

Madhya Pradesh Electricity Regulatory Commission

**Tariff Order for Procurement of Power by Distribution
Licensees from Small Hydro Based Generation**

30th June 2008

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1: BACKGROUND

- 1.1 In February 2004, Madhya Pradesh Electricity Regulatory Commission (herein-after referred to as “MPERC” or “Commission”) had issued a discussion paper titled “Approach Paper on Tariff-Setting and Support to Renewable Energy Sources”. The Approach Paper had noted that pricing of the conventional electricity does not take into account the costs corresponding to negative externalities such as pollution, depletion of resources, displacement of people, damage to fragile ecosystems, etc., which is consequence of some of the conventional forms of generation. In this regard, the Paper had emphasized the importance of investments in renewable sources of energy, which is a cleaner form of energy generation apart from being environment friendly.
- 1.2 Broadly, the Approach Paper had covered the following areas:
- (a) Mechanisms to determine Minimum Purchase Requirements of renewable based power for the Licensees
 - (b) Identification of issues that may arise as a result of increasing production from renewable sources
 - (c) Mechanisms to supplement Minimum Purchase Requirements and address issues that arise as a result of increasing production from renewable sources.
 - (d) Need for determination of a suitable tariff for procurement of power by grid from wind based generation
- 1.3 In continuation with the above Approach Paper, MPERC has been determining tariffs for various renewable energy based generations. The Commission adopts the consultation process on tariff determination by taking out a discussion paper which highlights the approach of the Commission. Stakeholders’ comments on the approach of the Commission are considered and incorporated in the tariff order.

2: SMALL AND MINI HYDRO POTENTIAL

- 2.1 Hydroelectricity accounts for approximately 25% of India’s electricity generation. There is a wide variance in the size of hydroelectric plants, ranging from a few kilowatts to several hundreds megawatts. There is a potential of 15000 MW of small Hydro based generation in India. The State of Madhya Pradesh has an estimated potential of 410 MW for small hydro based generation. It may be noted that the Commission has set an obligation of 10% of the total procurement from non-conventional energy sources for the utilities¹ and provision of purchase of power by grid from Small Hydro based generation, facilitated by this tariff order will help achieving the target.

¹ Vide biomass tariff order issues in the month of August, 2008.

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- 2.2 While the Ministry of Power, Government of India deals with large hydro projects, the mandate for the subject small hydro power (up to 25 MW) is given to the Ministry of New and Renewable Energy, Government of India. Small hydro power projects are further classified as

Class	Station capacity in kW
Micro Hydro	Up to 100
Mini Hydro	More than 100 to 2000
Small Hydro	More than 2000 to 25000

- 2.3 Promotion of Small Hydro Projects (hereinafter it refers to all forms of SHP as mentioned in the table above) offers advantage over conventional form of generation, as apart from providing a clean & renewable source of energy, it avoids some of the key pitfalls of larger projects, such as extensive submergence, loss of forests, habitat destruction, rehabilitation problems, etc.

3: LEGISLATIVE PROVISION

- 3.1 The State Electricity Regulatory Commissions (SERCs) under Section 86(1)(e) of the Electricity Act 2003, are mandated to promote co-generation and generation of electricity from renewable sources of energy by providing suitable measures for connectivity with the grid and sale of electricity to any person. The Commissions are also required to specify, for the purchase of electricity from such sources, a percentage of the total consumption of electricity in the area of a distribution Licensee. Further the Act, under Section 62 empowers the Commissions to determine the tariff for the supply of electricity by a generating company to a distribution Licensee in accordance with the provisions of the Act. Also, Section 61 provides that the Commissions are to specify the terms and conditions for the determination of tariff and, in so doing, be guided by the principles listed in Clauses (a) to (i) of that Section.
- 3.2 As per the Proviso 6 of Section 6.4 of Tariff Policy, it has been recognised that it will take some time for the non-conventional energy sources to compete with conventional sources of energy, hence its procurement shall be done at preferential tariffs to be determined by the Commissions and states as under:

(2) Such procurement by Distribution Licensees for future requirements shall be done, as far as possible, through competitive bidding process under Section 63 of the Act within suppliers offering energy from same type of non-conventional sources. In the long-term, these technologies would need to compete with other sources in terms of full costs.

(3) The Central Commission should lay down guidelines within three months for pricing non-firm power, especially from non-conventional sources, to be followed in cases where such procurement is not through competitive bidding.

3.3 Hence, in exercise of the powers vested in it under Section 86(1)(a), (b) and (c) read with (e), and Section 62(1) of the Electricity Act, 2003 (EA, 2003) and all other powers enabling it in this behalf, the Madhya Pradesh Electricity Regulatory Commission, through this order, determines the tariff, procurement process and related dispensation for the purchase of power by the distribution licensees in Madhya Pradesh from Small Hydro based generators in the State.

3.4 The Appellate Tribunal for Electricity (APTEL) in its order dated May 18, 2007 recognises the need for promoting renewable energy source. The order states that

“...The State and its Authorities including the Electricity Regulatory Commissions have a solemn responsibility to protect and improve the environment for present and future generations. Article 48A of the Constitution of India, as a directive principle of the State Policy, inter alia, provides that the State must endeavour to protect and improve the environment. Article 51-A (g) casts a duty on the citizens of India to protect and improve the natural environment. Article 21 of the Constitution, which in its bosom conceals different facets of the right to life, imposes a positive obligation on the State and the Authorities created by it, to take preventive measures, to protect the ecology and environment and to conceive, anticipate and attack the causes of environmental degradation.

The preamble to the Electricity Act, 2003 recognizes the significance and importance of promotion of efficient and environmentally benign policies. In consonance with the preamble, Section 61 (h) of the Electricity Act, 2003, spirit of the Constitution and concern for the environment, it is the bounden duty of the Regulatory Commissions to frame Regulations with a view to give fillip to the production of power through renewable sources of energy. While framing the Regulations, the Regulatory Commissions must have regard to the thrust and spirit of the aforesaid provisions of the Constitution and Electricity Act, 2003, the National Electricity Policy and MNES guidelines. The Regulations should be fashioned in such a manner that it should be possible to build up sizable capacity through clean renewable sources of energy.”

3.5 The Appellate Tribunal has emphasized the mandate for regulatory commissions to incentivise renewable generation in its order dated 28 Sept. 2006. The order notes that

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“...The preamble of the Act also recognizes the importance of promotion of efficient and environmentally benign policies. It is not in dispute that non-conventional sources of energy are environmentally benign and do not cause environmental degradation. Even the tariff regulations u/s 61 are to be framed in such a manner that generation of electricity from renewable sources of energy receives a boost. Para 5.12 of the National Electricity Policy pertaining to non-conventional sources of energy provides that adequate promotional measures will have to be taken for development of technologies and a sustained growth of the sources. Therefore, it is the bounden duty of the Commission to incentivise the generation of energy through renewable sources of energy. PPAs can be re-opened only for the purpose of giving thrust to non-conventional energy projects and not for curtailing the incentives.”

