind generators are now being treated almost at par with conventional generators in terms of scheduling their power and are also subjected to penalties for deviation from their respective schedules.

Analysis and Decision

The Commission has noted the suggestion on introduction of Two-Part tariff for wind energy projects. The Commission instructs its staff to examine this potential tariff structure for RE projects through a white paper.

8. Tariff Design

Commission's Proposal:

(1) The generic tariff shall be determined 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 while Tariff shall be specified for the period equivalent to 'Tariff Period'.

Comments Received

8.1. **Adani Green Energy Limited and National Solar Energy Federation of India** have suggested different discount factors for each year of the project life citing the example of UERC. It is further submitted that if formula for levellisation used by the Commission with discount factor as post-tax WACC of 10.29% is used, it is not possible to achieve the post-tax equity IRR as guaranteed to the developers i.e. 14%. Further it is suggested to compute the Pre-tax WACC for each of the 25 years of the project life as per the following formula:

Pre-Tax Weighted Average Cost of Capital for year N =

*Rate of Interest on Loan x Average Loan for year N x Weightage of Loan in Total Capital in year N
+ Pre-Tax Return on Equity x Weightage of Equity in Total Capital in year N*

8.2. Shri B.B.L Gupta has suggested factoring in the Minimum Alternate Tax (MAT) during the first 10 years of the project. Example of GERC has been cited where in its Order No. 5 of 2016 in the matter of Determination of Tariff and other terms & conditions for procurement of Power by Distribution Licensees from small, mini and micro hydro power projects has computed the discount factor as follows:

$$\text{WACC} = \text{Cost of Debt} + \text{Cost of Equity}$$

$$\text{Where, Cost of Debt (For first 10 Years)} = 0.70 \times (\text{Market Rate of Interest}) \times (1 - \text{MAT})$$

$$\text{Cost of Debt (11th Year to 35th Year)} = 0.70 \times (\text{Market Rate of Interest}) \times (1 - \text{Corporate tax})$$

$$\text{Cost of Equity} = 0.30 \times \text{Return on Equity (i.e. 14\%)}$$

Analysis and Decision

The Commission has consistently followed the practice of single discount factor and applied it on the year on year cost to arrive at the levellised tariff and feels the methodology is adequate. As regards the comment on pre-tax vs post tax WACC, the Commission would like to reiterate its earlier stand that while taking the investment decision, the developer considers post tax WACC as the discount rate to post tax incremental cash flows to arrive at the NPV of the project. Considering the same, the Commission has decided to retain the provisions made in the draft regulations.

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 the certainty of regulatory principles, it is proposed 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.

9. Despatch principles for electricity generated from Renewable Energy Sources:

Commission's Proposal:

- (1) All renewable energy power plants except for biomass power plants with installed capacity of 10 MW and above, and non-fossil fuel based cogeneration plants shall be treated as 'MUST RUN' power plants and shall not be subjected to 'merit order despatch' principles.
- (2) The biomass power generating station with an installed capacity of 10 MW and above and non-fossil fuel based co-generation projects shall be subjected to scheduling and despatch code as specified under Indian Electricity Grid Code (IEGC) and Central Electricity Regulatory Commission (Unscheduled Interchange and related matters) Regulations, 2009 including amendments thereto.

(3) Scheduling of wind and solar energy shall be governed as per the aforesaid provisions of Central Electricity Regulatory Commission (Indian Electricity Grid Code) (Third Amendment) Regulations, 2015 and Central Electricity Regulatory Commission (Deviation Settlement Mechanism and related matters) (Second Amendment) Regulations 2015 as amended from time to time.

Comments Received

9.1. **ReNew Power Ventures Private Ltd** has commented that many states are frequently backing down RE generation on frequent basis during their peak season citing grid security as the reasons, as a result of which renewable generator faces huge revenue loss.

However, to maintain the transparency in operation there should be provision of written intimation subsequent to issuance of backing down instructions, which can be presented as record by both the parties in case of any ambiguity. It is proposed to add following clause in the regulation:-

Provided, RLDC can issue back down instructions on consideration Grid security or safety of any equipment and person. However such instructions are be backed by written intimation mentioning reasons, subsequent to issuance of back down instruction.

9.2. **Devi Energy Pvt. Ltd.** has commented the DSM Regulations, 2015 cover only the Wind and solar Energy and requested to include small hydro also in these Regulations. Small hydro like Wind and Solar is also largely dependent on weather and effective scheduling of power is very difficult with high degrees of confidence.

9.3. **MPPMCL** have sought clarity on the provision in case if biomass power plants with installed capacity of 10 MW and above, and non-fossil fuel based cogeneration plants when they are subjected to MOD with single part tariff.

9.4. **Hero Future Energies** has commented that in order to safeguard the investor and developer community deemed generation benefit needs to be provided and any backing down needs to be properly communicated with reason. It has suggested to add following clause in the regulation : Further if the SLDC/ State Transmission Utility backs down renewable generating plant with detailed reasons for the same. If SLDC/ State Transmission Utility fails to follow the aforesaid practice, then such renewable energy shall be considered as deemed generation and compensation shall be given at applicable PPA tariff.

9.5. **Mytrah Energy (India) Pvt. Ltd.** has suggested that in case of back down renewable generation must be treated as Deemed Generation and deemed generation has to be purchased at applicable tariff. It is observed that in high wind seasons wind power generators are facing generation loss due to back down given by SLDC.

- 9.6. **NTPC** has suggested Wind and Solar generation loss due to non-availability of power evacuation infrastructure (Transmission systems) may be suitably considered under deemed availability/generation. It is also submitted in REWA Solar project such provision had been kept in the contract document resulting into assurance of Solar Project developer and benefit passed on to consumer as there is no padding planned for such uncertainty. In case of Hydro Power <25 MW, dispatch principal may be mentioned. Also, curtailment of RE generation if any may be reported as daily & monthly basis with detailed reasons.
- 9.7. **IESA** has requested to similarly classify renewable energy projects with energy storage as 'Must Run'. Energy storage integrated with large scale RE provides flexibility to the grid and hence must be given priority.
- 9.8. **Shree Bhawani Power Projects Limited**, requested to include small hydro power projects under the DSM Regulations 2015. Small hydro is like wind and solar is dependent on weather. A cloudy, cooler day in March means less snow melt than a sunny day in March and hence discharge of water is affected. Also majority of small hydro plants are run-of-river plants with no pondage or storage. Predicting weather to half hour interval is impossible.
- 9.9. **Solar Thermal Power Association of India** has requested to make a provision for deemed generation for solar thermal power projects since they are subjected to scheduling and should not get penalized for non-adherence to schedule due to Backing Down Instructions (BDIs) or non-availability of the grid due to reasons not attributable to solar thermal projects
- 9.10. **Astha Green Energy Ventures India Ltd.** submit that the major concern for run-of-river Small Hydro Energy Generator is still the same as with Wind/Solar Technologies that with the impact of global warming now slowly being materially established, the weather patterns over the day have become even more difficult to predict. Considering the fact that Run-of-River Small Hydro energy generation is also variable and intermittent, and volatile in nature therefore, requested that the charges for deviation from schedule for Small Hydro energy generator shall also be delinked from the frequency based charges as applicable under the DSM mechanism as Run-of-River Small Hydro energy generation is a must run plant and uncertain and hence, charges for deviation shall not be linked to frequency and shall be treated similar to Wind/solar generators.
- 9.11. **Bonafide Himachali's Hydro Power Developers Association, Himalaya Power Producers Association, Taranda Hydro Power Pvt. Ltd., Nanti Hydro Power Private Limited and Suryakanta Hydro Energies Private Limited** have submitted that Hydro project up-to 25 MW falls under renewable source of energy, and runoff river projects without pondage, therefore the prediction/forecast of energy two days prior is unrealistic. The DSM Regulations, 2015 cover only the Wind and Solar Energy. They have requested to include small hydro also in these

Regulations. Small Hydro like Wind and Solar is also largely dependent on weather and effective scheduling of power is very difficult with high degrees of confidence.

9.12. **Sandhya Hydro Power Projects Balargha Pvt. Ltd.** has requested that the Commission may impose a certain penal provision in case the “MUST RUN” is not strictly abided by the Discom. They have also requested to keep Small Hydro Plants out of Despatch and Scheduling requirement as per IEGC for interstate flow of power.

9.13. **Dr. Anoop Singh, IIT Kanpur**, has commented that renewable energy plants have been accorded 'must run' status. This means that even while low variable cost conventional generation may be available, renewable energy plants continue to be scheduled for such durations thus increasing the average cost of power procurement. While there are reasons for recording 'must run' status to the renewable energy plants, according 'deemed generation' for renewable energy plants which are curtailed by the system operator due to various technical reasons would further increase the cost burden on the consumers. Given that the renewable energy plants continue to benefit from the 'must run' status, deemed generation status should be avoided.

Further, it is likely that the deemed generation provision can be misused. A plant without fuel (say biomass) may collude with the utility personnel to invoke 'artificial unavailability' of the grid at the local level for the duration of fuel shortfall and hence seek benefits under deemed generation.

Further, on Backing down of RE generators, it comments that the Concerns of the RE generators stem from backing down of their plants by the distribution utilities. Unless such backing down is desirable from the system security perspective which requires a technical minimum operation of conventional power plants, backing down of RE generators reduces social welfare. This is particularly true for the non-fuel based renewable energy plants (i.e. solar, small Hydro and wind). Due to the zero marginal cost of generation of such technologies, utilisation of the same would have reduced the overall cost of power procurement. This issue should be addressed through a separate regulatory dispensation.

Analysis and Decision:

The Commission has analyzed the comments and observations submitted by the stakeholders.

- It has been pointed by various stakeholders to include small hydro projects in the Forecasting, Scheduling and Deviation Settlement Framework for Wind and Solar Generators [CERC (Indian Electricity Grid Code) (Third Amendment) Regulations, 2015 and CERC (Deviation Settlement Mechanism and related matters) (Second Amendment) Regulations 2015]. The developers have argued that majority of small hydro projects are set up as run-off-river projects without any pondage,

while intermittent nature of weather and water flow leads to erroneous forecasting of energy generation. The Commission would like to clarify that the issue of inclusion of small hydro projects in this DSM framework is beyond the scope of RE Tariff Regulations.

- Several power producers have pleaded that generation lost due to any back-down instructions or grid unavailability should be treated as deemed generation by the off-taker. NTPC has referred to the REWA bidding guidelines in this regard. The Commission acknowledges the loss of units due to grid unavailability or back-down instructions. The suggestion of written explanation in case of back-down due to issues other than grid security and reliability is appreciated and the Commission directs NLDC to work with SLDCs to evolve such a framework.
- Solar, wind and SHP plants are treated as must-run. Solar and wind plants have a special dispensation on DSM because of the intermittent nature of the resource. The renewables have received distinctive treatment to that extent. While majority of the RE sector is fast approaching grid parity, the country as a whole is moving towards reliability of grid and power supply. Hence, the Commission feels that it is not required to expand exceptional clauses for RE generators at this juncture.

10. Capital Cost

Commission's Proposal:

The norms for the Capital cost as specified in the subsequent technology specific chapters shall be inclusive of all capital work including plant and machinery, civil work, erection and commissioning, financing and interest during construction, and evacuation infrastructure up to inter-connection point.

Provided that for project specific tariff determination, the generating company shall submit the break-up of capital cost items along with its petition in the manner specified under Regulation 8.

Comments Received

10.1. **IWTMA and InWEA** have highlighted that in the above regulation capital cost for the project includes cost of evacuation infrastructure only up to inter-connection point. However, under the CERC(Grant of Connectivity, Long-term Access and Medium-term Open Access in inter- State Transmission and related matters) (Sixth Amendment) Regulations, 2017 notified dated 17 February, 2017, the responsibility of setting up evacuation infrastructure upto 100 km from the project is shouldered on the project developer, and CTU's responsibility in beyond 100 km.

They have proposed to include "evacuation infrastructure up to 100km from switchyard of generating station" in this regulation.

10.2. **Dr. Anoop Singh, IIT Kanpur**, has commented that Renewable energy based projects, particularly those based on dispersed natural resources with significant difference in the quality of resource, would generally witness early development of sites which offer better quality of resources and/or lower investment. Once the better sites have been harnessed, the less economical sites may be identified for investment based on their economics in the prevailing regulatory and policy environment. Some of these sites maybe less economical due to high investment and/or poor resource quality. However at the same time, money would expect that technological improvements should help reduce the investment cost and help efficient harvesting of relatively poor quality resources. A judicious approach should be adopted to allow for higher capital investment for uneconomical projects as this may also result in risky projects being taken up by investors. Further it comments that If an investor adopts incrementally improved technology which can offer high CUF than the benchmarked one, it may not hurt the investors return as the investor gets paid for units generated beyond the benchmarked CUF at a (higher) price, which was estimated for a lower benchmarked CUF.

Analysis and Decision:

Reference from IWTMA and InWEA regarding Connectivity Regulations Sixth Amendment is noted. The development of evacuation infrastructure varies significantly from one project to the other depending on the site and the location of nearest grid sub-station. As such the limit of 100km is an upper limit. Additionally, the Ministry of Power is leading development of Green Energy Corridors to provide evacuation infrastructure close to high resource regions. Thus, at this point, the Commission feels that the provision of including cost of evacuation infrastructure up to inter-connection point is adequate.

11. Loan and Finance Charges

Commission's Proposal:

(1) Loan Tenure

For the purpose of determination of tariff, loan tenure of 13 years shall be considered.

(2) Interest Rate

(a) The loans arrived at in the manner indicated in the Regulation 13 shall be considered as gross normative loan for calculation for 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.

(b) For the purpose of computation of tariff, normative interest rate of two hundred (200) basis points above the average State Bank of India MCLR (one year tenor) prevalent during the last available six months shall be considered.

(c) 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.

Comments Received

11.1. **IWTMA and InWEA** have proposed to continue with loan tenure period of 12 years as they have observed that there is no lending agency offering loan for a period of 13 years.

11.2. **Continuum Wind Energy (India) Pvt. Ltd.** has estimated that effective Rate of Interest based on Regulation 14 (2) (b) will be ~9.5% which they propose is very less based on following facts:

1. In Greenfield project the interest rate sanctioned by various banks is not less than 11%.
2. As DISCOM credit risk along with the delay in payment cycle has a bearing in the rate of interest.

They propose to consider Rate of Interest not less than 11%.

11.3. **IBPA** has proposed that Interest Rate of three hundred (300) points above the average SBI MCLR and the Moratorium period should be considered in the Repayment Schedule.

