

Tamil Nadu Electricity Regulatory Commission

Consultative Paper on “Procurement of Power from small hydro power (up to 5 MW)”

(Comments/Suggestions are invited on or before 31-03-2010)

1.0 Introduction

1.1 Hydro Power

Hydropower is a renewable, non-polluting and environmentally benign source of energy. It is perhaps the oldest renewable energy technique known to the mankind for mechanical energy conversion as well as electricity generation. Hydropower represents use of water resources towards inflation free energy due to absence of fuel cost with mature technology characterized by highest prime moving efficiency and spectacular operational flexibility. Out of the total power generation installed capacity of 1, 56, 092 MW in the country as on 31-12-2009, hydro power contributes about 24% i.e. 36,885 MW.

1.2 Development of Small Hydro Power Projects

Hydro power projects are generally categorized into small and large hydro. Hydro projects up to 25 MW station capacities have been categorized as Small Hydro Power (SHP) projects. While Ministry of Power, Government of India is responsible for large hydro projects, the mandate for the subject of small hydro power (up to 25 MW) is given to Ministry of New and Renewable Energy (MNRE). Depending upon the capacities, SHP projects are categorized as Micro, Mini and Small hydro projects as under:

Class	Station Capacity (kW)
Micro	Up to 100
Mini	101 to 2000
Small	2001 to 25000

SHP is considered as a reliable option for development of rural areas and is one of the thrust areas of power generation from renewable in the MNRE. It has been recognized that small hydro power projects can play a critical role in improving the over all energy scenario of the country and in particular for remote and inaccessible areas.

Estimated potential of SHP in the country is of about 15,000 MW. The total installed capacity of SHP in India (upto 25 MW) as on 31-03-2009 is 2429.77 MW from 674 projects. *(Source: MNRE)*. A target of adding about 550 MW during the 10th plan (2002-

2007) and 1400 MW during 11th plan (2007-2012) was fixed by MNRE. Following are the year-wise capacity addition from SHP projects during the 10th and 12th plan:

Year	Target (MW)	Capacity addition during the year (MW)	Cumulative SHP installed capacity (MW)
2002-03	80	80.39	1519.28
2003-04	80	84.04	1603.32
2004-05	100	102.31	1705.63
2005-06	130	120.80	1826.43
2006-07	160	149.16	1975.59
2007-08	200	205.25	2180.84
2008-09	250	248.93	2429.77

(Source : www.mnes.nic.in.)

The perspective plan for grid-interactive SHP Projects in India up to 13th plan is summarized below:

Up to 9th Plan	10th Plan	11th Plan	12th and 13th Plans
1438 MW	536.70 MW	1400 MW	3140 MW

(Source : MNRE 11th plan proposal)

The details of State-wise installed capacity and potential of SHP as on 31-03-2009 are tabulated below.

SI.No	Name of State	Installed capacity up to 2007-08 in MW	Potential sites in Nos.	Potential in MW
1	Andhra Pradesh	180.83	489	552.29
2	Arunachal Pradesh	61.32	566	1333.04
3	Assam	27.10	60	213.84
4	Bihar	54.60	94	213.75
5	Chhatisgarh	18.050	164	706.62
6	Goa	0.050	9	9.10
7	Gujarat	7.000	292	196.97
8	Haryana	62.700	33	110.05
9	Himachal Pradesh	230.915	547	2268.41
10	Jammu & Kashmir	111.830	246	1411.72
11	Jharkhand	4.050	103	208.95
12	Karnataka	563.45	128	643.16
13	Kerala	133.87	247	708.10
14	Madhya Pradesh	71.16	99	400.58
15	Maharashtra	211.325	253	762.58
16	Manipur	5.450	113	109.10
17	Meghalaya	31.030	102	229.81
18	Mizoram	24.470	75	166.94
19	Nagaland	28.670	99	196.98