Madhya Pradesh Small Hydro Policy

- 3.6 The Government of Madhya Pradesh has issued “Incentive Policy for the Development of Small Hydro Power Projects in Madhya Pradesh” in August, 2006. The policy provides for selecting the developers of pre-identified small hydro projects on the basis of the quantum of minimum free power, they are willing to provide to the state. The provision with regard to the free power as indicated in the aforementioned policy of GoMP is reproduced below:

Sl. No.	Estimated Installed Capacity	Free Power as % of total generation minus Auxiliary Consumption
1.	Up to 5MW	5% with exemption of 3 years from COD
2.	More than 5MW & up to 10MW	8% with exemption of 2 years from COD
3.	More than 10MW & up to 25MW	10% with exemption of 2 years from COD

- 3.7 The policy has made the provision that the developers of such projects may operate the plants as CPPs/PPPs on a Build-Own-Operate-Transfer (BOOT) basis for a period of 30 years or plant life, whichever is less.
- 3.8 It also clarifies that the determination of bulk supply tariffs as well as the regulation of PPAs, wheeling, banking, T&D loss charges, etc remain under the exclusive jurisdiction of the Commission.
- 3.9 This SHP Tariff Order also follows the guidelines of the “Incentive Policy for encouraging generation of power in Madhya Pradesh through Non-conventional Energy sources (solar, wind, bio energy, etc.)” issued by the Government of Madhya Pradesh dated 17.10.2006

4: REGULATORY PROCESS

- 4.1 Water Resource Department (WRD) of the Government of Madhya Pradesh, as petitioner, and Narmada Valley Development Authority (NVDA) as a co-petitioner filed a petition in December 2006 before the Commission for determination of the tariff and other related issues for sale of power generated from Small Hydro-Power Projects. WRD also sought the approval of the Commission for tariff for sale of power by Small Hydro Power Projects to utilities, based on a typical 1 MW cost model for all the SHPs up to 25 MW for two categories of Projects i.e. Canal based Projects and Run-of-the-River (RoR) Projects.
- 4.2 The Commission held the hearing on April 17, 2007, wherein the Commission heard the Petitioner, Co-Petitioner and the Respondents. The Commission took note of the objections/suggestions of the respondents, replies made by the Petitioner and Co-Petitioner and the tariff prepared by Petitioner for 30 years for canal head projects from 666 P/U (year 1) to 391 P/U (year 30) and for run of river projects from 681 P/U (year 1) to 303 P/U (year 30). A public notice was issued on August 01, 2007 on the subject petition to obtain the comments/ objections from the public. The last date for filing the comments/objections was 21/08/2007. The Commission office did not receive any comments from the public within the stipulated time. Only MP Power Trading Company Limited, vide its letter of 21/08/2007, requested the Commission to consider its submission.
- 4.3 The Commission held the hearing on 26/09/2007. During the course of the hearing the Commission observed that the cost of the Small Hydro project is location specific and depends on the capacity of the project. In the petition the Petitioner neither specified the capacity nor the location, instead, made the petition for determination of tariff for sale of power from Small Hydro Projects to Utilities on the basis of a typical 1 MW model. The Commission has, in the past, determined the tariff for sale of power from wind generation and bio-mass generation to the utilities of the State, wherein the process was initiated by the Commission by issuing a detailed discussion note. On the same premise, a decision was taken to develop a discussion paper detailing the approach of the Commission to determine tariffs for canal based and run-of-the-river based Small Hydro projects in the state.
- 4.4 A discussion paper on the approach of the Commission for determination of tariff for SHP based generation was issued on 06.12.2007.
- 4.5 The Commission had issued a public notice on 08.12.2007 to invite comments/suggestions from all stakeholders by 31.12.2007 which was subsequently extended to 15.01.2008. The Commission received comments/ suggestions on the various aspects of renewable energy projects and the respective provisions of the draft Regulation from the following:

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Name of organisation
M.P Electricity Consumers Society , Indore
M/s Ecological Energy Power Limited, Jabalpur
M/s Consolidated Energy Consultants Limited (CECL), Bhopal
Narmada Valley Development Authority, Narmada Bhavan, Bhopal
Mr D G Joshi, Jabalpur
M/s Surge Power and Infrastructure Pvt. Limited, Bhopal

- 4.6 Further, a Public hearing was held on 27.02.08 at the Commission's Office, which was attended by the following stakeholders:

Name of organisation
M.P Electricity Consumers Society , Indore
Ecological Energy Power Limited, Jabalpur
Consolidated Energy Consultants Limited (CECL), Bhopal
Narmada Valley Development Authority, Narmada Bhavan, Bhopal
Mr D G Joshi, Jabalpur
Surge Power and Infrastructure Pvt. Limited, Bhopal
Veera Power and Infrastructures (P) Ltd
Ascent Hydro projects Ltd.

- 4.7 The Commission has kept in view the tariffs issued by other State Electricity Regulatory Commissions, comments/objections from different stakeholders, facts on small hydro based generation from various sources including WRD, guidelines of Central Electricity Regulatory Commission as well as Central Electricity Authority for the determination of tariff for procurement of power from renewable energy sources. Accordingly, the Commission issues the following order.

5: APPLICABILITY OF THE ORDER

- 5.1 This tariff order shall be applicable to all Small Hydro Power Projects up to 25 MW capacity in the State of Madhya Pradesh commissioned on or after the date of issue of this order and intended for sale of electricity to the Distribution Licensees within the State of Madhya Pradesh.
- 5.2 Existing Small Hydro Projects in the State shall be governed according to the “Incentive Policy for the Development of Small Hydro Power Projects (SHP) in Madhya Pradesh”.
- 5.3 It may be specifically noted that the tariff determined through this order is based on the Government of MP’s incentive policy for the development of SHP in MP, notified on August 8, 2006. In this context the applicability of the Order shall be on the projects developed on the basis of above-mentioned incentive notification.
- 5.4 In case of change in the above-mentioned incentive policy of the Government of MP, the Commission may review the tariff as per the requirement.
- 5.5 It is made mandatory through the Order, for the Licensees to submit to the Commission quarterly progress reports on the capacity addition, purchase of energy and other relevant details in respect of SHP based electric generation projects commissioned in their licensed area. The progress made shall also be posted on their websites on a regular basis.