11.4. **Devi Energy Pvt. Ltd and Taranda Hydro Power Pvt. Ltd.** have commented that once the effect of demonetization is over, the MCLR will go up exponentially and no hydro power developer would get a rate below 350 bps plus MCLR particularly because of increasing NPAs in the power sector. It is requested to work out the MCLR average along with the market realities.

11.5. **Mytrah Energy (India) Pvt. Ltd.** has requested to consider the average normative interest rates prevalent in top 5 Government and private institutions. Investors are likely to get loan tenure from 10-15 years, and the actual Interest rate raised from market is usually more than the value as proposed by CERC. This will have an impact when CERC will determine taking capital cost as actual and other parameters on fixed basis.

11.6. **Indian Institute of Technology, Roorkee** has submitted that the loan tenure is given as 13 years and on the other hand, it is specified that for interest calculations, repayment of loan shall be equal to the annual depreciation allowed. Both these statements seem to be contradictory and works out to be 15 years. It is suggested to specify the normative interest rate in the regulations itself (as is done in HPERC).

11.7. **Shree Bhawani Power Projects Limited** has requested to consider the average of interest rate for the past two years duration. Only AAA or AA rated firms get the spread of 200 bps above

MCLR. SPVs (like them) and majority of other developers will not get a rate below 350 bps above MCLR. It is requested to bring both the MCLR average and the spread in line with market realities.

- 11.8. **Astha Green Energy Ventures India Ltd and Nanti Hydro Power Private Limited** have submitted that No hydro power developer would get a rate below 350 bps plus MCLR particularly because of increasing NPAs in the power sector. They have requested you to have a realistic view and workout the MCLR average along with the market realities.
- 11.9. **Suryakanta Hydro Energies Private Limited** has submitted that there has been no mitigation in the risk profile during construction and technology of small hydro project, thus from lender's perspective, there is no case for reduction in risk premium to be charged to small hydro projects term loan. If the average of last 3 or 5 years is considered from major Financial Institutes, it will come out to be more than 11%. Presently major lender IREDA for small hydro units charges in the range of 10.5% to 11.7% depending upon the internal rating system with an additional rate of 0.5% during construction project. Requested to consider the average and not only last six months on rate of interest for finalization.
- 11.10. **Cargo Solar Power (Gujarat) Pvt. Ltd.** has submitted that the loan interest rate for solar thermal project should be equal to the rate of external commercial borrowing (ECB) and a duration of at- least 15 years to improve the financials of solar thermal projects.
- 11.11. **Ecogreen Energy Pvt. Ltd.** has proposed to consider the interest on debt as 14% or the norms to be considered above 400 basis points.

Analysis and Decision:

The Commission has received comments stating that no funding agency offers loan for a period of 13 years. The Commission has explained in the Explanatory Memorandum that various financial institutions provide loan tenure ranging from 10-15 years. Hence, the Commission has decided to retain the loan tenure of 13 years as provided in Draft Regulations.

The Commission has linked Interest Rate with the SBI's MCLR (One Year Tenor) Average, prevalent during the last available six months. The Commission is of the view that this will be a true representation of market realities and has decided to continue with the provision made in the Draft Regulations. Spread of 200 basis points is expected to be an average, with projects, above and below this point. This amounts to an interest rate of 10.66%, considering the MCLR data during September 2016 – February 2017.

12. Depreciation

Commission's Proposal:

- (1) The value base for the purpose of depreciation shall be the Capital Cost of the asset admitted by the Commission. The Salvage value of the asset shall be considered as 10% and depreciation shall be allowed up to maximum of 90% of the Capital Cost of the asset
- (2) Depreciation rate of 5.28% per annum for first 13 years and remaining depreciation to be spread during remaining useful life of the RE projects considering the salvage value of the project as 10% of project cost shall be considered.
- (3) Depreciation shall be chargeable from the first year of commercial operation. Provided that in case of commercial operation of the asset for part of the year, depreciation shall be charged on pro rata basis.

Comments Received

- 12.1. **IWTMA and InWEA** have proposed to retain the depreciation rate at 5.83% during the loan tenure of 12 years based on "Differential Depreciation Approach" and beyond the loan tenure, the remain over the useful life computed on "Straight Line Method".

Analysis and Decision:

The Commission is of the view that since majority of the RE technologies have achieved maturity level, it would be possible for the developers to secure loan from lenders /financial institution for longer duration of say 12 years or more. The longer duration of loans has also been observed in the project information gathered from financial institutions. Following the 'Differential Depreciation' Approach over the loan tenure and beyond loan tenure over useful life computed on 'Straight Line Method', the Commission now sets the depreciation rate of 5.28% per annum for first 13 years and remaining depreciation to be spread during remaining useful life of the RE projects considering the salvage value of the project as 10% of project cost.

13. Return on Equity

Commission's Proposal:

- (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 13.
- (2) The Normative ROE of 14%, which has to be grossed up by prevailing MAT rate as on 1st April of previous year for the entire useful life of the project.

Comments Received

- 13.1. **Prayas (Energy Group)** has welcomed the proposal.
- 13.2. **Inox Renewables Ltd.** has suggested that 14% post tax ROE is less and can induce negative sentiments in investors towards Investment in RE projects. Further, they have cited that as per clause 24 of CERC (Terms and Conditions of Tariff) Regulations 2014, the Return on Equity provided to Thermal generating stations is at base rate of 15.5% and proposed ROE of 16% for RE projects.
- 13.3. **IWTMA and InWEA** have suggested to continue with the previous CERC Regulations of ROE wherein the pre-tax ROE is 20% per annum for the first 10 years and 24% per annum from the 11th year onwards. They have cited that MAT is only extended up to a period of 10 years and while the developers have to bear the corporate tax of 34.608% which is applicable for the remaining period of the useful life. Further, the pre-tax ROE arrives at 17.80% for the first 10-year period of the useful life as proposed by CERC in the draft, is significantly lower than the normative pre-tax return of 20.34% for RE in the cost-plus regime allowed during the previous Control Period.
- 13.4. **Continuum Wind Energy (India) Pvt. Ltd.** has proposed to replace MAT Rate by Corporate Tax Rate in Regulation 16 (2) as Section 80 I A has not been extended as per the current budget provision.
- 13.5. **IBPA** has proposed ROE as 18%.
- 13.6. **ReNew Power Ventures Private Ltd.** has commented in order to promote RE generation and to attract fresh investment in the sector RoE should be of the level prevailing for the conventional based technology. It is proposed the normative Return on Equity to be 16% to be grossed up by prevailing MAT, for first 10 years and grossed up by prevailing Corporate Tax rate for the remaining 15 years.
- 13.7. **Greenko Energies Pvt. Ltd.** has commented renewables need to be allowed at least the same ROE (if not higher. Also, as per the Finance Bill for FY 2017-18, deduction under section 80-IA has not been extended (that is, the sunset year has expired in FY-17). Therefore, grossing up of RoE by MAT would result in inadequate tariff for the actual tax outgo for the RE projects.
- 13.8. **Indian Wind Power Association** has commented that the return on equity for RE as per the draft regulation is 14% is lower than the ROE of thermal power projects (16%). It is requested to consider 16 % ROE for Renewable Energy projects along with IT rate while determining ROE in line with previous RE Tariff Regulation.
- 13.9. **Devi Energies Pvt. Ltd. and Taranda Hydro Power Pvt. Ltd.** have commented that the investment in the Small Hydro Sector has been quite dismal in view of the hydrological risks & geological surprises in the hilly areas. Limited working seasons with constant risks of landslides etc. further

discourage the investment climate. Thus, the proposed 14% RoE for the Small Hydro sector shall result in total investment blackout particularly in the hilly areas and in view of expected returns to 12 to 13% in other financial instruments like MFs. It is requested to retain the RoE as specified in the previous regulations

- 13.10. **Mytrah Energy (India) Pvt. Ltd.** has requested to keep RoE 20% for first ten years and 24% for remaining useful life of project to attract the investors and promote renewable sector. Further, it has been suggested to consider inclusion of enabling clause to review the post-tax regulated returns (RoE) on account of change in law/ change in tax rates in future.
- 13.11. **Uttarakhand Jal Vidyut Nigam Ltd.** has proposed normative return on equity as 16.5% to be grossed up by prevailing MAT as on 1st April of the previous year for the entire useful life of the project
- 13.12. **Ranga Raju Warehousing Pvt. Ltd. has** suggested that on account of factors impacting bank's MCLR as well as no change/ mitigation in the risk profile of small hydro projects, benchmark lending rates needs to be aligned such that the actual interest rates, being in range of 11 %-14% for small hydro plants. This is also being substantiated by the capital cost financing data for under implementation small hydro projects provided by IREDA. The financing rates are in the suggested range being discussed. Accordingly, it is requested to not reduce the risk premium as well as the interest rate considered in the last generic RE tariff regulations so as to reflect the practical ground realities in RE tariff determination.
- 13.13. **Shree Bhawani Power Projects Limited and Nanti Hydro Power Private Limited** requested to consider RoE as 16%-17% post tax considering the geological and hydrological risks and constant risk of landslides in hilly regions and to encourage private investment in these regions.
- 13.14. **Astha Green Energy Ventures India Ltd., Bonafide Himachali's Hydro Power Developers Association, Suryakanta Hydro Energies Private Limited, Nanti Hydro Power Private Limited and Himalaya Power Producers Association,** have submitted that the National Hydro Policy and The Indian Electricity Act mandate the Regulatory Commissions to encourage the renewable sources of energy. The proposed Return on Equity of 14% grossed up by MAT for entire life goes totally in contravention to the above mandate. The proposed 14% RoE for the Small Hydro sector shall result in total investment blackout particularly in the hilly areas and in view of expected returns to 12 to 13% in other financial instruments like MFs. For encouragement to the renewable energy the example of Madhya Pradesh having a 20% pre-tax RoE should be considered. They have requested to retain the RoE as specified in the previous regulations.
- 13.15. **Indian Institute of Technology, Roorkee** has submitted that Return on equity (ROE) of large hydro power (LHP) has been regulated by CERC as 16.5% (storage based) and 15.5% (run of river)

projects). ROE for SHP, a renewable energy source has been proposed only 14% which should have been more than ROE for large hydro plants. It is proposed that CERC provides at least a 16% (15.5% for being run of river and 0.5% being having more risk) ROE.

- 13.16. **Adani Green Energy Limited and National Solar Energy Federation of India** have requested to specify Return on Equity at 20% pre-tax for the first 10 years and 24% from the 11th year onwards on lines of RE Tariff Regulations 2012. References from Hon'ble APTEL judgment on appeal no. 93 of 2012 dated 18.02.2013 has been drawn in which the State Commission was directed to re-determine the RoE not less than that allowed to the conventional power plants as per its Tariff Regulations.
- 13.17. **Hero Future Energies** has suggested normative Return on Equity to be 16% to be grossed up by prevailing MAT for first 10 years and grossed up by prevailing corporate tax rate for remaining 15 years. They have referred to Electricity Act 2003 and National tariff Policy citing that renewable energy needs to be promoted over Thermal power projects.
- 13.18. **Ecogreen Energy Pvt. Ltd.** has proposed Return on equity to be 16% on post basis for entire project life.
- 13.19. **NTPC** has suggested ROE may be kept same as in Tariff regulation 2012 in order to promote renewables.
- 13.20. **Shri K.C. Mohapatra** has submitted that the present equity allowed by some State is about 20% P. Tax. The proposed return on equity will discourage entrepreneurs in taking up Hydro Power Projects. He has requested to follow the norm of Karnataka Electricity Regulatory Commission i.e. 16% + any other tax paid on the ROE is allowed as necessary.
- 13.21. **Shri B.B.L Gupta** has commented that lower return of equity is not advisable for the projects which involve geological risk such as Small Hydro projects. Further he has suggested to include provision of additional return on equity for Small Hydro Projects on the similar lines of timely completion of conventional power projects as per the CERC Terms and Conditions of Tariff Regulations 2014.

Analysis and Decision:

The Commission has analyzed the comments and observations submitted by the stakeholders. Some stakeholders have welcomed the Commission's proposal of revising ROE to 14% from 16% and some stakeholders have suggested retaining the previous values 16% or at least match it with that of Thermal power /Large Hydro Projects. Considering the present market realities wherein competitively bid tariffs in solar, MSW or wind projects over the last couple of years have consistently been below corresponding CERC tariffs, it can be inferred that the market expectation of ROE has come down.

Therefore, the Commission has decided to retain the Return on Equity as defined in the Draft Regulations (14%). The capital cost and O&M cost for SHP have been revised and the Commission believes that this should take care of higher risks for such projects.

14. Interest on Working Capital

Commission's Proposal

(1) The Working Capital requirement in respect of Wind energy projects, Small Hydro Power, Solar PV and Solar thermal power projects shall be computed in accordance with the following:

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

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

(2) The Working Capital requirement in respect of biomass power projects with Rankine Cycle technology, Biomass Gasifier based power projects, non-fossil fuel based co-generation, Municipal Solid Waste and Refuse Derived Fuel projects shall be computed in accordance with the following clause:

Biomass, Biomass Gasifier, Biogas Power, Municipal Solid Waste (MSW), Refused Derived Fuel (RDF) and Non-fossil fuel Co-generation

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

(3) Interest on Working Capital shall be at interest rate equivalent to the normative interest rate of three hundred (300) basis points above the average State Bank of India MCLR (One Year Tenor) prevalent during the last available six months for the determination of tariff.

Comments Received

- 14.1. **AA Energy Ltd.** commented that interest on working capital for biomass power projects should be taken @13% on the capital.

- 14.2. **ReNew Power Ventures Private Ltd.** has submitted that nationwide the RE generators are facing serious payment problems from many states and have an amount outstanding for equivalent to six months and more. In spite of favorable orders by respective SERCs, the RE developers are facing serious problem in getting the payment on time. Even if the payment is released that too is without any delay payment surcharge adding to the difficulties already faced by the RE generators. It is further requested to keep Receivables equivalent to 6 (Six) months.
- 14.3. **Mytrah Energy (India) Pvt. Ltd.** has also requested to keep Receivables equivalent to 6 (Six) months.
- 14.4. **Ecogreen Energy Pvt. Ltd.** has proposed to consider the interest on working capital as 14.5% or the norms to be considered above 450 basis points.