20	Orissa	44.30	222	295.47
21	Punjab	123.900	234	390.02
22	Rajasthan	23.850	67	63.17
23	Sikkim	47.11	91	265.54
24	Tamil Nadu	90.05	176	499.31
25	Tripura	16.010	13	46.86
26	Uttar Pradesh	25.100	220	292.16
27	Uttaranchal	127.92	458	1609.25
28	West Bengal	98.400	203	393.79
29	A&N Island	5.250	12	7.91
	Total	2429.77	5415	14,305.47

(Source : MNRE)

In the past, most of the SHP projects were set up by the State Electricity Boards (SEBs) or public sector. Now, most of the present SHP capacity addition in the country is coming through private sector. The Private sector entrepreneurs found attractive business opportunities in small hydro and the State governments also have started realizing the importance of private sector participation for tapping the full potential of SHP. The private sector has been attracted by these projects due to their small adoptable capacity matching with their captive requirements or even as affordable investment opportunities. Total installed capacity of power generation in the country is 1, 48,265 MW as on 30-04-2009. The contribution of power from Non-conventional Energy Sources (NCES) to the country's installed capacity is around 13,242 MW (Source: Ministry of Power) out of which the contribution of SHP projects is around 2429.77 MW as on 31-03-2009. The NCES power represents 8.93% and SHP 1.64% of the total installed capacity.

1.3 SHP Project Scenario in Tamil Nadu

The installed capacity of SHP in Tamil Nadu is 90.05 MW from 15 stations contributing 0.88% of the Tamil Nadu's total installed capacity of around 10214 MW as on 31-12-2009. The following are the list of small hydro power plants in Tamil Nadu:

Sl.No.	Name of the small hydro power plant	Installed Capacity (MW)
1	Pykara Mini	2
2	Sholayar-II	25
3	Servalar	20
4	Vaigai Small	3
5	Lower Bhavani Small	8

6	Punachi Mini	2
7	Maravakandi Mini	0.75
8	Lower Bhavani (RBC)	8
9	Sathanur Dam	7.5
10	Thirumurthy Mini	1.95
11	Mukurthi Mini	0.7
12	Aliyar Small	2.5
13	Perunchani Mini	1.30
14	Amaravathy	4
15	Tuklapatti	0.35
Total (14 Nos.)		90.05

(Source: TNEB)

Out of the total installed capacity of 90.05 MW, TNEB owns 89.70 MW and the only private sector small hydro project is at Tuklapatti (Madurai District) commissioned in 2008 with a capacity of 0.35 MW. The Works are under progress for the TNEB's Periyar Vaigai Barrage SHP to the tune of 13 MW. As per the report of the MNRE, the total numbers of identified sites in Tamil Nadu as on 31-03-2009 for development of SHP projects are 176 with the total capacity of around 499 MW. However, in the MNRE website the list of potential sites available is only for 373.455 MW and 155 locations as in Annexure – I. The numbers of potential locations for different capacity ranges are given below:

Sl.No.	Description of potential sites	No. of Locations	Potential Capacity (MW)
1	<= 0.5 MW	66	14.455
2	0.5 MW > and <= 2 MW	54	84
3	2 MW > and <= 5 MW	19	67.50
4	5 MW > and <= 25 MW	16	207.50
		155	373.455

2.0 Power position in Tamil Nadu

The generating capacity connected to TNEB's grid including the allocation from Central Generating Station is 10214.55 MW as on 31-12-2009 comprising 2970 MW from TNEB's four thermal stations, 516 MW from four gas turbine stations, 2187 MW from 33 hydro stations, 17.55 MW from TNEB's wind farm, 1180 MW from private sector power projects, 214 MW as contribution to Tamil Nadu grid by sale of electricity from captive generating plants, 2825 MW as Tamil Nadu's share from central generating stations and 305 MW as external assistance.

Generating capacity from privately owned wind farms is 4579.24 MW as on 31-12-2009. The installed capacity of cogeneration in sugar mills is 466.10 MW and biomass power project is 147.55 MW as on 01-04-2009.

The average power availability during the year 2009-10 (Up to December 2009) is around 8400 MW. The expected peak demand will be around 10,500 MW which leaves a deficit of around 2100 MW. The deficit in the State is likely to increase since the capacity addition in the next few years is expected to be less than the projected increase in demand. Therefore, any capacity addition will help the State to a great extent to tide over the shortage of power prevailing in the State.