6: TARIFF REVIEW PERIOD/CONTROL PERIOD

- 6.1 The control period will start from the date of issue of this order and will close at the end of FY 2013 i.e. on 31.03.2013. The tariff decided in a particular control period shall apply to all Small Hydro Projects which come up within that control period and the tariff determined for a project shall remain in effect for the whole project life of 30 years from the date of grid connectivity.

7: MECHANISM FOR TARIFF DETERMINATION

- 7.1 WRD in its petition had requested for separate tariffs for Run-of-the-River (RoR) and Canal Based Generation. The Run of the River projects exploit the water flow of the river by diverting it to the power house by constructing small barrages. If the river is not perennial, then the generation could be possible only when there is sufficient water flow, may be, during monsoon.

- 7.2 On the other hand, generation of power from canal based projects is solely dependent on water releases for the purpose of irrigation and is therefore done during the irrigation seasons only. At the same time, such projects have readily available reservoirs and relatively more easily accessible sites. These projects would normally do not have problems of land acquisition, forest clearances and rehabilitation and resettlement costs. As such capital cost of canal based projects is generally less than that of run of the river projects.
- 7.3 Owing to difference in the nature of these projects and also in their costs, the Commission has determined separate tariffs for the run-of-the river and canal based SHPs.

Cost-plus Approach

- 7.4 The Commission has adopted the cost plus approach to determine tariff for procurement of power from SHP based generation. The cost-plus approach to tariff determination would ensure that the investors are protected for the cost and associated risks. Here the tariff setting is determined in a manner that the developer recovers its cost incurred on interest on loan, operation and maintenance (O&M), depreciation etc. and also earns a regulated rate of return on equity.
- 7.5 The advantage of a cost based tariff approach is that it provides the scope for cost reduction for developers through technological innovation and development. Also the cost of renewable power generation sets is reducing gradually and since it is difficult to predict this reduction, the actual cost can be reflected through the cost plus tariff mechanism. Further, since the tariffs can be set for a longer period, the annual exercise of tariff setting can be avoided.

Single Part Vs Two Part Tariff

- 7.6 Normally, two part tariff is applied in order to recover fixed and variable costs through the fixed and variable components of tariff separately. Two part tariff is also used where the proportion of variable components in tariff is quite large and is useful in a scenario of merit order dispatch.
- 7.7 Small hydro power projects are not amenable to merit order dispatch principles because of infirm nature and almost all the costs of SHP generators are fixed in nature, hence it is appropriate to have a Single Part tariff for SHP generators.
- 7.8 For the Small Hydro Projects, taking into consideration their contribution to the total generation handled by the State Grid, single part tariff appears appropriate as the Commission believes that the implementation of two part Tariff may involve large administrative machinery for monitoring & settlement.
- 7.9 Most of the States have adopted the same methodology. Water Resource Department in its petition has also recommended cost plus methodology and single part tariff.

Benchmarking

- 7.10 This approach generally requires evaluation, detailed scrutiny and determination of each cost parameter for each Project separately. There will be considerable diversity in the value of parameters across the Projects, such as in respect of water availability and consequently the plant capacity, construction cost, utilisation factor, financing plan, etc.
- 7.11 In the absence of availability of such extensive data in Madhya Pradesh , the approach for benchmarking was done by the following means:
- (a) Normative benchmarking based on guidelines of Central Electricity Authority and Central Electricity Regulatory Commission.
 - (b) Analysis of tariff orders issued by various State Electricity Regulatory Commissions.
 - (c) Water Resource Department's and other stakeholders' response to approach paper on procurement of electricity from small hydro projects.
 - (d) Cost details received from project proponents.
 - (e) Guidelines and details on project cost from Indian Renewable Energy Development Agency, Ministry of New and Renewable Energy Sources and Appellate Tribunal for Electricity.
- 7.12 Regulatory clarity and certainty in Tariff setting is necessary from the perspective of developers, investors and lenders, in order to support investments in Small Hydro projects. Thus, while there is merit in setting a uniform tariff level for the Small Hydro Projects, it is also necessary to set out clearly its premises and rationale. A 'Benchmark Tariff Determination', based on performance standards in terms of operation and maintenance cost, auxiliary consumption, Plant Load Factor, depreciation, etc. has been made by the Commission and the cost of generation on benchmark performance norms has been arrived at by the Commission.

Project Specific or Generalized Tariff

- 7.13 A Generalized tariff mechanism would provide an incentive to the investors for use of most efficient equipment to maximize returns and for selecting the most efficient site. The process of project specific tariff fixation will be cumbersome and time consuming. It is proposed to use a generalized benchmark tariff for all the Small Hydro Power plants.

Front Loaded or Back Loaded tariff

7.14 In case tariff is front loaded the developer can switch to third party sale after enjoying the benefits of higher tariffs in the initial years and selling electricity to utilities at a higher rate. On the other hand with a back loaded tariff, the developer may not be able to meet his loan liability in the first few years of the project. The Commission, therefore, decides to adopt the cost plus approach towards tariff determination so as to balance the requirement of various stakeholders.

8: TARIFF DESIGN

RUN-OF-THE-RIVER PROJECTS

8.1 Typically in a cost plus approach the tariff would depend upon the assumptions on investment costs, operating costs, financing costs and the operating parameters. The key elements that influence the determination of tariffs are mentioned below:

- Capital Cost
- O&M Cost
- Capacity Utilisation Factor
- Debt-Equity Ratio
- Interest on loan capital
- Interest on working capital
- Depreciation
- Return on Equity
- Auxiliary consumption

8.2 In subsequent sections, stakeholders' views are presented along with the view of the Commission on various tariff components

Capital Cost

8.3 Based on the approach paper of the Commission issued on 08.12.2007, stakeholders made the following submissions on the capital cost of the RoR and canal based generation:

- (a) Consolidated Energy Consultants Limited, Bhopal mentioned in its written objection that the evacuation cost of Rs 25 lakh per MW appears on the lower side and as the cost is dependent on the length of the line as also the capacity of power needed to be handled and voltage of the line. Hence, the cost of evacuation can be increased up to Rs 50 lakh per MW for both forms of generation.

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- (b) M.P. Electricity Consumers Society submitted that all the charges for the connection with the grid should be provided by the MP Trading Company.
- (c) Surge Power and Infrastructure Private Limited requested that the tariff for RoR projects should be calculated by taking into account a benchmark capital cost of Rs 6.75 Cr/MW.
- (d) Water Resources Deptt. Govt. of Madhya Pradesh has proposed the capital cost of Rs.10.45 Crore per MW for RoR projects.