Analysis and Decision:

While the Commission notes the concern regarding delay in payment, the same cannot be a ground for revising the Receivables (equivalent to 6 (Six) months) as proposed by some stakeholders. This would lead to avoidable increase in tariff thereby making the project all the more risky in terms of off take. This issue (of delay in payment to project developers) has been raised in the Forum of Regulators on several occasions and the Commission hopes it would be resolved through intervention by the State Commissions. Therefore, the Commission has decided to retain the Receivables equivalent to 2 (two) months, as defined in the Draft Regulations. Also, the Commission is of the view that Interest on Working Capital shall be at interest rate equivalent to the normative interest rate of three hundred (300) basis points above the average State Bank of India MCLR (One Year Tenor) prevalent during the last available six months as interest on working capital is taken to be 1.0% above the loan interest rate.

15. Rebate.

Commission's Proposal

- (1) For payment of bills of the generating company through letter of credit, a rebate of 2% shall be allowed.
- (2) 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.

Comments Received

- 15.1. **NTPC** has suggested Payment received through Electronic transfer on the day of presentation, a rebate of 2% may be allowed in line with payment through letter of credit.

Analysis and Decision:

The Commission feels the provision of rebate is adequate. The buyers and sellers are free to negotiate a mutually acceptable term.

16. Sharing of CDM Benefits

Commission's Proposal

(1) The proceeds of carbon credit from approved CDM project shall be shared between generating company and concerned beneficiaries in the following manner, namely

- a) 100% of the gross proceeds on account of CDM benefit to be retained by the project developer in the first year after the date of commercial operation of the generating station;
- b) In the second year, the share of the beneficiaries shall be 10% which shall be progressively increased by 10% every year till it reaches 50%, where after the proceeds shall be shared in equal proportion, by the generating company and the beneficiaries.

Comments Received

- 16.1. **Mytrah Energy (India) Pvt. Ltd.** has suggested the Commission should consider and allow investor to retain 100% CDM considering the upfront expenditure involved which is incurred by the generators without any liability on beneficiaries and there is also a wide gap date of CDM registration with UNFCC, issuance of CER and actual receipt of payment. Further as per current market scenario CER certificates are traded at very low prices.

Analysis and Decision:

For CDM benefits, the Commission has considered the provisions under the tariff policy, recommendations by Forum of Regulators (FOR) in its Report on Policies for Renewable Energy and the similar provision in the tariff Regulations for conventional power. Accordingly the Commission has decided to retain the same as proposed in the draft Regulations.

The Commission would, however like to clarify that the sharing of CDM benefit, if any, shall be applicable only after the sale proceeds from CERs are received by Project Developer and not from date of commissioning.

17. Subsidy or incentive by the Central / State Government

Commission's Proposal

The Draft Regulations had the following provisions for the Subsidy or incentive by the Central / State Government:

“The Commission shall take into consideration any incentive or subsidy offered by the Central or State Government, including accelerated depreciation benefit if availed by the generating company, for the renewable energy power plants 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 as per relevant provisions under Income Tax Act and corporate income tax rate.

ii) Capitalization of RE projects during second half of the fiscal year. Per unit benefit shall be derived on levelled basis at discount factor equivalent to weighted average cost of capital.”

Comments Received

17.1. **Inox Renewables Ltd., Hero Future Energies Pvt Ltd, ReNew Power Ventures Pvt. Ltd., MytrahEnergy (India) Pvt. Ltd. and Greenko Energies Pvt. Ltd.** have suggested that Commission should not consider the Generation Based Incentives (GBI) while determining tariff of a wind energy project, as the GBI is offered by the government to the wind power generators to increase the generation from the respective wind power projects. They have cited the Clause no 4.6 of present GBI Scheme by MNRE in this regard:

“4.6 The incentive is over and above the tariff that may be approved by the State Electricity Regulatory Commissions in various states. In other words, the incentive that is sanctioned by the Union Government to enhance the availability of power to the grid will not be considered while fixing tariff by state regulators.”

17.2. **HPSEB Ltd.** has submitted that the State Commission has considered annual rate of depreciation as 15% instead of 80% considered by CERC and additional depreciation of 20% of plant and machinery on 70% of project cost and accordingly issued two rates of tariff i.e with accelerated and depreciation and without accelerated depreciation. They have requested that in view of the provision of Income Tax Act, only additional depreciation on 70% of Plant & Machinery on 70% of project cost be allowed and only one rate of tariff be specified.

17.3. **Shree Bhawani Power Projects Limited, Bonafide Himachali’s Hydro Power Developers Association, Nanti Hydro Power Private Limited, Devi Energies Pvt Ltd., Taranda Hydro Power Pvt. Ltd. and Himalaya Power Producers Association** have requested to prescribe only one tariff for small hydro projects and also spell out that the discussion on AD is limited to wind and solar and not applicable to small hydro. They have quoted the Commission’s Order dated 31.03.15 (Petition No SM/004/2015 (suo moto) had clearly replied to HPERC’s query on AD and stated on

page 4 that *"As regards the accelerated depreciation, the Commission would like to clarify that two tariff schedules are generally announced by the Commission - one with AD benefit and the other without AD benefit –implying thereby that a project not availing AD benefit or the technology not having AD benefit would be entitled to tariff without AD benefit and vice versa. Thus, given that AD benefits are not available for SHP projects, the tariff without AD benefit will be applicable for such projects."*

It is also to be noted that as per income tax notification (Finance Act, 2015 w.e.f 01/04/2016 with due insertion of Sub clause (xviii) in section 2(24) of the Income Tax Act, 1961 providing an inclusive definition of the expression 'Income (under the taxing law) a subsidy is now taxed as income. If SERCs deduct the subsidy from tariff (which really defeats the definition of a subsidy) they must do so on a post-tax basis.

- 17.4. **HPERC** submitted that its implementation of accelerated depreciation involves various difficulties, particularly in case of SHPs. The Discoms find it difficult to identify the RE projects from which the power is to be purchased in view of the uncertainties at the time of signing of PPA as to whether the generating company will actually avail accelerated depreciation or not. Scope of accelerated depreciation lacks clarity. It is suggested that in order to avoid such complications, adjust the impact of accelerated depreciation on deemed basis in the tariff determination, so long as the tax laws provide for such depreciation at higher rates or one time additional depreciation. However in order to partially offset impact of such provision and provide a level playing field, a marginal increase of 0.5% in basic return of equity can be considered.

Analysis and Decision:

- The Commission has analyzed the comments and observations submitted by the stakeholders. It has been pointed by various stakeholders to provide only one tariff schedule for small hydro projects without incorporating the accelerating depreciation (AD) benefit as such projects are not availing AD benefit. The Commission has noted the suggestion and would like to clarify that the generic tariff schedule for small hydro projects shall not include the AD benefit and tariff without AD benefit will be applicable for such projects during the control period 2017-2020.
- Several companies have cited MNRE's guideline on GBI, to suggest that it should be provided over and above the FIT. However, since the cost-plus tariff framework takes into account all costs of the developer and assures a prescribed return on investment, additional return beyond that cannot be justified. GBI may be provided additional in case of projects in which tariff is determined through competitive bidding. But this argument does not hold in case of regulated tariff.

Chapter 3: Technology specific parameters for Wind Energy

18. Capital Cost

Commission's Proposal:

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

Comments Received

18.1. **ReGen Powertech, IWTMA and InWEA** have suggested to determine the Capital cost for Wind energy projects. IWTMA and InWEA, on the basis of Indexation Mechanism has proposed capital cost of Rs.605 Lacs/MW and an additional cost of Rs 30 Lacs/MW owing to increased scope of work within the battery limits (LVRT and HVRT requirements, reactive power control and voltage regulation capabilities). Total Capital cost proposed is Rs. 635 Lacs/MW.

IWTMA and InWEA have also proposed to take into account the price variations of steel in the international market while arriving at the capital cost of wind power projects.

18.2. **IWPA** has requested to provide a generic wind project capital cost linked with indexation mechanism as done by Commission in previous regulation. The capital cost so determined can be useful as a reference for the states where the State commission has not come up with RE Tariff Regulations.

18.3. **Mytrah Energy (India) Pvt. Ltd.** opine that proposed clause is very ambiguous and may result in less investment in the sector may also rule out small player from the industry. The indexation based capital cost and long term tariff gives confidence to investors and developers to continue with the investment and make the sector lucrative. It is requested to determine the capital cost by using indexation formula only as specified by the commission in its earlier regulations. It is further requested to consider recent amendment in IEGC to implement forecasting and scheduling (F&S) related equipment, annual fees and charges involved and installation of Low Voltage Ride Through (LVRT) technology to all WTGs as mandated by the CEA while determining capital cost.

Analysis and Decision:

Various stakeholders have commented that generic tariff for wind projects should be determined, and hence capital and O&M cost should be provided for. The Commission is of the view that wind is a mature technology and going forward more number of projects will be coming under the framework of competitive bidding. Thus, the Commission has decided to provide the option for project specific tariff only for wind projects along with the financial and operational norms.

19. Capacity Utilisation Factor (CUF)

Commission's Proposal:

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

| Annual Mean Wind Power Density (W/m ²) | CUF |
|--|-----|
| Upto 220 | 22% |
| 221-275 | 24% |
| 276-330 | 28% |
| 331-440 | 33% |
| > 440 | 35% |

- (2) The annual mean wind power density specified in sub-regulation (1) above shall be measured at 100 meter hub-height.
- (3) For the purpose of classification of wind energy project into particular wind zone class, as per MNRE guidelines for wind measurement, wind mast either put-up by NIWE or a private developer and validated by NIWE would be normally extended 10km from the mast point to all directions for uniform terrain and limited to appropriate distant in complex terrain with regard to complexity of the site. Based on such validation by NIWE, state nodal agency should certify zoning of the proposed wind farm complex.

Comments Received

- 19.1. **Prayas Energy Group** has welcomed that step. However it is submitted that there is a trend to move towards even higher hub heights. Similarly, larger rotor sizes also significantly contribute to increasing CUFs. Hence it is very likely that CUFs are much more in practice for new wind turbines than proposed in the draft. This is also seen from recent wind bidding results as well. It would be best to refrain from proposing zone by CUFs and urge all procurers to move towards competitive bidding based price discovery.
- 19.2. **MPPMCL** has commented that, wind turbines with hub height up to 120 meters are available now, which is expected to go significantly higher within the control period of the proposed regulations (2017-2020). For example, Suzlon has installed WTGs of 2.1MW capacity each at 120 meter hub height in MP State during FY 2015-16. It is requested to determine AMWPD at hub height of 110 meter and specify CUF accordingly. This would make wind sector more competitive and innovative.
- 19.3. **IWTMA and InWEA** have highlighted from the RLMM (Revised List of Models and Manufacturers) approved by NIWE, that ~72% of the turbines are less than 100m hub height turbines and has proposed to continue with the prevailing hub height of 80m as provided under RE Tariff

Regulations, 2012 for arriving at the CUF or shall adopt the new Hub-Height of 100 m but shall keep the CUF unaltered, considering the low proportion of such turbines installed in the market.

Further, IWTMA and InWEA submit that the increase in CUF will have an impact on tariff reduction upto 54 paise per unit, which would significantly impact the returns of the investors and propose that the CUF should be left unchanged with the prevailing Hub-Height of 80m.

19.4. Shri B.B.L Gupta has suggested utilizing the actual energy data from established projects across various states from NIWE to compute the CUF at 100m hub height. Further, he comments that several states have been considering data of energy generation from wind energy plants installed in the respective states e.g. Tamil Nadu has prescribed the CUF of 27.15%, Gujarat 24.5% and Rajasthan 21% for Jodhpur, Jaisalmer and Barmer and 20% for other regions.

Analysis and Decision:

The Commission has received varied comments where some stakeholders have asked to continue with CUF determination at 80m hub height and some stakeholders have asked to determine CUF at even higher hub height of 110m. The Commission's understanding based on review of international trends is that, more efficient turbines of larger rotor diameter and higher hub heights are now being utilized. This has been reiterated by National Institute of Wind Energy (NIWE). Accordingly, the Commission has decided to retain the CUF at 100m hub height as specified in the Draft Regulations.

The Commission has applied wisdom based on available data. Efforts are on to improve communication and telemetry facilities. Once actual generation level data become available, Commission will undertake a detailed study for improving CUF norms, if required.

20. Operation and Maintenance (O & M) Expenses

Commission's Proposal:

"The Commission shall determine only Project Specific O&M Expenses based on the prevailing market information."

Comments Received

20.1. **ReGen Powertech, IWTMA, IWPA and InWEA** have suggested to determine the generic O&M Expenses for Wind energy projects. IWTMA and InWEA have proposed O&M cost as Rs 11.88 Lacs/MW by escalating the O&M cost in FY 2016-17 by 5.72%.

Analysis and Decision:

As specified previously in this document, the Commission has decided to provide only project specific tariff for wind projects and hence O&M cost norm shall not be specified.

Chapter 4: Technology specific parameters for Small Hydro Project

21. Capital Cost

Commission's Proposal:

The normative capital cost for small hydro projects during first year of Control Period (FY 2017-18) shall be as follows:

| Region | Project Size | Capital Cost (Rs. Lakh/ MW) |
|--|---------------|-----------------------------|
| Himachal Pradesh, Uttarakhand and North Eastern States | Below 5 MW | 830 |
| | 5 MW to 25 MW | 755 |
| Other States | Below 5 MW | 647 |
| | 5 MW to 25 MW | 593 |

Capital Cost Indexation Mechanism

The Capital Cost for SHP as specified for first year of control period will remain valid for the entire duration of the control period unless reviewed earlier by the Commission.

Comments Received

- 21.1. **Ministry of New and Renewable Energy** has submitted that it had sponsored a study to Alternate Hydro Energy Centre (AHEC) of IIT Roorkee during 2014 to study the trends of cost of small hydro power projects. Accordingly, the cost data of 167 small hydro and 69 large hydro power stations covering 18 states namely Andhra Pradesh, Arunachal Pradesh, Chhattisgarh, Gujarat, Himachal Pradesh, Jammu and Kashmir, Karnataka, Kerala, Manipur, Mizoram, Nagaland, Maharashtra, Orissa, Sikkim, Tamil Nadu, Telangana, Uttarakhand and West Bengal were collected from different sources. According to the study the cost per MW for SHP for the year 2015 comes to Rs. 10.2 crores and the predicted cost for the year 2020 based on the analysis of given data is Rs. 13.5 crores. They have requested to relook into the normative capital cost prescribed in the draft regulations.
- 21.2. **Indian Renewable Energy Development Agency** has provided data on Loan amount and capital cost per MW for 8 projects in the hilly region. The average cost of SHP projects in the hilly

region works out as Rs 9.3 crores /MW which may be considered for fixing the tariff for projects in hilly region.

21.3. **Continuum Wind Energy (India) Pvt. Ltd.** has proposed to refer Alternate Hydro Energy Centre, IIT Roorkee's report, published by MNRE in Aug. 2015 to consider Capital Cost of SHP.