3.0 Legislative and Regulatory Framework for development of SHP Projects.

3.1 Related Provisions of Electricity Act, 2003

“An Act to consolidate the laws relating to generation, transmission, distribution, trading and use of electricity and generally for taking measures conducive to development of electricity industry, promoting competition therein, protecting interest of consumers and supply of electricity to all areas, rationalization of electricity tariff, ensuring transparent policies regarding subsidies, promotion of efficient and environmentally benign policies constitution of Central Electricity Authority, Regulatory Commissions and establishment of Appellate Tribunal and for matters connected therewith or incidental thereto.”

Section 3(1) of the Electricity Act, 2003 States that *the Central Government shall, from time to time, prepare the National Electricity Policy and tariff policy, in consultation with the State Governments and the Authority for development of the power system based on optimal utilisation of resources such as coal, natural gas, nuclear substances or materials, **hydro and renewable sources of energy.***

The section 4 of the Electricity Act, 2003 stipulates that *the Central Government shall, after consultation with the State Governments, prepare and notify a national policy, **permitting stand alone systems (including those based on renewable sources of energy and non-conventional sources of energy) for rural areas.***

Section 61 (h) of the Electricity Act 2003 States that *the Appropriate Commission shall, subject to the provisions of this Act, specify the terms and conditions for determination of tariff and in doing so shall be guided by the following namely, (h) the promotion of cogeneration and generation of electricity from renewable sources of energy, (i) the National Electricity Policy and Tariff Policy.*

Section 86 (1) (e) of the Electricity Act 2003 States that *the State Commission shall promote cogeneration 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, and also specify, for purchase of electricity from such sources, a percentage of the total consumption of electricity in the area of a distribution licensee.*

3.2 Related Provisions of National Electricity Policy:

“5.2.20 Feasible potential of non-conventional energy resources, mainly small hydro, wind and bio-mass would also need to be exploited fully to create additional power generation capacity. With a view to increase the overall share of non-conventional energy sources in the electricity mix, efforts will be made to encourage private sector participation through suitable promotional measures.”

“5.12.2 The Electricity Act 2003 provides that co-generation and generation of electricity from non-conventional sources would be promoted by the SERCs by providing suitable measures for connectivity with grid and sale of electricity to any person and also by specifying, for purchase of electricity from such sources, a percentage of the total consumption of electricity in the area of a distribution licensee. Such percentage for purchase of power from non-conventional sources should be made applicable for the tariffs to be determined by the SERCs at the earliest. Progressively the share of electricity from non-conventional sources would need to be increased as prescribed by State Electricity Regulatory Commissions. Such purchase by distribution companies shall be through competitive bidding process. Considering the fact that it will take some time before non-conventional technologies compete, in terms of cost, with conventional sources, the Commission may determine an appropriate differential in prices to promote these technologies.”

3.3 Related Provisions of National Tariff Policy:

Para 6.4“(1) Pursuant to provisions of section 86(1)(e) of the Act, the Appropriate Commission shall fix a minimum percentage for purchase of energy from such sources taking into account availability of such resources in the region and its impact on retail tariffs. Such percentage for purchase of energy should be made applicable for the tariffs to be determined by the SERCs latest by April 1, 2006. It will take some time before non-conventional technologies can compete with conventional sources in terms of cost of electricity. Therefore, procurement by distribution companies shall be done at preferential tariffs determined by the Appropriate Commission.

(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.”