8.4 The following are the capital cost values allowed by some other Regulatory Commissions in determining tariffs for purchase of power from SHP sources:

States	AP	Uttarakhand	Maharashtra	Karnataka	Chhattisgarh	HP	UP
Capital Cost	Rs 4.5 Crore/ MW	Rs. 5.5 Crore /MW	Rs 4.4 Crore /MW	Rs 3.9 Crore /MW	Actuals *	Actual expenditure (ceiling of Rs. 6.5 Crore/MW)	Rs 4.5 Crore /MW
Date of order	July 04	Nov 05	Nov 05	Jan 05		Dec 07	July 05
WPI CAGR	4.35%	4.18%	4.18%	4.72%			4.38%
Present Value of capital cost	Rs 5.22 Crore/ MW	Rs 6.01 Crore /MW	Rs 4.81 Crore /MW	Rs 4.48 Crore /MW			Rs 5.01 Crore /MW

**subject to prudence check by the Chhattisgarh Commission*

8.5 MNRE provides capital subsidy for SHP for a special category of States and for other States to the tune of Rs. 2.25 Cr./MW x (Capacity) x 0.646 and Rs. 1.5 Cr./MW x (Capacity) x 0.646 respectively. It is a measure taken by MNRE to promote SHP and is generally treated as an incentive for developers of small hydro projects.

However, the above policy is likely to change in the near future. It is expected that MNRE may change it to generation based incentive in the near future.

On the issue of factoring the incentive of capital subsidy provided by Central Government, some of the stakeholders presented to the Commission their concerns as follows:

- (a) NVDA submitted that it is difficult for the small entrepreneurs to fulfil the formalities of availing the capital subsidy. Hence it should not be considered for tariff determination process.
- (b) Surge Power and Infrastructure Private Limited suggested that subsidy amount should not be deducted to calculate the capital cost for the determination of tariff.

Commission's view

- 8.6 The Commission had sought suggestions from stakeholders on whether capital cost norms should be different for different project sizes (<1 MW, 1-10 MW, 10-25 MW, etc). In the absence of any comment on this issue the Commission proposes a common capital cost across all project sizes.
- 8.7 The approach adopted by various SERCs on considering the effect of subsidy provided by MNRE is different while determining the tariff for SHP based generation. In its recent order, HPERC cites that “in order to fulfil the mandate of promoting renewable energy generation provided by Section 86 (1) (e) and Section 61(h) of the Electricity Act 2003, the Commission has decided that the entire benefit of subsidy be given to developer as incentive for the purpose of promotion of small hydro power in the State.” It further indicates that in the light of increased number of renewable energy projects in the recent past and inclining trend in the future, budgetary requirement for subsidy will become difficult for GOI.
- 8.8 Chhattisgarh State Electricity Regulatory Commission (CSERC) mentions in the SHP Order – “Small hydel projects are in developing stage in the State and commissioning of the projects for which agreements have been reached with the CREDA, may take at least 2-3 years from now. It is not certain if the said policy will be in force till that time. Under such situation, the Commission feels that it would not be appropriate to take into account MNES subsidy if any, for the purpose of tariff determination. Otherwise also considering promotional aspects, such subsidy may be to the benefit of the developer. However, if the developer gets any subsidy / incentive from MNRE / State Govt. or any other agency on the capital cost, then such subsidy / incentive shall be considered by the Commission at the time of tariff determination.”
- 8.9 Maharashtra ERC in its Order issued in June 2005, has factored the amount of subsidy into tariff. The Order mentions that “Subsidy is intended to make cost of renewable energy competitive as compared to cost for conventional sources, through repayment of term loan taken by the developer from financial institutions. In such a scenario keeping the subsidy out of the tariff calculation will adversely affect the tariff (viz. increase the levelised tariff to the utility by approximately 9%) and the interest of the consumers, besides affecting the development and harnessing of the SHP potential in the State.”
- 8.10 There are two reasons why MPERC does not take into account the subsidy provided by MNRE while determining capital cost of SHP. First the SHP sector is in its nascent stage and developers need support to invest in the sector. Secondly, current level of procurement from renewable energy sources by utilities has been abysmally low. As per tariff order FY 09, utilities procured only 41 MU from renewable sources out of 37100 MU in the year 2007-08, which is merely 0.11% of the total procurement. It is largely due to the fact the State has very less installed capacity of renewable energy projects and the developers need to be incentivised to add more capacity.

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- 8.11 Keeping in view the uncertain future of the capital subsidy of MNRE, need to promote SHP in the State, the Commission is of the view that the capital cost considered for tariff determination should not include subsidy provided by MNRE.
- 8.12 In the absence of the base data for any Small Hydro Project in the State, the Commission has assessed the capital cost as allowed by other Commissions. The most recent order of Himachal Pradesh indicates the maximum ceiling for the capital cost as Rs. 6.50 Crore per MW. The Commission appreciates the fact that projects in MP may be located at remote places and also incur higher cost for construction of dam / barrage including the cost involved for the acquisition of land. The Commission also believes that the rivers and streams in the State have wider bed compared to hilly states like HP and Uttarakhand and hence the cost of construction will be on the higher side. The remote location of the project may also lead to higher cost for the evacuation system.
- 8.13 Further, it can be noted that the “Incentive Policy for the Development of Small Hydro Power Projects (SHP) in Madhya Pradesh” indicates provision of mandatory free power to the State Government.
- 8.14 In view of the above-mentioned context, the Commission considers it prudent to take Rs. 7.00 Crore per MW as the normative capital cost, including the cost of the evacuation. The Commission believes that the capital cost will meet the requirement of most of the viable projects in the State.

O&M Cost

- 8.15 Ecological Energy Private Ltd. suggested that MPSEB has allowed escalation of 5% for O&M works applicable every 5 years and the same should be considered by the Commission.
- 8.16 MP Electricity Consumers Society opined that the O&M cost of 2% is adequate with an escalation of 5% per year.
- 8.17 Water Resource Department has suggested normative O&M expenses amounting to 2.5% of capital cost, escalated at 4% per year.
- 8.18 The following are the O&M cost values considered by some other Regulatory Commissions in determining tariffs for purchase of power from SHP sources:

Andhra Pradesh	Uttarakhand	Maharashtra	Karnataka	Himachal Pradesh	Uttar Pradesh
1.5%	3% + upto 1% for insurance	2.50%	1.50%	1.50%	2.50%

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8.19 The Commission, in its order on Tariff for electricity from the Bio-mass projects has considered the normative O&M expenses as 2.5% of the capital cost with 4% annual escalation.

Commission's view

8.20 For the determination of the present tariff the Commission considers the O&M expenses same as it has already considered for determination of the tariff for other non-conventional energy sources such as wind and biomass i.e. 2.5% of the capital cost with the annual escalation of 4%.

Capacity Utilisation Factor (CUF)

8.21 The table below indicates the Capacity Utilisation Factor (CUF) considered by other SERCs. A higher CUF in HP and Uttarakhand is due to higher availability of water in the rivers and streams of these states for their being a perennial source of water emanating from Himalayan glaciers.