21.4. **Devi Energies Pvt. Ltd. and Taranda Hydro Power Pvt. Ltd.** have commented that during the last five years of the control period of the previous regulations, the capital cost of the small hydro in the hilly areas has gone up by almost 60 to 70%. The realistic present capital cost is about 11 to 12 Crores on an average. Also, The MNRE has also circulated a benchmark cost data based on the studies conducted by IIT Rorkee. This cost data which has also been referred by the CERC in its draft regulations indicates the average capital cost of small hydro as Rs.10.50 Crores per MW as in the year 2015. The explanatory memorandum with the draft regulations indicates that the inputs for the capital cost determination have been collected from PFC, REC and IREDA. As per these inputs the total project cost as per IREDA works out to Rs.8.24 Cr. per MW. However, this cost appears to be the average to the whole country and not specifically to the hilly areas. Various examples have been cited and it is advised to seek inputs from IREDA separately for the hilly States and other States. It is further submitted that proposed capital cost would result in a lot of prospective developers / entrepreneur to have are thinking on investing in the small hydro sector as they would find the risks far outweighing the benefits and returns thereof. It is also that the capital cost of small hydro projects needs to be reviewed every year as per the indexation methodology adopted in the past. The proposed Goods and Services Tax (GST) shall also have a major bearing on the capital cost and since the impact of GST is still uncertain, it is all the more pertinent to adopt the indexation methodology to arrive at the capital cost on year to year basis.

21.5. **Taranda Hydro Power Pvt Ltd.** has also submitted the loan sanction letter from IREDA for 13 MW (2 x 6500 kW) Rala Small Hydro Power Project in Himachal Pradesh.

21.6. **Ranga Raju Warehousing Pvt. Ltd.** has commented average capital cost SHP is around Rs 9.30 Crores. It is also requested to consider impact of GST and annual revision of capital cost for Small Hydro plants.

21.7. **Shree Bhawani Power Projects Limited, Nanti Hydro Power Private Limited and Himalaya Power Producers Association** have requested to review capital cost of small hydro power (SHP) projects every year. It is also requested to include indexation methodology for review of capital cost for SHP projects. The indexation methodology may include weightage for labour and cement component along with Steel and Plant & Machinery.

The Capital Cost for SHP projects should be reconsidered for especially hilly states. They have cited reports from AHEC, IIT Roorkee and IREDA sanction Letter dated 28.02.2017 which suggests the Capital Cost for SHP in hilly regions as 9.3 crores per MW. They have also cited several additional costs which a developer has to incur which arrives at approx. 5% of total project cost (4% (1.5% local area development and 2.5% CAMPA to MOEF and a labour cess of 1%). In order no 5 of 2016 (dated 14.12.16) by GERC on renewable energy, they have allowed a Rs 7.48cr/mw capital cost for small hydro between 5MW to 25MW.

21.8. **Bonafide Himachali's Hydro Power Developers Association, Suryakanta Hydro Energies Private Limited, Taranda Hydro Power Pvt. Ltd. and Himalaya Power Producers Association,** have requested to consider the yearly revision of Capital Cost and adopt an indexation methodology as there is a large variation in civil works associated commodities including labour and steel as also the electro mechanical and hydro mechanical plant and machinery etc. The proposed Goods and Services Tax (GST) shall also have a major bearing on the capital cost. Presently average cost of small hydro plant stands out to be more than Rs. 10 Cr/MW. It would therefore, be more fair and transparent to benchmark capital cost every year and introduce the concept of GST when there is more clarity on the final implications.

21.9. **Mittal Processors Pvt. Ltd.** have submitted that Capital Cost of Nimoo Bazgo - 45MW (3X15MW)/Chutak - 44 MW (4X11MW) Tariff Order (CERC). The project build by NHPC and the cost approved for Nimoo Bazgo is Rs. 985.15 Crore (Rs. 21.89 Cr./MW) and for Chutak is Rs. 894 Crore (Rs. 20.31 Cr./MW) - it was justified on other factors like strategic reason. AHEC – IIT Roorkee report has also been referred. They have also submitted that given that SHP can generate 3 times more power than a Solar unit hence energy cost of SHP can be brought down as aggressively if similar benefits are accorded to the SHP as given to Solar.

21.10. **Power & Energy Consultants** have submitted that the capital cost determination for Himachal Pradesh, Uttarakhand and North-Eastern States as one category and other States as second category. In this respect attention is drawn that that even in North Eastern States projects in Arunachal Pradesh are different than state like Assam, Meghalaya and therefore in North Eastern States should also be separately categorized as two categories:

- 1) Assam, Shillong, Tripura etc
- 2) Arunachal Pradesh, Manipur etc.

Separate categorization is required to be done as the cost of construction in the State of Arunachal Pradesh and Manipur is higher and various reasons based on cost of land, supply, transportation, labour availability and cost, geology, logistics etc. have been cited. Capital cost should be viewed in totality afresh based on the projects approved by various financial

institutions. Indexation method will not be appropriate for considering the capital cost for the first year of the control period i.e. FY 2017-18 and is suitable for the future years. They have submitted the capital cost for 3 projects which ranges from 9.54 crores to 11.99 crores per MW. They have also submitted that is requested to specify in the Regulation the cost of transmission for power evacuation to state grid, which is project specific and depends upon the voltage and length of the line, to be considered separately by giving due weightage to system loss and other parameters. The tariff determination for the transmission system should be additional to the tariff calculated for hydro projects.

21.11. **Uttarakhand Jal Vidyut Nigam Ltd.** has suggested the following capital cost for Small Hydro Power projects to be considered for the State of Uttarakhand.

| Region | Project Size | Capital Cost (Rs. Lakh/ MW) |
|-------------|---------------|-----------------------------|
| Uttarakhand | Below 5 MW | 1200 |
| | 5 MW to 25 MW | 1100 |

21.12. **Nanti Hydro Power Private Limited** has stated that during the last five years of the control period of the previous regulations, the capital cost of the small hydro in the hilly areas has gone up by almost 60 to 70%. The realistic present capital cost is no where less than 11 to 12 crores per MW on an average. The company's project Upper Nanti SHEP 13.50 MW has been financed by IREDA considering the capital cost of Rs. 9.50 Crores per MW (copy of sanction letter enclosed). The cost of Sawara Kuddu (11MW HEP) of the HPPCL has already crossed Rs. 1400.00 Crores and the project is still two years away from commissioning. Likewise the 22MW Khauli SHEP commissioned by the HPSEBL in 2012-13 has a cost of Rs. 11.20 Crores per MW.

21.13. **Indian Institute of Technology, Roorkee** has submitted that the cost data of 167 small hydro and 69 large hydro power stations covering 18 states namely Andhra Pradesh, Arunachal Pradesh, Chhattisgarh, Gujarat, Himachal Pradesh, Jammu and Kashmir, Karnataka, Kerala, Manipur, Mizoram, Nagaland, Maharashtra, Orissa, Sikkim, Tamil Nadu, Telangana, Uttarakhand and West Bengal have been collected in the Report submitted to the Ministry of New and Renewable Energy.

For appraisal of projects the cost has been divided in major heads of cost viz. civil works, electro-mechanical works and transmission & distribution works. The year wise cost/MW value based on given data were found Rs. 5.3 crores and Rs. 5.14 crores per MW for small and large scale respectively in the year 2005, Rs. 7.76 crores and Rs. 6.95 crores per MW for small and large scale respectively in the year 2010 and Rs. 10.2 crores and Rs. 8.76 crores per MW for small and large

scale respectively in the year 2015. But, by taking the data only for the year 2010 to 2015 these figures were Rs. 7.45 crores and Rs. 6.7 crores per MW for small and large scale respectively in the year 2010 and Rs. 10.5 crores and Rs. 9 crores per MW for small and large scale respectively in the year 2015.

The predicted cost for the year 2020 based on the analysis of given data is found to be Rs. 13.5 crores and Rs. 11.3 crores per MW for small and large scale respectively.

Hydropower potential in West Bengal (mainly in North Bengal Darjeeling district) which have got the same topographical and climatic conditions as of North East states for hydropower projects and thus deserve the same kind of handling as for North East and other Himalayan states.

21.14. **HPERC** submitted that the Commission had addressed state specific peculiar situations in the State Regulations. It is requested that the state specific considerations for SHP shall be considered while formulating the Regulations.

21.15. **HPSEB Ltd.** has submitted that the State Commission has prescribed the following capital cost in the RE Regulations 2012 and have requested to review the capital cost of the projects.

| Project Size | Capital Cost (Rs. Lakh/ MW) |
|---------------------|-----------------------------|
| Above 100 kW – 2 MW | 780 |
| 2 – 5 MW | 750 |
| Above 5 – 25 MW | 700 |

21.16. **Him Urja Pvt. Ltd.** submitted that the weightage for the Plant and Machinery has been taken at 70% whereas in practice it is not more than 20%. The cost of labour has increased more than 3 times in the last five years. Cost of cement has increased by 1.5 times during this period. One important issue arises from the analysis of the project cost of the hydro power projects. In the case of large hydro power projects the Commission itself has accepted the cost of even upto Rs.20 crores per MW in the case Nimmo Bazgo and the average cost of the projects commissioned in the year 2012 -2015 is Rs.10.63 per MW as per figures reported in CEA Report on Hydro Power 2015.

21.17. **Sandhya Hydro Power Projects Balargha Pvt. Ltd.** has submitted the data published in the report by AHEC IIT Roorkee that the project cost for SHP at Rs 10.5 crores / MW and its projections for Rs 13.5 crores/MW by 2020. They have requested to consider the project cost as estimated by AHEC, IT Roorkee. They submit that allowing higher project cost will eventually not increase the overall tariff since hydro projects can generate 3 times more energy in comparison to the other RE forms, hence keeping the tariff low.

21.18. **Astha Green Energy Ventures Pvt. Ltd.** commented that the Capital Cost considered under Actual Project Cost Approach in the Explanatory Memorandum does not consider data for small hydro projects in the hilly states like H.P., Uttarakhand etc. and thus is not a correct representative of small hydro project cost across hilly regions. The actual project cost in hilly states is largely in the range of Rs 9.0 -11 Cr/ MW for projects to be commissioned during the control period of draft RE tariff regulation.

This is also reflected in the total project cost including IDC data being provided by IREDA for under-implementation small hydro projects in the hilly states viz. Himachal Pradesh, Uttarakhand. The data shared by the lending agency IREDA clearly suggests that average capital cost for small hydro projects in such regions is around 9.30 Cr/ MW. Further the fact sheet as per the IHC Roorkee report clearly depicts that the average Project cost of Projects commissioned before 2015 is Rs. 8.23 Cr/MW whereas Projects commissioning on or after 2015 comes out to be more than Rs. 10.50 Cr/MW. For example, there are few hard costs such as under in Himachal Pradesh.

- It almost requires 5-7 years in constructing a small hydro power project wherein, IDC also plays a vital role in increasing the Capital cost of the project.
- 1.5% of Project Cost for Local Area Development Fund plus additional 1% free power as LADF post COD
- 0.1% of Project cost for Environmental Monitoring Plan
- 2.5% of the Project cost for Catchment Area Treatment Plan +applicable service tax
- 12% free energy to State Govt. for first 12 years, 18% for next 18 years and 30% for the balance period i.e. 10 Years. 1% additional free energy over and above the aforesaid rates is levied under Central government Hydro Policy, 2008.
- 1% of the Project Cost is levied as Labor Cess.
- Entry Tax, VAT items are also additionally levied on the plant and machinery for Himalayan States+ Service tax.
- Forest Fees and charges in the form of NPV, Compensatory Afforestation, and Reclamation plan etc. which forms around 0.5% of the Project cost. Additionally, transmission line costs up to inter-connection points also need environmental cost to be borne by the developer in case the ROW is a forest area.
- Other statutory charges levied by various agencies such as PCB, Fisheries, Irrigation etc.
- There is also increase in costs of transportation of materials from downhill to uphill.

Analysis and Decision:

Several stakeholders have expressed apprehension regarding GST. The Commission can look into it only when it is implemented and the exact impact on prices of specific goods and services is known.

It has been pointed out by various stakeholders including industry, academia and financial institutions, that the actual capital cost for SHP projects is considerably higher than that proposed in the draft regulations, especially for hilly regions of HP, Uttarakhand and North-Eastern states. The Commission has reviewed the project cost data submitted by IREDA, Project Developers and the recommendations of Alternate Hydro Energy Centre, I.I.T. Roorkee. IREDA has stated an average cost of Rs.9.3 crores/MW for 8 projects they have funded. It may be noted that the median of this sample set is 8.98, with half the projects (especially higher size) lying under Rs.9 crores/MW.

It needs to be appreciated that the Commission has to incentivise efficiency by providing a signal through capital cost norms, and cannot go strictly by actual costs every time. However, it is also acknowledged that SHP projects have a big local development component by providing local employment and power to local communities, which must be encouraged and supported.

Additionally, the Commission notes that topographical and climatic conditions for SHP projects in West Bengal (mainly in North Bengal Darjeeling district) are similar to that of North East states. It has therefore, been decided to include West Bengal among the hilly region states viz. Himachal Pradesh, Uttarakhand and North Eastern States which have high potential for small hydro power, and accordingly all the operational norms enjoined for these States shall be applicable to West Bengal as well. For non hilly States (that is, other States) also a proportionate increase has been provided in the final regulation.

Thus, based on the above review, the Commission specifies the following capital cost for small hydro projects for FY 2017-18:

| Region | Project Size | Capital Cost (Rs. Lakh/ MW) |
|--|---------------------|------------------------------------|
| Himanchal Pradesh, Uttarakhand, West Bengal and North Eastern States | Below 5 MW | 1,000 |
| | 5 MW to 25 MW | 900 |
| Other States | Below 5 MW | 779 |
| | 5 MW to 25 MW | 707 |

The capital cost will remain valid for the entire duration of the control period unless reviewed earlier by the Commission.

22. Capacity Utilisation Factor

Commission's Proposal:

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

Explanation: For the purpose of this Regulation normative CUF is net of free power to the home state if any, and any quantum of free power if committed by the developer over and above the normative CUF shall not be factored into the tariff.

Comments Received

22.1. **Indian Institute of Technology, Roorkee** have submitted that Capacity utilization factor (CUF) as 45% for Himachal Pradesh, Uttarakhand and NE States and 30% for other states has been taken. The capacity utilization factor is net of free power to the home state but does not cover the 1% of additional free power to be given to local people perpetually every year till the life of the project under LADA as per Govt. of India Policy 2008 and adopted by many of the states like Himachal Pradesh. Thus CUF prescribed should consider such reduction.