3.4 Commission’s Regulations on Power Procurement from New and Renewable Sources:

In exercise of the powers conferred under section 61(h) read with section 86(1)(e) and section 181 of the said Electricity Act, 2003, the Commission notified the “Power Procurement from New and Renewable Sources of Energy Regulations 2008” on 8.02.2008. Regulations 4(2) and 4(3) of the above said Regulation which is relevant to this paper is reproduced below:

4(2) While deciding the tariff for power purchase by distribution licensee from new and renewable sources based generators, the Commission shall, as far as possible, be guided by the principles and methodologies specified by:

- (a) Central Electricity Regulatory Commission*
- (b) National Electricity Policy*
- (c) Tariff Policy issued by the Government of India*
- (d) Rural Electrification Policy*
- (e) Forum of Regulators (FOR)*
- (f) Central and State Governments*

4(3) The Commission shall, by a general or specific order, determine the tariff for the purchase of power from each kind of new and renewable sources based generators by the distribution licensee. In case of small hydro projects with a capacity of more than 5 MW but not exceeding 25 MW capacities, Commission decides the tariff on case to case basis.

4.0 Need for the consultative paper

Considering the (i) overwhelming emphasis of Electricity Act 2003, National Tariff Policy, National Electricity Policy to promote environmental friendly renewable sources of energy such as Wind, Hydel, Solar and Biomass (ii) huge deficit of power in the State and (iii) unexploited SHP potential of around 500 MW in the State, Commission considers that there is an urgent need to put in place necessary regulating mechanism to develop SHP in the State. To initiate such process, the Commission has decided to come out with this consultative paper to elucidate the views of the stakeholders.

5.0 Applicability of proposed order

The proposed order is applicable for the small hydro projects with a total station installed capacity of less than or equal to 5 MW. The order shall come into force from the date of its issue. The tariff fixed in the proposed order shall be applicable to all the small hydro projects commissioned on or after the date of this order. It should be noted that the existing contracts and agreements between small hydro generators and the distribution licensees signed prior to this order would continue to remain in force. However, the small hydro generators and the distribution licensees shall have the option to mutually re-negotiate the existing agreements / contracts in line with this order before the expiry of the contracts / agreements. Any renewal of the said contracts / agreements, new contracts / agreements shall be in conformity with this order.

6.0 Tariff Determination Process

With regard to tariff determination process, the relevant portion of Regulation 4 of the Power Procurement from New and Renewable Sources of Energy Regulations, 2008 is reproduced below:

The Commission shall follow the process mentioned below for the determination of tariff for the power from new and renewable sources based generators, namely;-

- a) initiating the process of fixing the tariff either suo motu or on an application filed by the distribution licensee or by the generator.*
- b) inviting public response on the suo motu proceedings or on the application filed by the distribution licensee or by the generator.*
- c) issuing general / specific tariff order for purchase of power from new and renewable sources based generators.*

In accordance with the above regulations, the Commission has prepared this consultative paper to elicit the views and suggestions of the stake holders.

7.0 Tariff / Pricing Methodology

The relevant portion of Tariff / Pricing Methodology as specified in Regulation 4 of the Commission's above said Regulation is reproduced below.

(2) While deciding the tariff for power purchase by distribution licensee from new and renewable sources based generators, the Commission shall, as far as possible, be guided by the principles and methodologies specified by:

- (a) Central Electricity Regulatory Commission*
- (b) National Electricity Policy*
- (c) Tariff Policy issued by the Government of India*
- (d) Rural Electrification Policy*
- (e) Forum of Regulators (FOR)*
- (f) Central and State Governments*

(3) The Commission shall, by a general or specific order, determine the tariff for the purchase of power from each kind of new and renewable sources based generators by the distribution licensee.....

Provided where the tariff has been determined by following transparent process of bidding in accordance with the guidelines issued by the Central Government, as provided under section 63 of the Act, the Commission shall adopt such tariff.

(4) While determining the tariff, the Commission may, to the extent possible consider to permit an allowance / disincentive based on technology, fuel, market risk, environmental benefits and social impact etc., of each type of new and renewable source.

(5) While determining the tariff, the Commission shall adopt appropriate financial and operational parameters.

(6) While determining the tariff the Commission may adopt appropriate tariff methodology.