Andhra Pradesh	Uttarakhand	Maharashtra	Karnataka	Chhattisgarh	Himachal Pradesh	Uttar Pradesh
35%	45%	30%	30%	Actuals*	40%	35%

8.22 Water Resource Department has suggested a CUF of 40% for RoR projects.

Commission's view

8.23 In the absence of adequate data for reliable determination of CUF as well as the fact that calculating and determining CUF on an individual basis for a large number of SHP would be a tedious and time consuming process, the Commission is inclined to use a normative value of CUF for the purpose of tariff determination.

8.24 Availability of water in the rivers of MP solely depends on monsoon and thus it is mostly seasonal in nature and not perennial. Although the WRD suggested 40% CUF but the data as captured from other Commissions' orders indicate that except for the small hydro projects on Himalayan Rivers, the CUF as 40% has not been considered in other states. For the projects on the rivers of the Indian peninsular the CUF is either 30% or 35%. Further, the assumption of higher CUF would result in reduction in the tariff but it will not help in promotion of activity as the tariff may not be sufficient for making the project viable. The Commission has also considered the uncertain behaviour of the monsoon i.e. deficient rainfall in the State in last decade. The Commission, therefore, considers 35% CUF for the RoR small hydro projects in MP.

Auxiliary consumption

8.25 MP Electricity Consumer Society submitted that the auxiliary consumption with transformation losses should be increased to 1.5% from 1%

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- 8.26 Water Resource Department has suggested 0.5% auxiliary consumption and 0.5% transformation losses.
- 8.27 CERC norms provide for 0.5% transformation losses and auxiliary consumption of 0.2-0.7% depending on the plant type.
- 8.28 The table below summarises assumptions taken by other SERCs for auxiliary consumption inclusive of transformation losses.

Andhra Pradesh	Uttarakhand	Maharashtra	Karnataka	Chhattisgarh	Himachal Pradesh	Uttar Pradesh
1%	0.7-1.2% depending on project type	1%	0.5% (only Auxiliary Consumption)	1% aux, 0.5% losses	0.5% (only Auxiliary Consumption)	1%

Commission's view

- 8.29 The Commission has considered 1% of gross generation for auxiliary consumption and transformation losses in MP for Small Hydro Projects.

Financial Parameters

Debt-Equity Ratio

- 8.30 There was no suggestion from objectors on the proposed debt-equity ratio. The Commission is of the view that the debt-equity ratio of 70:30 would be appropriate for SHP based generation in MP which is consistent with other renewable energy based generation orders issued before.

Interest on loan capital

- 8.31 In the discussion paper the Commission has considered the interest on debt as 11%. None of the objectors except Mr. D. G. Joshi made any comment on this issue. Mr. D.G. Joshi made the submission that the interest rate on finance required for development of hydro power station should be less than 6% as in the case of other social development projects.

Commission's view

- 8.32 Interest on loan capital is computed loan-wise on the loans. The interest rate is based on the Regulatory Commission's assessment of the rates that are being offered by different financial institutions in their respective states. The table below gives the different interest rates that have been considered by other Regulatory Commissions for their respective States.

TARIFF ORDER FOR SHP BASED GENERATION

Andhra Pradesh	Uttarakhand	Maharashtra	Karnataka	Chhattisgarh	Himachal Pradesh	Uttar Pradesh
12%	short-term PLR of SBI on COD or 1.4.2004 whichever is later	11%	12.5%	12.5%	prevalent short term Prime Lending Rate of a Scheduled Bank	10.25%

8.33 The State Bank of India Prime Lending Rate (SBI PLR) is 12.5% as on 01st April 2008. The Orders of the other Commissions indicate that most of the States have assumed interest on the loan as 12.5% or SBI PLR which is 12.5% presently. The Commission, therefore, in order to promote the sector in the State, considers the interest rate on debt as 12.5% per annum for the purpose of determination of tariff for Small Hydro Projects in the State. However, the developer may obtain the debt at a cheaper rate or swap the loan with a cheaper rate loan at a later date and retain the benefits.

Years of Operation

8.34 The plant life has been considered as 30 years and the year of operation shall be reckoned from the date of commercial operation of the plant.

Interest on Working Capital

8.35 The Commission has followed the CERC's guidelines, for large hydro-generating projects, for composition of working capital for the purposes of computing tariff for SHP projects, as summarised below:

- (a) Operations and Maintenance expenses for one month;
- (b) Maintenance spares equivalent to 1% of the capital cost with an escalation of 5% per annum.
- (c) Receivables equivalent to 2 months of sale of electricity calculated on the normative Capacity Index.

8.36 The working capital loan normally is for taking care of the short term fund requirements arising during the operation of the plant. The Commission has, in its Regulations on the terms and conditions for determination of the generation tariff, made the provisions for interest on working capital as SBI PLR plus 1%.

Commission's view

8.37 Accordingly the Commission has considered the interest rate at State Bank of India Prime Lending Rate + 1%. For computation of present tariff, the rate of interest on working capital is taken at 13.50%.

Depreciation

Commission's view

- 8.38 The Commission has considered the debt-equity ratio as 70:30. The depreciation is used to meet the repayment liability of the debt which the developer has obtained. The higher rate of depreciation during the first ten years will enable the developer to meet its loan repayment obligation. The life of the asset is considered as 30 years. The Commission is of the view that 90% of the plant cost should be depreciated during its life period. The depreciation rate is computed on a Straight Line Method. The 70 % of the asset value is to be depreciated in the first 10 years with a rate of 7 % p.a. Rest 20 % of asset value is depreciated over next 20 years on straight line method at the rate of 1% per annum.

Return on Equity

- 8.39 The Central Electricity Regulatory Commission allows a return of 14% post tax for conventional plants. Most of the Commissions have allowed higher returns to encourage investment in renewable sources and have given the freedom to investors to manage their tax liability within this allowed return.

ROE/States	Andhra Pradesh	Karnataka	Uttar Pradesh	Uttara khand	Maharashtra	Haryana	T.N
ROE (%)	16	16	16	14	16	16	16

- 8.40 Renewable energy investment is considered as a high risk sector with long pay back period. SHP is no exception and the Commission feels that an adequate return is needed to build the confidence of investors to investment in SHP in MP. As per the provisions of the Act, the Commission has set a procurement target for renewable sources to ensure promotion of renewable energy which will also help create a guaranteed market for renewable based generation. The Commission has also considered 16% return on equity (pre tax) for the developers of wind energy and biomass energy generators in the State. Balancing the interest of all stakeholders including consumers, the Commission considers it appropriate to assume 16% return on equity (pre-tax) which it believes effectively remunerates the developers for the risk assumed. Moreover, the Commission has not factored in the incentive element available to the developers of such projects, thus making 16% (pre tax) return as attractive.