Data on capacity utilization factor or commonly used term plant load factor (PLF) though are different is not available easily. AHEC, IIT Roorkee in August 2015 based on only 102 sites (76 SHP and 24 LHP) has reported that for large hydro plant the load factor is in the range of 23 to 47% whereas for small hydro the plan load factor is in the range of 17 to 61%.

| State | LHP | SHP |
|-------------------|-----|-----|
| Arunachal Pradesh | 47% | 61% |
| Chhattisgarh | | 20% |
| Himachal Pradesh | | 48% |
| Jammu & Kashmir | | 31% |
| Karnataka | | 31% |
| Maharashtra | | 51% |
| Mizoram | | 16% |
| Tamil Nadu | | 18% |
| Telangana | | 38% |
| Uttarakhand | | 40% |
| West Bengal | | 30% |
| Andhra Pradesh | | 30% |
| Assam | 40% | 14% |
| Madhya Pradesh | 41% | |
| Odisha | 23% | 47% |
| Kerala | | 50% |
| Punjab | | 52% |

22.2. **Uttarakhand Jal Vidyut Nigam Ltd.** have suggested to reduce the CUF from 45% to 40% considering 40% CUF has been achieved by various generating companies in Uttarakhand and the State Commission has also considered 40% CUF in its Regulations.

22.3. **Him Urja Pvt. Ltd.** submitted that the data for HP & Uttarakhand reveal that hardly few projects are able to achieve the target of 45%. In Uttarakhand the average CUF was reported as low as 34% in the regulation of UERC when the CUF was reduced from 45% to 40%. The Average PLF of Large hydro Power Projects based on the CEA Report on Hydro Power is 43% which includes secondary energy also on which the large projects are entitled to incentive.

Analysis and Decision:

It has been pointed out by AHEC, I.I.T Roorkee that the Capacity Utilization Factor (CUF) of 76 SHP Projects is in the range of 16% - 71%. It may be observed from the CUF data submitted in the report Benchmark Cost for Small and Large Hydropower Projects as above that several projects in various states have attained CUF levels higher than the existing normative CUF norms. The Commission considers retaining these CUF norms in the Regulations as necessary for prudent selection of sites and efficient operation of small hydro projects. It shall not serve the society well to install plants at sites which do not provide a CUF of even 30%. Thus, the normative Capacity Utilisation Factor for small hydro projects located in Himachal Pradesh, Uttarakhand, West Bengal and North Eastern States shall be 45% and for other States, CUF shall be 30%.

23. Operation and Maintenance Expenses

Commission’s Proposal:

- (1) Normative O&M expenses for the first year of the Control period (i.e. FY 2017-18 shall be as follows.

| Region | Project Size | O&M Expense (Rs. Lakh/ MW) |
|---|---------------|----------------------------|
| Himanchal Pradesh, Uttarakhand and North Eastern States | Below 5 MW | 33.02 |
| | 5 MW to 25 MW | 23.78 |
| Other States | Below 5 MW | 26.41 |
| | 5 MW to 25 MW | 18.49 |

- (2) Normative O&M expenses allowed under these Regulations shall be escalated at the rate of 5.72% per annum for the Tariff Period for the purpose of determination of levellised tariff.

Comments Received

23.1. **Bonafide Himachali's Hydro Power Developers Association and Himalaya Power Producers Association** submit that in view of the steep increase in the wages and establishment cost as also the cost of spares etc. the O & M of the power plants has become very expensive. The normative cost of 3% considered by some of the States is not workable in the present day market scenario. The O & M cost should at-least be 6% particularly for the hilly State like Himachal Pradesh where the wages for the remote tribal areas are otherwise regulated by the HP Govt., to be 150% of the normal wages. Even in the public sector projects, the O & M expenses are to the order of 9 to 10%. Further the annual escalation of 5.72% proposed is also extremely low and should be suitably enhanced in line with the realistic cost escalations.

23.2. **Indian Institute of Technology, Roorkee** has submitted that Cost of annual operation and maintenance items in the fixed cost structure for calculating the tariff is the matter of debate as there is not much data available on such cost.

Operation and maintenance cost w.r.t. to Small Hydropower is much more than what has been assumed in the draft regulation. It is recommended that the O&M cost may be taken for Himalayan states as follows:

| SHP Installed capacity | O + M Cost |
|-------------------------------|----------------------|
| 1 – 5 MW | 6 – 8% of works cost |
| 5-10 MW | 5 – 6% of works cost |
| 10-25 MW | 4 - 5% of works cost |

23.3. **Him Urja Pvt. Ltd.** submitted that regulation for large hydro projects provide for O&M Charges at 4% for projects having capacity of upto 200 MW and 2.5% capacity above 200 MW. By this logic the O&M Charges for the small projects should be at least 6 to 8% but in the regulations the charges have been allowed at less than 3%. The O&M Charges are allowed on the reduced capital cost of project. Actually small hydro is allowed less than 2% on actual cost. Therefore they have requested that this anomalous situation may be rectified.

Analysis and Decision:

The Commission has examined the comments on O&M costs. The concerns raised such as the availability and cost of labour in remote locations, cost of spares and logistical challenges are acknowledged and considered. After analyzing costs of operation, manpower requirement and parts replacement, the Commission specifies the following normative O&M expenses for the first year (FY 2017-18).

| Region | Project Size | O&M Expense (Rs. Lakh/ MW) |
|---|---------------|----------------------------|
| Himachal Pradesh, Uttarakhand, West Bengal and North Eastern States | Below 5 MW | 36 |
| | 5 MW to 25 MW | 27 |
| Other States | Below 5 MW | 29 |
| | 5 MW to 25 MW | 21 |

One of the stakeholders has commented that the escalation factor of 5.72% is lower. The Commission in the Explanatory Memorandum has presented a detailed explanation of the computation of escalation factor. Based on the WPI and CPI for last three years i.e. 2013-2016, the escalation factor works out to 4%. However to further support the RE projects, the Commission retains the escalation factor of 5.72% for the control period 2017-20. The normative O&M expenses specified above shall be escalated at 5.72% from 2nd year onwards.

Chapter 5: Technology specific parameters for Biomass Power Projects based on Rankine Cycle Technology

24. Capital Cost

Commission's Proposal:

(1) The Commission proposes to determine normative capital cost for FY 2017-18 for Biomass Projects as under;

| Biomass Rankine Cycle Projects | Capital Cost (FY 2017-18) (Rs. lakhs/ MW) |
|--|---|
| Project [other than rice straw and juliflora (plantation) based project] with water cooled condenser | 559.03 |
| Project [other than rice straw and Juliflora(plantation) based project] with air cooled condenser | 600.44 |
| For rice straw and juliflora (plantation) based project with water cooled condenser | 610.80 |
| For rice straw and juliflora (plantation) based project with air cooled condenser | 652.20 |

Comments Received

24.1. **IBPA** has proposed additional capital cost of Rs. 100 Lakhs/MW for plants that use fuels other than Rice straw and Juli-flora as they have cited that this additional cost is required on the

installation of fuel processing machinery like Comminution equipment, Mixers/Blenders, briquetting machines, Balersto prepare a homogeneous mix.

Analysis and Decision:

Regarding capital cost, the Commission would like to specify that the base prices for Biomass based power projects with different technologies and fuel types were notified in 2014 (CERC Terms and Conditions for Tariff determination from Renewable Energy Sources, (First Amendment) Regulations, 2014) after a detailed and extensive study. The Commission is of the view that nothing substantially has changed over these 3 years and would like to retain the capital cost of biomass based power projects as specified in the Draft Regulations.

25. Auxiliary Consumption

Commission's Proposal

The auxiliary power consumption factor shall be as follows:-

- a) For the project using water cooled condenser:
 - i. During first year of operation: 11%
 - ii. From 2nd year onwards : 10%
- b) For the project using air cooled condenser:
 - i. During first year of operation : 13%
 - ii. From 2nd year onwards : 12%

Comments Received

25.1. **AA Energy Limited** commented that the Auxiliary consumption should be 11% not 10%.

Analysis and Decision:

The Commission is of the view that the auxiliary energy consumption is a function of plant efficiency and the energy conservation methods adopted by the developers. Further, the auxiliary consumption factor may vary according to the need of pre-processing requirement of the biomass fuel. Accordingly, the Commission has decided to retain the Auxiliary Consumption values specified in the Draft Regulations.

26. Station Heat Rate

Commission's Proposal:

The Station Heat Rate for biomass power projects shall be:

- a) For projects using travelling grate boilers: 4126kCal/kWh
- b) For projects using AFBC boilers: 4063 kCal/kWh

Comments Received

- 26.1. **IBPA and AA Energy Ltd.** has proposed SHR as 4200 kcal/kWh.
- 26.2. **MPPMCL** has submitted that SHR may be same as SHR for Bagasse based Co-gen plants as 3600kCal/kWh.
- 26.3. **GUVNL** has submitted that Station Heat Rate of 3800 kcal/kwh is appropriate.

Analysis and Decision:

The Commission has analyzed the comments and observations submitted by the stakeholders. The Commission has decided that since fossil fuel mix shall not be allowed for the control period 2017-20, the Station Heat Rate (SHR) and Gross Calorific Value (GCV) will be adjusted to the previous norms specified in RE Tariff Regulations 2012 when no fossil fuel was allowed. Accordingly, the commission has finalized SHR for FY 2017-18 which shall remain valid for the entire duration of the control period unless reviewed earlier by the Commission.

The Station Heat Rate for biomass power projects shall be:

- a) For projects using travelling grate boilers: 4200kCal/kWh
- b) For projects using AFBC boilers: 4125 kCal/kWh

27. Operation and Maintenance Expenses

Commission's Proposal:

- (1) Normative O&M expenses for the first year of the Control period (i.e. FY 2017-18 shall be Rs. 40 Lakh per MW.
- (2) Normative O&M expenses allowed at the commencement of the Control Period (i.e. FY 2017-18) under these Regulations shall be escalated at the rate of 5.72% per annum.

Comments Received

- 27.1. **IBPA** has proposed O&M expenses as Rs. 50 Lakhs/MW for FY 2017-18. They have cited that actual O&M of operating plants is in the range of Rs. 50 Lakhs/MW and also with the escalation of 5.72% on previous years O&M cost, this figure is arrived.

Analysis and Decision:

The O&M cost proposed in the Draft Regulations were based on the review of O&M expenses of various SERCs (as represented in Explanatory Memorandum) for the purpose of tariff

determination for their respective states. The Commission is of the view that O&M expenses as determined through price indexation as per RE Tariff Regulations 2012-17 seem to have become out of sync with market realities. Rs. 50 Lakhs/MW is too high to be considered and it should be in sync with the cost specified by other SERCs. Hence, the Commission has decided to retain the O&M expenses as specified in the Draft Regulations, at Rs. 40 lakhs/MW.

28. Use of Fossil Fuel

Commission's Proposal:

The use of fossil fuels shall not be allowed.

Comments Received

28.1. **Chhattisgarh Biomass Energy Developers Association** has proposed to continue the existing provisions in respect of permissible fuel mix ratio as per respective MNRE guidelines based on the year of commissioning. They have given below reasons to support their comment:

Biomass, such as rice husk, shells, deoiled cakes, etc. require support fossil fuel for proper combustion of biomass fuel. So far in India, there is no boiler technology available which confirms the use of 100% of biomass fuel usage without any support of fossil fuel. Even if the technology is made available today, these old boilers which are designed to burn biomass fuel along with some portion of fossil fuel have to be redesigned / change in technology (Boiler type) which requires large shut down time period (upto 1 year from date of ordering) along with huge financial cost which is nearly 35 % of approved project cost. Biomass power plants are mostly selling power to state discoms through long terms PPA's. Most of these power plants are connected to 33 KVA rural feeders due to which there are prone to frequent tripping of Grid which impacts the stability and the availability of the generator. Technically, if some amount of coal is not fired along with the biomass during each start up of boiler the fuel does not burn properly in the boiler which causes failure of boiler light-up.

28.2. **Indian Biomass Power Association (IBPA)** has suggested to continue with the earlier permitted level of 15% fossil fuel on energy in Biomass projects. They have given the following reasons to support their comment:

- Biomass based power generation is converting the agricultural wastes to Wealth which is very difficult, compared to fossil fuel based power generation.
- During start up and rainy days; operation will be supported by use of fossil fuels, without which the plant operation will be difficult.

- 28.3. **AA Energy Ltd.** commented that the usage of fossil fuel to run the plant on optimal level is very necessary as the condition in monsoon the usage of coal becomes very necessary and it has to be mixed with husk as the rice husk becomes very moist. So usage of fossil fuel should be allowed.
- 28.4. **Dr. Anoop Singh ,IIT Kanpur**, has commented that biomass/bagasse based plants may have been designed to burn coal along with the primary fuel (i.e. biomass /bagasse), that does not suggest that such boilers cannot operate purely on biomass/bagasse. Earlier policy allowed up to 15% use of coal by such plants. It is highly likely that such plants do run mostly on the primary fuel/bagasse during the season. During off season, coal may be the primary source of fuel due to unavailability of biomass/bagasse. Historical data with the author (for 1989-95) suggests that coal did not constitute even 2% of bagasse use for most of the plants in the sugar industry during that period and with the technological status of that time.
- Further, it says that the country needs to reduce its dependence on fossil fuels through progressive development of renewable energy sources, the regulatory environment should progressively limit the use of fossil fuels to a bare minimum due to the operational purposes. In case a cogeneration unit has sound technical reasons for continuation of greater proportion of coal use within the existing guidelines, specific tariff may be determined for such cases.

Analysis and Decision:

The Commission has analyzed the comments and observations submitted by the stakeholders on use of Fossil Fuel. CBEDA has cited technical reasons for necessity of using biomass in boilers. They have also stated that existing producers have designed their plant according to the coal allowance and bringing it down to zero will be expensive. On the other hand, Dr. Anoop Singh (IITK) has cited primary data which shows that historically, use of coal in biomass plants was minimal. The Commission would like to emphasize that the prime objective of the Regulations are to promote usage of biomass for energy generation. Therefore, by allowing usage of fossil fuel, the very objective of using alternate fuel is defeated. Fuel use cannot be flexible based on availability of biomass. Thus, considering the necessity to promote the usage of biomass as fuel in power projects, the Commission has decided to not allow the usage of fossil fuel in biomass based power projects commissioned during the next Control Period (2017-2020).