7.1 Preferential tariff or by bidding process

In this connection, it is relevant to discuss the following stipulations of National Tariff

Policy which are reproduced below:

***Section 6.4(1):** Pursuant to provisions of section 86(1)(e) of the Act, the appropriate Commission shall fix a minimum percentage for purchase of energy from such sources taking into account availability of such resources in the region and its impact on retail tariffs. Such percentage for purchase of energy should be made applicable for the tariffs to be determined by the SERCs latest by April 1, 2006. It will take some time before non-conventional technologies can compete with conventional sources in terms of cost of electricity. Therefore, procurement by distribution companies shall be done at preferential tariffs determined by the appropriate Commission.*

***Section 6.4(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.*

It is a fact that hydro energy is an alternate source of green power. Though the cost of generation from small hydro generator is slightly higher than the coal based generation, it is felt that the small hydro power should be promoted at preferential tariff since it is a green and sustainable power. This also helps to exploit the balance hydro potential in the State. Further, the Forum of Regulators, which is a body consisting of Chairmen of all State Electricity Regulatory Commissions and the Central Electricity Regulatory Commission considered this issue and has recommended that cost based tariff on reasonable norms should be permitted for renewable energy. Therefore, the Commission proposes that the energy procurement from small hydro power plant by distribution licensees shall be done at preferential tariffs as determined by the Commission as per 6(4) (1) of the tariff policy.

7.2 Project Specific or Generalized Tariff

Regulation 4 (3) of the Power Procurement from New and Renewable Sources of Energy Regulations, 2008 is reproduced below.

*“The Commission shall, by a general or specific order, determine the tariff for the purchase of power from each kind of new and renewable sources based generators by the distribution licensee. In case of small hydro projects with a capacity of more than **5 MW but not exceeding 25 MW capacities**, Commission decide the tariff on case to case basis.*

Hence, it is proposed by the Commission to issue a generalized tariff order for SHP projects up to 5 MW. Project specific order will be considered by the Commission for the projects with more than 5 MW capacities.

7.3.0 Cost-Plus Tariff Determination

Cost-plus tariff determination is a more practical method. It can be easily designed to provide adequate returns to the investor and a surety of returns will lead to larger investment in SHP. It is also in line with Regulation 4(6) of “Power Procurement from New and Renewable Sources of Energy Regulations 2008”.

7.3.1 Single Part vs. Two Part Tariff

Two part tariff is applied in order to recover fixed and variable costs through the fixed and variable components of tariff. Since the question of fuel does not arise for hydro power plants and the royalty / water tax is also a pass through item, all the costs of hydro electric generators are considered to be fixed. There may be some variation in Operation & Maintenance cost, etc. This will be appropriately addressed by adopting suitable discount/escalation factors. Therefore, the “single part tariff” is considered more suitable for SHP projects than a two part tariff.

7.3.2 Cost plus single part average tariff

Regulation 4(2) (6) of the Commission’s “Power Procurement from New and Renewable Sources of Energy Regulation 2008” specifies “cost plus single part average tariff”. It is proposed to adopt the same concept of cost plus single part average tariff for SHP projects also in the proposed tariff order.

8.0 Tariff Components

The tariff, if determined in a cost-plus scenario, would depend significantly on the following operating and financing parameters. The key drivers of the tariff are:

1. Capital investment
2. Plant Load factor
3. Auxiliary Consumption
4. Debt-equity ratio
5. Term of the loan
6. Interest rate on loan
7. Interest on working capital
8. Return on equity
9. Life of plant and machinery
10. Depreciation of plant and machinery
11. Operation and maintenance expenditure.

Each of the above parameters is discussed below in detail.

8.1 Capital Investment

8.1.1 Gross capital cost

The capital cost is one of the most important parameters for SHP projects tariff determination. The cost of a small hydro project is mainly dependent on the site and capacity. Most of the small hydro potential sites in Tamil Nadu are run of the river based or Canal drops. Hence the capital cost shall be appropriately fixed considering the above factor. The capital costs (in Crores/MW) adopted by the other Commissions are tabulated below.