Tariff Rate and structure

- 8.41 The table below presents various tariff components adopted by the Commission for the determination of tariff for SHP projects in MP:

TARIFF ORDER FOR SHP BASED GENERATION

Parameter	Tariff components
Capital Cost	Rs 7 Crore/MW
CUF	35%
O&M	2.5 % of capital cost escalated @ 4% per year
Auxiliary Consumption	1%
Depreciation	7% for the first 10 years and 1% for the next 20 years
Interest on term loan	12.50% per annum
Debt equity ratio	70:30
Interest on Working capital	13.50% per annum
ROE	16% (pre tax)

8.42 Considering the above parameters and 0% (zero) free power, the base tariff for generation from run-of-the-river SHPs to be commissioned after issue of this order for its project life of 30 years is given in the table below:

Year	1	2	3	4	5	6	7	8	9	10
Tariff (Rs./kWh)	5.40	5.22	5.04	4.86	4.68	4.50	4.33	4.16	3.98	3.81
Year	11	12	13	14	15	16	17	18	19	20
Tariff (Rs./kWh)	2.30	2.34	2.38	2.42	2.46	2.51	2.56	2.60	2.65	2.71
Year	21	22	23	24	25	26	27	28	29	30
Tariff (Rs./kWh)	2.76	2.82	2.88	2.94	3.00	3.07	3.14	3.21	3.28	3.36

8.43 In accordance with the GoMP policy which has the provision of minimum free power as indicated in the paragraph 3.6 of this order, the tariffs for generation from run-of-the-river SHPs of the three categories viz. up to 5MW, more than 5 MW & up to 10MW and more than 10 MW & up to 25 MW to be commissioned after the issue of this order are given below:

a. Up to 5 MW

Year	1	2	3	4	5	6	7	8	9	10
Tariff (Rs./kWh)	5.40	5.22	5.04	5.12	4.93	4.74	4.56	4.37	4.19	4.01
Year	11	12	13	14	15	16	17	18	19	20
Tariff (Rs./kWh)	2.42	2.46	2.51	2.55	2.59	2.64	2.69	2.74	2.79	2.85
Year	21	22	23	24	25	26	27	28	29	30
Tariff (Rs./kWh)	2.91	2.96	3.03	3.09	3.16	3.23	3.30	3.38	3.45	3.54

TARIFF ORDER FOR SHP BASED GENERATION

b. More than 5 MW & up to 10 MW

Year	1	2	3	4	5	6	7	8	9	10
Tariff (Rs./kWh)	5.40	5.22	5.48	5.28	5.09	4.90	4.71	4.52	4.33	4.14
Year	11	12	13	14	15	16	17	18	19	20
Tariff (Rs./kWh)	2.50	2.54	2.59	2.63	2.68	2.73	2.78	2.83	2.88	2.94
Year	21	22	23	24	25	26	27	28	29	30
Tariff (Rs./kWh)	3.00	3.06	3.13	3.19	3.26	3.33	3.41	3.49	3.57	3.65

c. More than 10 MW & up to 25 MW

Year	1	2	3	4	5	6	7	8	9	10
Tariff (Rs./kWh)	5.40	5.80	5.60	5.40	5.20	5.01	4.81	4.62	4.43	4.23
Year	11	12	13	14	15	16	17	18	19	20
Tariff (Rs./kWh)	2.56	2.60	2.64	2.69	2.74	2.79	2.84	2.89	2.95	3.01
Year	21	22	23	24	25	26	27	28	29	30
Tariff (Rs./kWh)	3.07	3.13	3.19	3.26	3.33	3.41	3.48	3.56	3.65	3.73

8.44 The tariffs for the three different capacities of the projects given in paragraph 8.43 are based on the minimum percentage of free power and the period of exemption as given in the paragraph 3.6 . However, the same tariff shall be applicable on the entire quantum of saleable power arrived on the basis of percentage of free power offered by the successful developer of the project.

CANAL BASED GENERATION

Capital cost

- 8.45 M.P. Electricity Consumers' Society submitted that the capital cost for canal based generation should be Rs. 10.4 Cr./MW
- 8.46 Water Resource Department has suggested capital cost of Rs 6.05 Cr/MW for canal based projects.

Commission's view

8.47 The Commission has noted that the WRD has been operating a couple of Canal Based Generating Projects in the State. The WRD has provided the data on the basis of pre-feasibility reports developed by them in this regard. The canal based generation requires lesser expenses on civil cost in comparison to RoR SHPs. The Commission has, therefore, considered a normative capital cost of Rs 6 Crore / MW for canal based generation projects which includes the cost of the evacuation system as well.

Capacity Utilisation Factor (CUF)

8.48 The WRD has proposed the CUF as 30%. The Commission has considered the normative CUF for RoR projects as 35% in this order. Normally the generation from the canal based projects depends on the release of the water from the dam / barrage into the canals for irrigation purposes. The water requirement for the irrigation normally lasts for 3 to 4 months in a year i.e. in rabi season. The Commission has therefore, considered the normative CUF for the canal based projects as 30%.

Other parameters

8.49 Other parameters will be same as mentioned in the case of RoR based generation..

Tariff Rate and structure –

Parameter	Tariff components
Capital Cost	Rs 6 Crore/MW
CUF	30%
O&M	2.5 % of capital cost escalated @ 4% per year
Auxiliary Consumption	1%
Depreciation	7% for first 10 year and 1% for next 20 years
Interest on term loan	12.50% per annum
Debt equity ratio	70:30
Interest on Working capital	13.50% per annum
ROE	16% (pre tax)

8.50 Considering the above parameters and 0% (zero) free power, the Commission sets the base tariff for generation from canal based SHPs to be commissioned after issue of this order for its project life of 30 years in the table shown below:

TARIFF ORDER FOR SHP BASED GENERATION

Year	1	2	3	4	5	6	7	8	9	10
Tariff (Rs./kWh)	5.40	5.22	5.04	4.86	4.68	4.50	4.33	4.16	3.98	3.81
Year	11	12	13	14	15	16	17	18	19	20
Tariff (Rs./kWh)	2.30	2.34	2.38	2.42	2.46	2.51	2.56	2.60	2.65	2.71
Year	21	22	23	24	25	26	27	28	29	30
Tariff (Rs./kWh)	2.76	2.82	2.88	2.94	3.00	3.07	3.14	3.21	3.28	3.36