The Commission clarifies that since this Regulation applies to the new plants that are commissioned during the control period; hence to that extent, the existing plants shall not be affected. This implies that for the biomass power projects commissioned on or before 31.03.2017, the use of fossil fuels to the extent of 15% in terms of calorific value on annual basis shall be allowed for the tariff period from the date of commissioning. The Commission has been given to understand that some plants are using

more than 15% coal on an annual basis. Such plants should be de-registered as a renewable energy plant by the State Agency, and their preferential tariff should be revoked. The Commission takes strict note of this matter, and advises MNRE to take necessary steps through the State Nodal Agencies.

Thus, Regulation 39 is revised as follows:

“The use of fossil fuels shall not be allowed.

Provided that for the biomass power projects commissioned on or before 31.03.2017, the use of fossil fuels to the extent of 15% in terms of calorific value on annual basis shall be allowed for the tariff period from the date of commissioning.”

29. Monitoring Mechanism for the use of fossil fuel

Commission’s Proposal

- (1) The Project developer shall furnish a monthly fuel usage statement and monthly fuel procurement statement duly certified by Chartered Accountant to the beneficiary (with a copy to appropriate agency appointed by the Commission for the purpose of monitoring the fossil and non-fossil fuel consumption) for each month, along with the monthly energy bill. The statement shall cover details such as –
- a) Quantity of fuel (in tonnes) for each fuel type (biomass fuels and fossil fuels) consumed and procured during the month for power generation purposes,
 - b) Cumulative quantity (in tonnes) of each fuel type consumed and procured till the end of that month during the year,
 - c) Actual (gross and net) energy generation (denominated in units) during the month,
 - d) Cumulative actual (gross and net) energy generation (denominated in units) until the end of that month during the year,
 - e) Opening fuel stock quantity (in tonnes),
 - f) Receipt of fuel quantity (in tonnes) at the power plant site , and
 - g) Closing fuel stock quantity (in tonnes) for each fuel type (biomass fuels and fossil fuels) available at the power plant site.
- (2) Non-compliance with the condition of fossil fuel usage by the project developer, during any financial year, shall result in withdrawal of applicability of tariff as per these Regulations for such biomass based power project

Comments Received

- 29.1. **MPPMCL** has commented that the regulation is not required.
- 29.2. **GUVNL** has commented that in view of Regulation 39, Regulation 40 regarding Monitoring Mechanism for Fossil Fuel, is not required at all. Further, the project developers should be mandated to submit a certificate of practicing Chartered Accountant certifying non usage of Fossil fuel on annual basis to the procurer. Also, the detailed consequences in case of breach in compliance of the condition of non-usage of fossil fuel need to be specified.
- It is also submitted that power procurer are entering into long term Power Purchase Agreement with Power Producer. Therefore, any non-compliance in regard to non-usage of fossil fuel would tantamount to breach of critical condition and therefore the Commission may specify penalty equivalent to at least 1.5 times of difference between cost paid by distribution licensee for sourcing renewable energy from alternate source to meet the RPO obligation minus preferential tariff determined by the Commission for such generation projects on annual basis / Project specific tariff determined by the Commission as the case may be.

Analysis and Decision:

Arguments have been put forward by stakeholders that in view of Regulation 39, which specifies that usage of fossil fuel should not be allowed, Regulation 40 regarding Monitoring Mechanism for Fossil Fuel is not required. The Commission is of the view that to ensure that no fossil fuel is mixed with the biomass, this Monitoring Mechanism is required. Accordingly, the Commission has decided to continue with the Monitoring Mechanism but with minor modification as follows:

- (1) The Project developer shall furnish a monthly fuel usage statement and monthly fuel procurement statement duly certified by Chartered Accountant to the beneficiary (with a copy to appropriate agency appointed by the Commission for the purpose of monitoring the fossil and non-fossil fuel consumption) for each month, along with the monthly energy bill.*
- (2) Non-compliance with the condition of fossil fuel usage by the project developer, during any financial year, shall result in withdrawal of applicability of tariff as per these Regulations for such biomass based power project*

30. Calorific Value

Commission's Proposal:

The Calorific Value of the biomass fuel used for the purpose of determination of tariff shall be at 3174 kCal/kWh.

Comments Received

- 30.1. **Prayas Energy Group** has commented that Calorific value should be in kCal/kg and not kCal/kWh. It is a typo.
- 30.2. **IBPA** has cited that the calorific value of 3174 kcal/kg was arrived at by CERC taking in to consideration 15% coal on energy. Their field experience shows the actual calorific value is around 2900 kcal/kg only as shown in below table:

| | | | |
|-----------------|------|-----|-------------|
| Paddy husk | 4000 | 20% | 3200 |
| Juli flora | 4400 | 40% | 2640 |
| Palm wastes | 4200 | 55% | 1890 |
| Maize shank | 3700 | 20% | 2960 |
| Coconut fronds | 4100 | 50% | 2050 |
| Wood bark | 3800 | 50% | 1900 |
| Sawdust | 4000 | 40% | 2400 |
| Match waste | 4000 | 30% | 2800 |
| Groundnut shell | 4400 | 10% | 3960 |
| Bagasse | 4500 | 50% | 2250 |
| Sugarcane Trash | 4000 | 15% | 3400 |
| Sawmill waste | 4200 | 30% | 2940 |
| Cashew shell | 4500 | 5% | 4275 |
| Poultry litter | 3800 | 50% | 1900 |
| Casuarina | 4400 | 30% | 3080 |
| Mustard husk | 4200 | 15% | 3570 |
| Coriander husk | 4000 | 15% | 3400 |
| Cotton stalk | 4400 | 15% | 3740 |
| Average | | | 2900 |

They are proposing calorific value should be considered as 2900 kcal/kg.

- 30.3. **GUVNL** has commented that states like Gujarat have huge untapped potential of biomass and out of that biomass is also available from stuff like cotton stalk having higher GCV of around 3600-3700 Kcal/Kg which cannot be ignored. GCV norm of 3500 kcal/kg has been suggested.

Analysis and Decision:

The Commission acknowledges the observations submitted by the stakeholders and the typographical error has been rectified in the final regulations. The Commission has decided that since fossil fuel mix is not allowed for the control period 2017-20, the GCV values will be adjusted to the erstwhile norms when 100% biomass fuel was mandated. Accordingly, the commission has finalized the GCV as 3100

kcal/kg for FY 2017-18 which will be valid for the entire duration of the control period, unless reviewed earlier by the Commission.

31. Fuel Cost

Commission’s Proposal

Biomass fuel price during first year of the Control Period (i.e. FY 2017-18) shall be as specified in the table below and shall be same for subsequent years unless specifically ordered by Commission . Alternatively, for each subsequent year of the Tariff Period, the normative escalation factor of 5% per annum shall be applicable at the option of the biomass project developer

| State | FY2017-18 (Rs./MT) |
|----------------|-----------------------|
| Andhra Pradesh | 2873.22 |
| Haryana | 3270.39 |
| Maharashtra | 3344.85 |
| Punjab | 3420.56 |
| Rajasthan | 2854.6 |
| Tamil Nadu | 2826.05 |
| Uttar Pradesh | 2922.86 |
| Other States | 3073.05 |

Comments received

31.1. **MPPMCL** has commented that fuel cost for state of MP may be considered as Rs 2500/MT

31.2. **AA Energy Ltd.** commented that Fuel price should be considered around Rs.3900/-per ton.

Analysis and Decision:

The comments received on the Biomass fuel prices are conflicting. Other stakeholders have not commented on the prices. The Commission does not find any material reason for changing the prices provided in the Draft Regulations.

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

32. Capital Cost

Commission's Proposal:

The normative capital cost for the non-fossil fuel based cogeneration projects shall be Rs. 452.75 Lakhs/MW for the first year of Control Period (i.e. FY 2017-18), and will remain valid for the entire duration of the control period unless reviewed earlier by the Commission.

Comments Received

- 32.1. **Indian Sugar Mills Association** has proposed to consider Capital Cost at a minimum of Rs. 550 Lakhs/MW
- 32.2. **National Federation of Cooperative Sugar Factories Ltd. (NFCSFL)** has proposed to consider Capital Cost at a minimum of Rs. 543 Lakhs/MW. They have highlighted that an economic size of sugar plant is of 5000 TCD, with a boiler pressure of 87 Kg to 110 Kg/cm² and even more in some cases. Prices of steel and other inputs have increased over the years, because of which the cost of high- pressure boilers has also gone up. This normative cost of Rs. 543 Lakhs/MW has been fixed by Government of India for the purpose of funding from Sugar Development Fund and this cost has been arrived after making exhaustive study.
- 32.3. **Shri B.B.L Gupta has requested to review the pricing methodology of Capital cost of Bagasse based projects.**

Analysis and Decision:

The Commission has analyzed the comments and observations submitted by the stakeholders. The comments above highlight that actual capital cost for Bagasse based cogeneration projects is on the higher side as considered in the Draft Regulations. The commission has also analyzed the data on normative cost from Sugar Development Fund (Ministry of Consumer Affairs, Food & PD):

| Boiler Pressure (ata) | Normative Cost (Rs. Lakhs/MW) |
|-----------------------|-------------------------------|
| Below 67 | Not eligible |
| 67 to 86 | 385.00 |
| 87 to 109 | 442.00 |
| 110 and above | 543.00 |

Averaging the normative cost for High Boiler Pressure projects (above 87 APA), it yields a value of Rs.492.5 Lakhs/MW.

Thus, the Commission has decided to revise the Capital Cost for Bagasse based cogeneration projects to Rs. 492.5 Lakhs/MW for High Pressure Boilers for FY 2017-18. Higher capital cost is provided to

encourage and ensure deployment of high pressure boilers which are more efficient in nature. This capital cost will remain valid for the entire duration of the control period unless reviewed earlier by the Commission.

33.Plant Load Factor

Commission’s Proposal:

- (1) For the purpose of determining fixed charge, the plant load factor for non- fossil fuel based cogeneration 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 under clause (2) below and load factor of 92%.
- (2) The number of operating days for different States shall be as follows:

| State | Operating Days | Plant Load Factor (%) |
|----------------------------------|--|-----------------------|
| Uttar Pradesh and Andhra Pradesh | 120 days (crushing) + 60 days (off-season) =180days operating days | 45% |
| Tamil Nadu and Maharashtra | 180 days (crushing) + 60 days (off-season) = 240 days operating days | 60% |
| Other States | 150 days (crushing) + 60 days (off-season) = 210 days operating days | 53% |

Comments Received

33.1. **Indian Sugar Mills Association** based on actual average operating days of the major sugar producing States, during the last 5years, as shown below, has proposed to include Maharashtra, Puducherry and Tamil Nadu in ‘Other States’ category.

| States | Number of working days (simple average) during last 5 years | | | | | Average of five years |
|-------------------------------|---|---------|---------|---------|---------|-----------------------|
| | 2015-16 | 2014-15 | 2013-14 | 2012-13 | 2011-12 | |
| Bihar | 94 | 101 | 126 | 116 | 97 | 106.8 |
| Chhattisgarh & Madhya Pradesh | 92 | 128 | 130 | 88 | 74 | 102.4 |
| Maharashtra | 116 | 149 | 125 | 125 | 147 | 132.4 |
| Punjab | 136 | 128 | 116 | 112 | 102 | 118.8 |
| Rajasthan | 91 | 92 | 78 | 63 | 39 | 72.6 |
| Tamil Nadu & Puducherry | 145 | 124 | 137 | 174 | 202 | 156.4 |

| | | | | | | |
|-------------|-----|-----|-----|-----------|-----|-------|
| Telangana | 114 | 105 | 110 | New State | | 109.7 |
| Uttarakhand | 107 | 115 | 102 | 113 | 110 | 109.4 |

33.2. **NFCSFL** based on actual average operating days as shown above, has proposed to group Maharashtra in the category of Uttar Pradesh & Andhra Pradesh instead of clubbing with Tamil Nadu.

33.3. **Rai Bahadur Narain Singh Sugar Mills Ltd.** has proposed to classify Uttarakhand along with UP and PLF should be taken as 45%, as Uttarakhand was a part of UP and there is not much difference in conditions of Sugar Mills in both States.

Analysis and Decision:

The Commission has analyzed the comments and data submitted by the stakeholders. The Commission is of the view that by using high pressure boilers there will lead to an increase in overall efficiency of the plant. Nevertheless, the SHR norms are not being amended to account for the same. Thus, the benefit of installing high pressure boilers shall go to the generating station. Hence, the Commission has decided not to change the proposed PLF in Draft Regulations. As regards the suggestion of including Uttarakhand along with Uttar Pradesh, the Commission would like to take a call only after detailed study in this regard. As such, the provision of draft regulation has been retained in the final regulation at present.

34. Auxiliary Consumption

Commission's Proposal:

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

Comments Received

34.1. **Indian Sugar Mills Association, NFCSFL and TSMA** have proposed that auxiliary consumption for bagasse based plants should be fixed at par with that of bio-mass power projects, or at least at 10%, based on actual.

Analysis and Decision:

Stakeholders have demanded an increased auxiliary consumption norm. However, the Commission is of the view that non-fossil fuel based cogeneration plants have some of the auxiliary equipment common between the sugar mill and the power generation unit. Also, bagasse requires less processing compared to biomass. Keeping above facts into consideration, the Commission has specified the norm

for auxiliary consumption for cogeneration projects. Accordingly, the Commission has retained the norm as specified under Draft Regulations.

35. Station Heat Rate

Commission's Proposal:

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 Cogeneration projects.

Comments Received

- 35.1. **Indian Sugar Mills Association** has proposed to consider actual data from the sugar mills from all the States/regions of the country, to arrive at a logical and realistic SHR. They propose that if the Commission allows, Indian Sugar Mills Association can collect these details and submit the same to the Commission.
- 35.2. **TSMA** commented that SHR during operations is found to be around 6750 Kcal per Kg of Bagasse and around 4400 KCal/KWH during off season. The Commission has adopted crushing operations of 120 days and 60 days of off season operations for Telangana. The weighted average works out to 5967 KCal/KWH $((6750 \times 120 + 4400 \times 60)/180)$. Hence, it is proposed that SHR should be fixed at least 5967 KCal/KWH.
- 35.3. **NFCSFL** has proposed to fix SHR of bagasse based projects as 4200 kCal / kWh.

Analysis and Decision:

This needs detailed study and the Commission urges the developers to submit the details and the staff can examine the aspect. As of now, the provision as proposed in the draft regulation has been retained in the final regulation.