State	Capital Cost (Rs. in Crores /MW)	Reference
Kerala	4.88 (including the cost of transmission lines/substation up to the inter connection point of the grid.)	Power Procurement from Renewable Sources by Distribution Licensee Regulations, 2006
Andhra Pradesh	3.75 (Rs. 4.5 Crores less capital subsidy of Rs. 0.75 Crores)	R.P.No.84 / 2003 in O.P.No.1075 / 2000 dated 20-03-2004
Karnataka	3.90	Order dated 18-01-2005
Uttar Pradesh	5.3 for PLF of 35-40%	Order dated 09-09-2009
Uttranchal	3	Tariff and Other Terms for Supply of Electricity from Non-conventional and Renewable Energy Sources, 2008
Maharashtra	4.4 (Exclusive of evacuation expenses of Rs.0.35 Cr/MW)	Order dated 09-11-2005
Himachal Pradesh	6.5	Order dated 18-12-2007

There is a wide variation ranging from Rs 3 Crores to Rs 6.5 Crores per MW in capital cost adopted by different Commissions. Hence, the Commission addressed MNRE and IREDA to furnish the reasonable capital cost for SHP projects. The Chairman and Managing Director of IREDA in his letter dated 31-03-2009 has stated that the capital cost for the capacity up to 5 MW varies from Rs.6.20 – 6.95 Crores per MW and the MNRE in their letter dated 30-03-2009 have stated that the average capital cost is in the range of Rs.6.00 – 6.50 Crores per MW. Further, as per the manual on development of small hydro electric projects published in 2009 by Central Board of Irrigation & Power (CBIP), the project cost is in the range of Rs.5.00 – 7.00 Crores per MW. The Central Electricity Regulatory Commission (CERC) in their Terms and Conditions for Tariff determination from Renewable Energy Sources Regulations, 2009, have adopted the following capital cost for Small Hydro Project, which is 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:

Region	Project Size	Capital Cost in Rs. Crores/MW
Himanchal Pradesh, Uttarakhand and North Eastern States	Below 5 MW	7.00
	5 MW to 25 MW	6.30
Other States	Below 5 MW	5.50
	5 MW to 25 MW	5.00

In response to the Commission's subsequent letter, IREDA has stated in their letter dated 26-05-2009 that the project cost of **SHP upto 5 MW in the plains** varies from Rs.5.82 Crores/MW to Rs.6.76 Crores/MW.

Taking into account all the above, the Commission has proposed to adopt a capital cost of Rs 5.50 Crores / MW for the SHP projects with capacity up to 5 MW.

8.1.2 Capital Subsidy

The CERC's regulation specified that the Commission shall take into consideration any incentive or subsidy offered by the Central/ State Government to the renewable energy power plants while determining the tariff under these Regulations. The other Commissions also have taken into account the subsidy offered by the MNRE. In the same line the Commission considers the following as capital subsidy which will be reduced from the capital cost.

As per the 11th plan proposals for New and Renewable energy by MNRE, the following pattern of subsidy is recommended for grid interactive/ distributed small hydro power.

Special Category States(NE Region, Sikkim, J&K, HP & Uttarakhand)	Other States
Rs 1 crores X (C MW) ^{0.7}	Rs 0.67 crores X (C MW) ^{0.7}

Where C is the surplus power generation (installed capacity) in megawatt available for export to the grid. The subsidy is released after completion of the project. The subsidy will be available for the surplus portion of the installed capacity exported to the grid. Projects supported by subsidy would require to be tested for their performance with respect to the Detailed Project Report (DPR) norms by an independent agency. Such

testing will ensure that projects established as per DPR norms only receive subsidy support. The subsidy of Central government for various capacities of SHP projects arrived as per the above formula is tabulated below:

Sl.No.	Surplus power generation capacity available for export to the grid in MW (C)	Subsidy in Crores (Rs 0.67 crores X (C MW) ^{0.7})	Subsidy per MW in Crores.
1	0.50	0.41	0.82
2	1.00	0.67	0.67
3	1.50	0.89	0.59
4	2.00	1.09	0.54
5	2.50	1.27	0.51
6	3.00	1.45	0.48
7	3.50	1.61	0.46
8	4.00	1.77	0.44
9	4.50	1.92	0.43
10	5.00	2.07	0.41
Average			0.54

The capital cost of smaller projects is generally be more than the larger projects due to economy of scale. It is seen from the above tabulation that the per MW capital subsidy decreases with the increase in installed capacity. Lesser is the capacity of the station, larger is the subsidy. Therefore, It is proposed to consider average cost of subsidy of Rs. 0.54 Crore / MW.