8.51 In accordance with the GoMP policy which has the provision of free power as indicated in the paragraph 3.6 of this order, the tariffs for generation from canal based SHPs of the three categories viz. up to 5MW, more than 5 MW & up to 10MW and more than 10 MW & up to 25 MW to be commissioned after the issue of this order are given below:

a. Up to 5 MW

Year	1	2	3	4	5	6	7	8	9	10
Tariff (Rs./kWh)	5.40	5.22	5.04	5.12	4.93	4.74	4.56	4.37	4.19	4.01
Year	11	12	13	14	15	16	17	18	19	20
Tariff (Rs./kWh)	2.42	2.46	2.51	2.55	2.59	2.64	2.69	2.74	2.79	2.85
Year	21	22	23	24	25	26	27	28	29	30
Tariff (Rs./kWh)	2.91	2.96	3.03	3.09	3.16	3.23	3.30	3.38	3.45	3.54

b. More than 5 MW & up to 10 MW

Year	1	2	3	4	5	6	7	8	9	10
Tariff (Rs./kWh)	5.40	5.22	5.48	5.28	5.09	4.90	4.71	4.52	4.33	4.14
Year	11	12	13	14	15	16	17	18	19	20
Tariff (Rs./kWh)	2.50	2.54	2.59	2.63	2.68	2.73	2.78	2.83	2.88	2.94
Year	21	22	23	24	25	26	27	28	29	30
Tariff (Rs./kWh)	3.00	3.06	3.13	3.19	3.26	3.33	3.41	3.49	3.57	3.65

TARIFF ORDER FOR SHP BASED GENERATION

c. More than 10 MW & up to 25 MW

Year	1	2	3	4	5	6	7	8	9	10
Tariff (Rs./kWh)	5.40	5.80	5.60	5.40	5.20	5.01	4.81	4.62	4.43	4.23
Year	11	12	13	14	15	16	17	18	19	20
Tariff (Rs./kWh)	2.56	2.60	2.64	2.69	2.74	2.79	2.84	2.89	2.95	3.01
Year	21	22	23	24	25	26	27	28	29	30
Tariff (Rs./kWh)	3.07	3.13	3.19	3.26	3.33	3.41	3.48	3.56	3.65	3.73

8.52 The tariffs for the three different capacities of the projects given in paragraph 8.51 are based on the minimum percentage of free power and the period of exemption as given in the paragraph 3.6 . However, the same tariff shall be applicable on the entire quantum of saleable power arrived on the basis of percentage of free power offered by the successful developer of the project.

9: OTHER TERMS AND CONDITIONS

Generation above CUF

- 9.1 M/S Surge Power and Infrastructure Private Ltd. suggested that for generation above normative CUF, an incentive of 24 paise per unit should be paid to the developers.
- 9.2 Provision of a fixed incentive for every unit generated above CUF has been made by APERC and UPERC. Both the Commissions have fixed an incentive rate of 21.5 paise of every unit generated above the generation at normative 35% CUF.
- 9.3 The State of Uttarakhand offers an incentive such that for actual PLF being higher than the normative CUF (which is 45%), an incentive is provided in such a manner that at 100% of normative CUF, the incentive to such units would be 10% of the approved Annual Fixed Cost (AFC). The rate of energy beyond the normative CUF is, therefore, given by UERC as Rate of Energy = $0.1 \times \text{AFC} / [365 \times 24 \times \text{Installed Capacity in KW} \times (1 - \text{CUFn})]$ Where, CUFn is Normative Value of CUF.
- 9.4 The States like Maharashtra, Karnataka, Punjab and Haryana have adopted a different approach wherein tariff for excess energy is same as applicable to the generation within the normative CUF.
- 9.5 The Commission in order to promote generation from SHP projects would like greater participation of private sector in the development of SHP projects thereby, creating more generation capacity, which is the need of the hour. As already discussed earlier, the Commission is also concerned about the very slow progress in the Small Hydro Power sector.

- 9.6 Keeping in view the above, the Commission has decided to follow an approach adopted by Karnataka, Maharashtra, Punjab and Haryana and the tariff for excess energy shall be same as applicable to the generation within the normative CUF. This will help promote SHP in the state as a better rate and applicability of same tariff for generation above normative CUF would offer a better platform for the developers to invest in the state. Moreover, this will also take care of the risk of non-achievement of normative CUF in certain years due to less water availability.

Power Purchase Agreement Tenure

- 9.7 M.P. Consumer Electricity Society submitted that the Power Purchase Agreement should be restricted to 15 years.

Commission's view

- 9.8 Following the provision made under the "Incentive Policy for the Development of Small Hydro Power Projects (SHP) in Madhya Pradesh" the Commission has considered a life span of 30 years of a typical Small Hydro Power Project while determining tariff. Given the background, the Commission directs that the developer and the Distribution Licensee enter into a Power Purchase Agreement for a period of 30 years from the date of the Commissioning of the plant.
- 9.9 The Distribution Licensees are directed to prepare a model Power Purchase Agreement in this regard for exclusive sale of electricity to them and would be required to submit the same before the Commission within 30 days of the order for approval.
- 9.10 The energy generated by the small hydro generating units will be procured by the distribution licensees in whose area the generating station is located.
- 9.11 The developers are required to get all the required environmental and pollution control consents/clearance before entering into Agreement.

Balancing and Settlement Code (BSC)

- 9.12 M/S Consolidated Energy Consultants Ltd. brought to the notice of the Commission that the BSC should not be made applicable to SHP as these projects are for generation of small capacity and are intermittent. Hence quantum of power supply, type and duration of supply cannot be guaranteed.
- 9.13 M/S MP Electricity Consumers Society also suggested that the BSC may not be applied to the small projects with poor predictability.

Commission's view

- 9.14 Generation from SHP is intermittent in nature. Hence the Commission decided to keep the Small Hydro generation projects out of the purview of 'scheduling' and 'merit order dispatch principles'.

Reactive Power Supply

- 9.15 The SHP Generators would be deemed to be the generating station of a generating company and all functions, obligations and duties assigned to such stations under the Electricity Act 2003 would apply to these power stations. These stations would be required to abide by all applicable Codes.
- 9.16 The Commission determines the charges for KVARh consumption from the grid as 27 paise/unit i.e. the rate which is already prevalent in the State and which may be revised as and when necessary.
- 9.17 Reactive energy charges would be paid by the developer to the Distribution Licensees in whose territorial area the generating station is located.

Charges for third party sale and captive consumption

- 9.18 Charges for third party sale and captive consumption shall be as per the provisions made under "Incentive Policy for the Development of Small Hydro Power Projects (SHP) in Madhya Pradesh", issued on 8th August, 2006 and "Incentive policy for encouraging generation of power in Madhya Pradesh through Non-conventional Energy sources (solar, wind, bio energy, etc.) dated 17th October, 2006.