36. Fuel Cost

Commission's Proposal:

- (1) The price of Bagasse first year of the Control Period (i.e. FY 2017-18) shall be as specified in the table below and shall be same for subsequent years unless specifically ordered by Commission. Alternatively, for each subsequent year of the Control Period, the normative escalation factor of 5% per annum shall be applicable at the option of the project developer.
- (2) For use of biomass other than bagasse in co-generation projects, the biomass prices as specified under Regulation 42 shall be applicable.

| State | Bagasse Price FY2017-18 (Rs. / MT) |
|----------------|---------------------------------------|
| Andhra Pradesh | 1622.16 |
| Haryana | 2307.26 |
| Maharashtra | 2273.75 |
| Punjab | 2030.49 |
| Tamil Nadu | 1747.51 |
| Uttar Pradesh | 1809.57 |
| Other States | 1964.71 |

Comments Received

- 36.1. **MPPMCL** has suggested that there should not be any provision for fuel cost for bagasse based co-generation plants. Bagasse is a by-product of sugarcane crushing while manufacturing sugar. Cost of sugarcane is adequately determined by State Governments to ensure return to stakeholders and paid to farmers and this cost already included in sugar pricing. Providing fuel cost for bagasse, amounts to additional payment/ double accounting of the same product. Further, bagasse can be used for paper making. Hence, its use in power generation should be discouraged for cleaner environment.
- 36.2. **Indian Sugar Mills Association** and **NFCSFL** have proposed that Fuel Price Indexation Mechanism is not sufficient to arrive at a logical price of bagasse. They have escalated the CERC Notified Bagasse Prices for FY 2016-17 by 5% and proposed the below prices for FY 2017-18:

| State | Bagasse Price FY2017-18 (Rs. / MT) |
|----------------|---------------------------------------|
| Andhra Pradesh | 1668.09 |
| Haryana | 2372.60 |
| Maharashtra | 2338.15 |
| Punjab | 2087.99 |
| Tamil Nadu | 1797.00 |
| Uttar Pradesh | 1860.82 |
| Other States | 2020.36 |

Additionally, they have submitted that the market price of bagasse is much higher than considered by the Commission.

36.3. **T SMA** has commented that Bagasse price of Rs.1622.16 proposed for Telangana is the lowest in the country and translates into variable tariff of Rs. 2.85 per unit - an increase in variable tariff of only 6 paise over previous year. This is not in line with the ground realities. Also, Heat value in bagasse would be the same throughout the country and as such there should not be any variation in the bagasse cost to be adopted for each State. It is further submitted that Bagasse is also a Biomass. However when compared to Bagasse the fuel cost adopted for biomass is very much higher

Government of India has prescribed MSP for paddy and wheat for past three marketing years as under:

(Rs./Qtl.)

| Marketing Year | Paddy | | Wheat |
|----------------|--------|-----------|-------|
| | Common | Grade 'A' | |
| 2014-15 | 1360 | 1400 | 1400 |
| 2015-16 | 1410 | 1450 | 1450 |
| 2016-17 | 1470 | 1510 | 1525 |

Source: Food Corporation of India

Rice husk constitutes around 50% of the fuel used by biomass generators in Telangana State and are allowed fuel cost as under:

| Biomass price | By CERC |
|---------------|---------|
| 2014-15 | 2751.20 |
| 2015-16 | 2940.31 |
| 2016-17 | 2807.74 |

Fuel cost allowed to biomass units is more or less double of MSP of paddy or wheat. In the case of bagasse based power, bagasse is also an agro waste and biomass. However bagasse price taken by the Commission is lower than the FRP as can be seen from the enclosed statement. Co-generated power is green power generated from annual renewable source and has to be encouraged as per the policy laid down by Government of India. This is possible only by extending it a preferential tariff.

Also, escalation in Bagasse cost to High Speed Diesel, fuel handling cost etc. The escalation formula prescribed does not take into account the cane price paid from which the Bagasse is generated. It is the firm opinion of this Association that the Bagasse price and its year on year escalation should be linked to Sugarcane price itself instead of linkage to fossil fuels.

It is submitted that the Bagasse price should be taken at 75% of the sugarcane price at FRP being paid in each state. Thus if sugarcane price is Rs.3000/- per MT, Bagasse price should be 75% of Rs.3,000/- i.e. Rs.2,250/- per MT. Alternatively, for each subsequent year of the Control Period, the normative escalation factor of 5% per annum shall be applicable at the option of the project developer. This would also encourage sugar factories to ensure higher recoveries which will in turn lead to higher sugarcane price to farmers.

- 36.4. **SISMA** has cited various data sources and requested to fix the bagasse price at Rs.2300/ MT for FY 2017-18 applicable for Tamil Nadu with annual escalation of 5% of base price.

Analysis and Decision:

The Commission has analyzed the comments and observations submitted by stakeholders. Some stakeholders have proposed to increase the price of fuel cost. However, there are views that there should not be any provision for fuel cost for bagasse based co-generation plants as Bagasse is a by-product of sugarcane crushing while manufacturing sugar and this cost is already included by the State Governments in sugar pricing.

The Commission is of the view that fuel prices should be considered for Bagasse based cogeneration plant plants for the purpose of tariff determination. Accordingly, the Commission has retained the fuel prices specified in the Draft Regulations.

Year-on-year escalation shall be 5%, hence it is no more linked to a defined index. The clause on escalation has been modified accordingly.

Chapter 7: Technology specific parameters for Solar PV Power Project

37. Capital Cost

Commission's Proposal

The Commission shall determine only project specific capital cost and tariff based on prevailing market trends for Solar PV project.

Comments Received

- 37.1. **MPPMCL** commented that Solar technology has matured now and achieved grid parity. To validate the indications and presumptions, Commission may seek appropriate analysis, data and input from bidders/ participants in recent solar bids, not excluding those of RUMS bidders, and conduct own exhaustive analysis on various parameters, including capital cost. This would provide Commission long term reference point for future endeavours. Hence, Accordingly Commission may determine project specific capital cost and other parameters in future.

Analysis and Decision:

The Commission welcomes the comments and suggestions from MPPMCL, and directs its staff to take into consideration these observations while determining project specific tariff for Solar PV projects.

38. Capacity Utilisation Factor (CUF)

Commission's Proposal

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

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

Comments Received

- 38.1. **NTPC** has commented that India may be divided into different zone (as in case of wind energy) with different CUF value and hence different tariff for different zone.

Analysis and Decision:

The Commission has examined this suggestion previously. It may be underscored that unlike wind resources, solar resource is fairly homogenous within State boundaries. Very few States see significant variation across their districts. Thus, it is recommended that the State Commissions take into account local GHI/DNI measurements and determine accurate expected CUF values in their State. The actual generation data from solar plants, as being recorded by respective SLDCs, should also be considered. However, one needs to be cautious as CUF is also a function of plant efficiency and design, thereby the incentives for the project developers must be aligned with encouraging plant efficiency.

39. Operation and Maintenance Expenses

Commission's Proposal

The Commission shall determine only project specific O&M expenses based on prevailing market trends for Solar PV project.

Comments Received

- 39.1. **NTPC** has suggested that while arriving out for O&M cost, in addition to increasing manpower cost, emphasis may also be given for long-term expenditure on electronic component oriented product like- Inverter, SCADA and other monitoring devices whose life/ product supports are short lived.

Analysis and Decision:

O&M cost norm as provided in previous control period considered all expenses related to part replacement over lifetime of the plant, as recommended by NTPC.

40. Auxiliary Consumption

Commission's Proposal

The auxiliary consumption factor shall be 0.25% of gross generation.

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

Comments Received

- 40.1. **NTPC** has commented the aux consumption indicated is very low. Further, actual operational data for Rajgarh 50 MW Plant & Ananthpur Solar 250 MW is attached and it is proposed that APC of Solar PV Projects should be at least 2%.
- 40.2. **Adani Green Energy Limited and National Solar Energy Federation of India Limited** have requested to consider auxiliary consumption for solar PV plants to be at-least 0.5% of total energy. They have submitted the data of three operating projects in Tamil Nadu and one operating project in Gujarat to support their argument

Analysis and Decision:

The Commission is of the view that there is not enough data to revise the Auxiliary Consumption values as defined in the Draft Regulations. The Commission directs its staff to undertake study on the same. Accordingly, Commission has decided to retain the Auxiliary Consumption of 0.25% for FY 2017-18, unless reviewed earlier by the commission.

Chapter 8: Technology specific parameters for Solar Thermal Power Project

41. Capacity Utilisation Factor (CUF)

Commission's Proposal

(1) The Capacity Utilisation Factor shall be 23%.

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

Comments Received

41.1. **Solar Thermal Power Association of India** has submitted that the CUF of 23% is based on the Direct Normal Irradiance of 2074 kWh/m²/year (references have been made from RE Tariff Regulations 2009). The actual DNI is in the range of 1550-1600 kWh/m²/year as per actual data from projects in Rajasthan and Andhra Pradesh. The CUF norm is based on data from 2005 based on Jodhpur location in Rajasthan. The CUF achieved with the actual DNI 1550-1600 kWh/m²/year is 16%. They have requested to take a complete review of latest available figures of DNI based on actual experience and data available of commissioned solar thermal plants.

Further they have also requested for a provision of stabilization period of 6 months on similar lines of biomass and MSW/RDF plants with a resultant relaxation in CUF norms during first year of operation. Projects are facing issues in achieving the optimum capacity during the initial year of operation based on the technology.

Analysis and Decision:

The Commission is of the view that there is not substantial data to revise the CUF of Solar Thermal projects. The Commission directs its staff to undertake study on the Solar Resource Assessment and other technical parameters like, Auxiliary Consumption, Stabilization Period, etc. Accordingly, the Commission has decided to retain the CUF as defined in Draft Regulations for FY 2017-18, unless reviewed earlier by the Commission.

42. Auxiliary Consumption

Commission's Proposal

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

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

Comments Received

42.1. **Solar Thermal Power Association of India** has submitted that norms for auxiliary consumption shall be revised from 10% to 12% based on actual experience and figures available of commissioned solar thermal plants without heat storage facility. They have also requested to verify the actual consumption and take a decision based on the same.

42.2. **Cargo Solar Power (Gujarat) Pvt. Ltd.** has requested to consider the recommendation of MNRE for usage of clean fuels (Natural Gas, Biomass and Grid electricity) to support as auxiliary fuel for solar thermal projects in its draft policy dated 5th May 2016.

Analysis and Decision:

The Commission is of the view that there is not substantial data to revise the Auxiliary Consumption of Solar Thermal projects. The Commission directs its staff to undertake study on the Solar Resource Assessment and other technical parameters like, CUF, Stabilization Period, etc. Accordingly, the Commission has decided to retain the Auxiliary Consumption as defined in Draft Regulations for FY 2017-18, unless reviewed earlier by the Commission.

Chapter 11: Technology specific parameters for Power Projects using Municipal Solid Waste / Refuse Derived Fuel and based on rankine cycle technology

43. Technology Aspect

Commission's Proposal

The norms for tariff determination specified hereunder are for power projects which use municipal solid waste (MSW) and refuse derived fuel (RDF) and are based on Rankine cycle technology application, combustion or incineration, Bio-methanation, Pyrolysis and High end gasifier technologies.

Comments Received

43.1. **Ecogreen Energy Pvt. Ltd.** has proposed entire range of technologies of Waste to Energy (WtE) shall be included in the eligibility criteria as well as considered under technology aspects.

Analysis and Decision:

The Commission has enlisted the prominent technologies as above. No specific technology has been mentioned by the stakeholder to be added to the list.

44. Capital Cost

Commission's Proposal

The Commission shall determine only project specific capital cost and tariff based on prevailing market trends for MSW/RDF projects.

Comments Received

- 44.1. **Ecogreen Energy Pvt Ltd.** has suggested have suggested the capital cost for WtE plants with Air-cooled Condenser configuration and Water Cooled condenser configuration separately.

| Technology | Cost with WCC (Rs Crore /MW) | Cost with ACC (Rs Crore /MW) |
|------------|------------------------------|------------------------------|
| MSW | 16 | 18 |
| RDF | 10 | 12 |

Analysis and Decision:

The Commission has analyzed the comments & observations submitted by the stakeholder. Since the Commission has decided to provide only project specific tariff for MSW/RDF, it does not find any material reason for providing capital cost for MSW/RDF based projects.

45. Station Heat Rate

Commission's Proposal

The Station Heat Rate for power projects which use municipal solid waste and refuse derived fuel shall be 4200 kcal/kWh.

Comments Received

- 45.1. **Ecogreen Energy Pvt Ltd.** has proposed the station heat rate at least 4500/kcal/kWh for WtE Projects as in WtE projects Vibrating Gate / Reciprocating Gate type boiler are advisable to use similar to biomass projects.

Analysis and Decision:

The Commission has analyzed the comments & observations submitted by the stakeholder on SHR of MSW/RDF based projects. The Commission would like to inform that the Regulations on MSW/RDF were introduced in RE Tariff Regulations with the introduction of Fourth Amendment in October 2015. The SHR values were also defined that time after a detailed analysis. The Commission is of the view that nothing substantially has changed since October 2015 and has decided to continue with the SHR value specified in the Draft Regulations.

46. Operation and Maintenance Expenses

Commission's Proposal

The Commission shall determine only project specific O&M expenses based on prevailing market trends for MSW/RDF projects.

Comments Received

- 46.1. **Ecogreen Energy Pvt Ltd.** has proposed O&M cost at-least 7% of the Capital Cost with an escalation of 5.72% thereafter.

Analysis and Decision:

The Commission has analyzed the comments & observations submitted by the stakeholder. Since the Commission has decided to provide only project specific tariff for MSW/RDF, it does not find any material reason for providing O&M expense for MSW/RDF based projects.

47. Fuel Cost

Commission's Proposal

Refuse derived fuel (RDF) price during FY 2017-18 shall be Rs 1,800 per MT. For each subsequent year of the Tariff Period, the normative escalation factor of 5% per annum shall be applicable at the option of the refuse derived fuel (RDF) project developer.

No fuel cost shall be considered for determination of tariff for the power projects using municipal solid waste (MSW).

Comments Received

- 47.1. **GUVNL** has commented that since the raw material for making RDF is Municipal Solid Waste which is free of cost, the fuel price of RDF should be zero. They, however suggest that the capital cost for RDF based project may be determined including cost associated with preparation of RDF as RDF preparation is an integral part of such project.

Analysis and Decision:

The Commission has analyzed the comments & observations submitted by the stakeholder. The Commission has observed that RDF has been assigned certain price in the market and hence proposed RDF price as Rs. 1800/MT. Further, the Commission has decided to retain the RDF price as specified in the Draft Regulation for FY 2017-18. The Commission also directs its staff that, while determining

project specific tariff, the impact of fuel preparation on capital cost should be ascertained (for RDF based projects).

Chapter 12: Miscellaneous

48. Miscellaneous

Comments Received

- 48.1. **ReNew Power Ventures Private Ltd. and Mytrah Energy (India) Pvt. Ltd.** have commented that Goods and Services Tax (GST) which will be in place by 1st July 2017, is expected to have a negative impact on the renewable sector with increase in input costs as any of the current exemptions available to the industry are to be subsumed under the Act and result in increase in LCOE of wind and solar projects. They have further referred report released by the Ministry of New and Renewable Energy that suggests the promulgation of the law can result in an overall increase in tariff of 12-15% in case of solar and 12-14% in case of wind. Hence, they have requested to either put on hold the present process till there's clarity on the slab in which different items are categorized gets finalized or build sufficient mechanisms to address concerns if any that may arise from promulgation of such legislation.
- 48.2. **ReNew Power Ventures Private Ltd. and Mytrah Energy (India) Pvt. Ltd.** have requested to consider de-rating factor for determination of Solar PV tariff as well as wind, as the performance of the technology gets de-rated over the period of 20-25 years. They have cited reference from NREL study according to which, this degradation is of the order of 1%. However, in hot climates both panels and PV cells degrade faster. According to a Mumbai IIT study, this degradation varies from <1% to 9%. If projects get degraded by more than 20%, it is considered to have reached the end of its lifetime. It is recommended nearly 1% for large solar farms and 2% for Rooftop projects.
- 48.3. **GUVNL** has commented that instead of proposing CUF on lower side, Commission may consider CUF on Zonal basis as considered in case of Wind which will ensure benefit to the consumers in areas where high solar radiation/insolence is received. Accordingly, tariff for different zones may be determined by the Commission
- NTPC** has commented that degradation may also be considered for Tariff determination in case of Solar PV.
- 48.4. **Adani Green Energy Limited and National Solar Energy Federation of India** have requested to consider module degradation of 0.70% per annum and by reducing the CUF over the operating life of the plant for determining the tariff of Solar PV projects in accordance with the regulations. References from Hon'ble APTEL judgment dated 17.04.2013 in Appeal No. 75 of 2012 and a separate datasheet of module have been submitted.

- 48.5. **IESA** has suggested classifying Renewable Energy sources with energy storage as a separate entity of 'firm power'.
- 48.6. **IESA** has further requested the Commission to invite a draft regulation in determining the capital cost of energy storage technologies as it would provide an opportunity for all stakeholders to present their views on the capital cost for different storage technologies.
- 48.7. **Cargo Solar Power (Gujarat) Pvt. Ltd.** has requested to consider the waiver of custom duty and VAT for promoting solar thermal technology. In addition they have also requested to consider VGF for solar thermal projects on case-to-case basis.
- 48.8. **Mittal Processors Pvt. Ltd.** has submitted that:
1. SHP can be the only source to balance the Solar and Wind projects in terms of their peaking load requirement
 - a. While the Wind and Solar can supply power at their designated times, if they are not adequately backed up by appropriate peaking station there will be an energy demand-supply mismatch. In absence of any other any peaking station especially like GAS, which includes shortage of gas supply, hydro power will be only source of supply for peaking demand.
 - b. 5 MW hydro project will be able to balance the peaking requirement of 15-20MW solar project in energy terms due to its higher CUF.
 2. Transmission Bottleneck can be overcome more easily by SHPs –
 - a. It will be hard and expensive to create transmission infrastructure in the hilly areas hence either these remote areas will not be getting adequate power supply since bringing power from stations based in lower reaches will not be possible or it will require significant state investment. However SHP can cover multiple villages in the hilly region using a local area grid and still transmit excess power to the rest of the grid using a single connection point. Here if adequate incentives are provided to the SHP developers to create a local transmission network these remote areas can be provided access to inexpensive power without any major state investment. We believe it is economically more viable to built SHP and distributed / de-centralized generation.
- 48.9. **Indian Institute of Technology, Roorkee** has submitted that large hydro power systems are normally connected to 132 or 220 kV grid, which are not subjected to frequent breakdowns. Small Hydropower is often connected to 11 or 33 or 66 kV being in dispersed locations and thus have very frequent breakdowns. The loss of generation from each breakdown is not only the period of grid breakdown but also time taken to restart and synchronize the plant/machines with

grid (often it takes 10 to 20 minutes each time) over the duration of line breakdown. On an average the loss of generation for which the investors do not get paid back is 480 hours of non-availability of grid (as per normal PPA). They also do not get accounted in the tariff the loss of generation for the period required to restart/synchronize the plant. Having no storage of water (being run of river schemes) there is a loss of generation of about 5% to 10% on small hydropower plants on this account. This loss need to be taken into account by offering deemed generation in the order of 5% to 10%. For such cases, this issue has been inadvertently left out to be addressed in tariff calculation.

Quantum and time availability of subsidy from MNRE is an uncertain matter and hence may not be taken as normative norm for cost reduction while calculating tariff. It needs to be adjusted against loan repayment. The purpose of subsidy is to reduce the risk and viability gap of SHP and is loss if this is taken into tariff computation.

48.10. **HPERC** submitted that the cost of power from SHP projects is increasing and there are inadequate level of subsidies or incentives. The Discoms do not find it prudent to purchase the RE Power from SHPs at enhanced rates. The Commission may advise the Govt. of India under section 79(2) of the Act to take suitable steps for boosting up the subsidy/incentive levels for SHPs.

48.11. **Hero Future Energies Pvt. Ltd.** has suggested that Renewable generators need to be safeguarded against payment delays and timely payment mechanism needs to be evolved wherein RE generators shall be given priority over other sources, It has requested the following clause in the regulations to be added:

Timely Payments for RE Procurement

The Commission shall ensure that the tariff for renewable energy shall be paid by obligated entities/procurers, in a timely manner. The payment for procured RE shall be given priority on payment over power procured from other sources.

48.12. **MPPMCL** has commented that it is observed that the Commission has proposed significant hikes in O&M costs (up to 32%) and fuel costs (up to 25%) for different RE technologies. It is requested to keep these hikes in 10-15% which will make these technologies more competitive and garner wider acceptability by stakeholders in larger social interest.

48.13. **Prayas Energy Group** has commented that there is a dire need to re-look at the whole economics of biomass based power generation systems, since their levelized tariff now lie in the range of Rs 6-7.5/kWh. It would be useful for the Commission to start a discussion on this issue.

48.14. **Prayas Energy Group** has welcomed the initiative to do away with generic capital cost and O&M cost assumptions, especially for wind and solar PV and the fact that section 86 allows deviation

from these norms as long as the agreed tariff is below the does not exceed the levelised tariff calculated on the basis of the norms specified in these regulations.

48.15. **Prayas Energy Group** has commented that there is need for separate RE targets (RPOs) arises as long as there is a lack of a level playing field for renewables (i.e. the cost of socio-environmental externalities of conventional power is not internalised), or till such time as there continues to be a direct price differential between RE and conventional power. In the medium term, as RE and conventional power prices begin to converge, policy and regulatory officials as well as DISCOMs should begin to include renewables as an integral part of the least cost planning exercise than continue with separate targets. Such an exercise could give some form of preference for RE for its environmental benefits (possibly through a higher weightage in the merit order stack) in line with the national vision of increasing the share of RE. However, on the other hand, it should also consider any added differential in system integration costs (e.g. higher balancing costs) arising due to RE. Estimating and attributing such RE specific integration costs is not an easy exercise. However, these will also help ease the integration of renewables into the grid. While calculating differential in integrating costs arising due to RE the assumptions for grid reliability and functioning should be normalised in both cases.

Also, with solar PV prices crashing, the earlier price difference between solar and say wind/biomass has vanished. The problem will only get more pronounced with time. Hence the very basis for differentiating between solar and non-solar RPOs and RECs is debatable and will need to be addressed soon. Obligated entities should be able to procure the cheapest form of renewables, subject to technical grid constraints and after considering the system value (distance from transmission lines, contribution to peak demand etc.) of those renewable energy projects beyond mere generation price. The Commission should initiate a discussion on the above issues.

48.16. **Solar Thermal Power Association of India** has also requested to define “Advance Technology” in respect of solar thermal projects with heat storage facility. They have submitted that the distinction between solar thermal projects with heat storage facility and without heat storage facility is relevant in reference to the back-to-back arrangement of solar thermal projects under composite schemes under Electricity Act 2003, and under the schemes of the Central Govt. which provide that in case of solar projects using advanced technologies, the value of CUF shall be 7% below the average CUF committed by the solar developer. References from RE Tariff Regulations 2009 and its Statement of Reasons Order have been cited.

48.17. **Him Urja Pvt. Ltd.** submitted that Hon’ble Commission may like to obtain data from the developers so as to ascertain their financial health. The under recovery is basically due to low

normative capital cost which is not enough to develop a project and low O&M charges which is again based on the low normative capital cost.

In 2013 disaster most of the projects including our project suffered extensive and shut down for long periods. The loss of generation due to reasons not attributable to developer is not protected under regulations resulting in permanent erosion in equity. This loss cannot be recovered by the developers as it is operating in cost plus tariff regime. The so called incentive of generation after 45% CUF is only on the paper as none of the developers are able to achieve it.

Though the stated objective of the RE Regulations is to provide preferential tariff to small hydro projects but in practice it receives much less than what is given to large hydro.

The tariff based on regulations of the large hydro power projects may be much more beneficial to small hydro if so allowed with minor modifications as below:

- Exemption from declaration of the capacity and substituting it with some availability norm.

48.18. Design energy based on the average of historical data of large projects or on the basis of the energy calculated in the DPR for 90% dependable year. IIT Kanpur has commented that for regulation principles it is difficult for the regulator to keep track of the actual cost of the regulated entities and hence Norm-based costs are prescribed in the regulation. Further, it says that in the existing regulatory environment in the Indian power sector pertaining to the domain of the CERC, arguments based on the 'actual' cost components and the actual operational parameters would negate the regulatory principle adopted by the CERC.

Hence, tariff regulations should not be overwhelmed by the 'actuals' for setting the benchmark cost and operational parameters. If the regulations always follows the purported 'actuals', there would never be an incentive to reduce costs and to improve operational performance.

48.19. On Stabilisation period, Dr. Anoop Singh (IIT Kanpur) has commented that Technical stabilisation for generation unit should have occurred before the CoD and is to be built into the turnkey contract with the technology supplier. Additional provision for stabilisation period may not seem necessary. Any stabilisation of fuel supply for biomass/waste based plants needs to be planned by adequate on-site storage before the CoD.

Analysis and Decision:

- ReNew and MEIL have raised concerns over application of GST on inputs to projects, thereby resulting in increased costs. The Commission can look into it only when it is implemented and the exact impact on prices of specific goods and services is known.

- ReNew, MEIL, Adani and NSEFI have commented on degradation rate of panels, citing sources which advise that this rate is higher, and on methodology to incorporate degradation in tariff calculations. Module degradation is not relevant as the Commission is issuing any generic tariff.
- GUVNL has pointed out that the CUF norm is on the lower side, and suggested that CUF zones may be considered for Solar projects as well. The irradiation map of India as available on MNRE's website shows that solar resource is fairly homogenous across large tracts of the country. Specifically, variation within State boundaries is not much, except for a few States (e.g. M.P., Chhattisgarh etc.). The Commission advises the State Regulatory Commissions to consider local conditions while regulating tariff for Solar projects. Additionally, an exhaustive CUF study shall be conducted by the Commission based on actual data of installed solar & wind projects.
- The role of energy storage as a balancing resource for the grid is being examined separately and the Commission staff has issued a staff paper in this regard.
- Waiver of custom duty, VAT and provision of VGF are requests that are outside the scope of the Regulatory process. Interested stakeholders may address these recommendations to MNRE.
- Comments of Mittal Processors regarding benefits of SHP plants are acknowledged. It may be noted that the Commission continues to provide regulated tariff to encourage deployment of SHP projects at good sites.
- **AHEC, IIT Roorkee** has commented on the time lost due to restart and synchronize with grid after every line breakdown. The Commission appreciates the concern. This is akin to demand for deemed generation benefit or two part tariff structure, by wind and solar generators. This aspect needs detailed examination and cannot be covered in the present scope of RE tariff regulations. The Commission directs the staff to examine and prepare a staff paper highlighting inter alia the pros and cons of this dispensation and solicit stakeholders' comments.
- Hero Future Energies has requested for a regulation on priority of payments to RE generators over other generators. Payment terms may be negotiated while signing the PPA. The Central Government is also safeguarding interests of RE generators by arranging institutions such as SECI to sign PPAs with developers and sign a back-to-back PSA with the Discoms.
- Prayas Energy Group has suggested that a deep dive should be undertaken to take a look at biomass systems as their tariffs continue to be high. This is acknowledged and the staff of the

Commission may initiate a study in this regard. At the same time, it should be noted that biomass plants ensure efficient utilization of crop residues in agricultural areas, which otherwise have no means of disposal except burning. Burning of large scale crop residue causes air pollution, which has been highlighted as one of the major reasons for winter smog in Delhi, for example.

- Prayas has also commented that the need for having a separate RPO for Solar goes away now, and possibly the time is right to do away with the RPO framework. The Commission has taken note of these comments. This discussion is outside the scope of the RE Tariff Regulations, and shall be initiated in an appropriate context.
- The suggestion regarding definition of advanced technology with respect to solar thermal plants is acknowledged; however, since generic tariff is not being provided for solar plants, the Commission has decided to proceed as proposed in the draft regulations.
- Him Urja has highlighted the impact of Uttarakhand disaster of 2013 on SHP developers of the State. The Commission is sympathetic on the issue of protection in case of natural disasters and advises that a clause to this effect should be incorporated in the agreement to be signed between the seller and the buyer.
- Comment of Solar Thermal Association of India has been examined. The SOR of RE Tariff Regulations 2009 (as referred by them) clearly mentioned

“The generic norms under these Regulations have been provided for solar thermal power plants without thermal storage. In case a developer chooses to develop the system with thermal storage, the tariff determination for such system could be taken up on case-to-case basis under ‘project specific’ tariff determination route. As design of thermal storage, extent and type of thermal storage would be unique; it is preferred to deal with such project cases on case to case basis.”

Thus, Commission has already distinguished between plants with and without thermal storage.

Sd/-
(Dr. M. K. Iyer)
Member

Sd/-
(A.S. Bakshi)
Member

Sd/-
(A.K. Singhal)
Member

Sd/-
(Gireesh B. Pradhan)
Chairperson

New Delhi
18th April, 2017