Metering & Billing

- 9.19 Metering arrangement is to be done at site as per the provisions of the Government of M.P. incentive policy for encouraging generation of power in M.P. through Non-conventional Energy Sources notified on 17.10.06.
- 9.20 Billing of the metered energy will be carried out on a monthly basis.
- 9.21 The meter reading will be carried out by the distribution licensee where the energy is injected into the system.

Payment Mechanism

- 9.22 The Commission prescribes a settlement period of 30 days from the date of submission of the bill to the concerned distribution licensee where the power is injected. The provision is made in order to ensure that the developer has an assurance of cash inflow for the energy, which they deliver to the grid.

- 9.23 In case the payment is delayed beyond 30 days from the date of submission of the bill, the distribution licensee will pay penal interest on outstanding amount at the rate of 5% p.a. over and above the short term lending rate of the State Bank of India (known as Prime Lending Rate) prevailing on the first day of the month when payment becomes due. In case the distribution licensee makes the payment within 15 days from the date of submission of bill by the generating company, a rebate of 1% of billed amount shall be allowed by the generator.

Default Provisions – Third Party Sale or sale to utility

- 9.24 In case of default in payment for more than three months continuously by the distribution licensees, the developer shall be free to sell power to the third party. Such sale to third party shall not absolve the distribution licensee of its payment and other obligations as per the power purchase agreement.
- 9.25 Where the developer has an existing arrangement for third party sale or for captive consumption and in case the developer desires to terminate the Agreement with third party and to supply to the utility, the utility with the prior permission of the Commission, will purchase the power at the rate as determined by the Commission, subject to execution of the Power Purchase Agreement with the licensee for the remaining period of project life.

Other applicable conditions

- 9.26 All statutory clearances and necessary approvals, if any, are to be obtained by the developer for setting up of project. The developer is also responsible for their compliance and their renewals as may be required from time to time.
- 9.27 The developer would ensure that the proposed location of the plant is in accordance with the policy guidelines of the Union/the State Government.

Minimum Purchase Requirements

- 9.28 Section 86(1)(e) of the Electricity Act,2003 states that the State Commission shall specify a percentage of the total consumption of electricity in the area of a distribution licensee for purchase of electricity from renewable sources.
- 9.29 The Commission, therefore, fixes a target for each licensee @ 10% of its annual consumption (including third party sale and own use) in its area of supply, subject to availability, as the minimum purchase requirement from all Non-conventional Sources of Energy including Bio-mass, wind, small hydro, co-generation etc. for the distribution licensees.

TARIFF ORDER FOR SHP BASED GENERATION

- 9.30 If the Distribution Licensee fulfils the minimum purchase requirements and still has offers from the renewable energy generators, then either the Distribution Licensee or the developers can approach the Commission for approval of such procurement offers. The Commission is presently not inclined to prescribe the maximum limit, as it does not foresee that in the immediate future, there would be offers from investors in renewable sources exceeding the prescribed minimum limit.
- 9.31 The condition of minimum purchase requirement for the Distribution Licensee would not be applicable under Force Majeure Conditions such as war, strike, lockout, riots, acts of God or natural calamity etc. so as to enable the Distribution Licensee to maintain the supply to its consumers and public services under emergency conditions.

Banking

- 9.32 Banking in respect of captive generator and third party suppliers shall be allowed in terms of provisions made in the Government of M.P. incentive policy for encouraging generation of power in M.P. through Non-conventional Energy Sources notified on 17.10.06. The distribution licensees are directed to submit a proposal to the Commission on the methodology of banking within three months from the date of the order.

Reduction in contract demand

- 9.33 Reduction in contract demand by consumers of the distribution licensees shall be allowed in terms of provisions made in the Government of M.P. incentive policy for encouraging generation of power in M.P. through Non-conventional Energy Sources notified on 17.10.06.

Power to amend

- 9.34 The Commission may review the tariff order in extra-ordinary case(s) following the guideline of the Section 62 (4) of the Act. This will help incorporate any over-looked fact/issue experienced during the course of implementation of Small Hydro Power Projects in the State, in the interest of the stakeholders.

Ordered accordingly

-sd-
(K.K Garg)
Member (Engineering)

-sd-
(Dr. J.L. Bose)
Chairman

Place: Bhopal
Date: 30th June 2008

TARIFF ORDER FOR SHP BASED GENERATION

SAMPLE CALCULATIONS FOR DETERMINATION OF TARIFF FOR SHPs			
Basic parameters of tariff determination for 1.0 MW SHP			
Capital cost		700	Rs. Lakh
Free Power		0.00%	
Debt-Equity			
Equity	30%	210	Rs. Lakh
Debt	70%	490	Rs. Lakh
RoE (pre tax)	16%	33.6	Rs. Lakh
Capacity Utilization Factor (CUF)		35%	
Auxiliary consumption (%)		1.00%	
Operation & Maintenance expenses (% of capital cost)			
power plant		2.50%	
Annual escalation in O&M		4.00%	
Loan repayment			
moratorium period		0	years
repayment period		10	years
No. of instalments		40	(quaterly)
Repayment of debt per instalment		12.25	Rs. Lakh
Interest rate p.a.		12.50%	
Power plant life		30	years
Depreciation			
Years	1-10 yrs	10-20yrs	20-30 yrs
Rate	7.00%	1%	1%
Discount rate		10.60%	
Working capital requirement			
O&M		1	month
Receivables		2	months
Spares (1% Capital cost)		1.00%	
Escalation for spares		5.00%	per annum
Interest on working capital		13.50%	per annum
TARIFF DETERMINATION			
Years	1	2	3
Generation			
Capacity Utilisation Factor	35%	35%	35%
Generation[MW]	1	1	1
Gross Generation (LU)	30.66	30.66	30.66
Auxillary Consumption(%)	1.00%	1.00%	1.00%
Auxillary Consumption (LU)	0.3066	0.3066	0.3066
Net Generation (LU)	30.3534	30.3534	30.3534
Free Power (%)	0.00%	0.00%	0.00%
Free Power (LU)	0	0	0
Net Saleable Power (LU)	30.3534	30.3534	30.3534
Fixed Charges for Generation (Rs. Lakh)			
Depreciation	49.00	49.00	49.00
O & M charges	17.50	18.20	18.93
Return on Equity	33.60	33.60	33.60
Interest charges	58.95	52.83	46.70
Working capital			
O & M charges	1.46	1.52	1.58
Receivables	27.31	26.40	25.49
Spares	7.00	7.35	7.72
Total working capital	35.77	35.26	34.78
Interest on working capital	4.83	4.76	4.70
Total annual Fixed Charges	163.88	158.39	152.93
Fixed Charges (Rs / kWh)	5.40	5.22	5.04