8.1.3 Commission's order on infrastructure development charges.

The Commission in its Order dated 19-9-2008 in M.P. No. 27 of 2008 has ruled that in accordance with Sections 39 (2) (c), 40 and 42 (2) of the Electricity Act 2003 the infrastructure development charges of Rs.25 lakhs per MW should be borne by the distribution licensee and the State Transmission Utility (STU). Therefore, it is logical that the capital cost should be scaled down by Rs.25 lakhs per MW.

8.1.4 Net Capital Cost

After deducting the capital subsidy and the infrastructure cost, the net capital cost for the SHP projects is worked out as follows:

$$\left. \begin{array}{l} \text{Net Capital cost for the SHP projects with capacity} \\ \text{upto 5 MW (5.50 - (0.54+0.25))} \end{array} \right\} = \text{Rs. 4.71 Crs /MW.}$$

These net capital costs are inclusive of all the costs such as plant and machineries, civil works, land cost/rent/lease, rehabilitation and re-settlement, etc.

8.2 Plant Load Factor (PLF)

In case of small hydro projects, PLF has always been a parameter of utmost importance. PLF is site specific depending upon the water availability in a particular location. Normative values of PLF of small hydro generators for different States are given below:

State	PLF in %
Kerala	30% with auxiliary consumption of 0.5%
Andhra Pradesh	35% with 1% Aux. Consumption
Karnataka	30% with 0.5% Aux. Consumption
Uttar Pradesh	Fixed different range of PLF starting from 30-40% to 65-70% and different tariff rate.
Uttanchal	45% with 1% Aux. Consumption
Maharashtra	30% with 0.5% auxiliary consumption and 0.5% towards transformation loss
Himachal Pradesh	45% with 0.5% auxiliary consumption and 0.5% towards transformation loss

The PLF of other States could not be considered since it is site specific depending upon the metrological parameters. To find out the normative PLF for Tamil Nadu, data on the PLF of TNEB owned small hydro generators were obtained for the years 2005-06, 2006-07, 2007-08 and 2008-09. The average PLF works out to be 33.62%. Considering the fact that the PLF of the future small hydro generators would be slightly less than the existing TNEB owned small hydro generators, it is proposed to adopt a PLF of 30% in the proposed tariff order. The PLF of 30% is also in line with the CERC (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2009.

8.3 Auxiliary Consumption

The CERC's regulation proposed normative auxiliary consumption of 1% to the SHP projects. In line with the above, Commission has proposed to consider a normative auxiliary consumption of 1% to the SHP projects.

8.4 Debt-equity ratio

As per the guide lines specified in the tariff policy for financing of future capital cost of projects, a debt: equity ratio of 70:30 should be adopted. This ratio has been adopted by most of the Commissions. Hence, it is proposed to retain the same for the proposed tariff order for SHP projects also.

8.5 Term of the Loan

CERC in their regulation has proposed loan tenure of 10 years. IREDA loans are available with the term structure of 10 years with a moratorium of one year. The Commission in Order No.1 of 2009 dated 20-03-2009 for wind energy tariff determination, have considered the terms of loan as 10 years with one year moratorium for wind projects. Hence, it is proposed to retain the same for the proposed tariff order for SHP projects also.

8.6 Interest rate on Loan

CERC in their regulation has proposed to consider average Long Term Prime Lending rate of State bank of India prevalent during the previous year plus 150 basis points. But, it is understood that IREDA, a major financier of renewable energy projects is financing the renewable energy projects at the interest rate range of 11.75% to 12.9% for renewable projects. Commission in Order No.1 of 2009 dated 20-03-2009 for wind energy generation has adopted an interest rate of 12%. Interest rates adopted by the other Commissions are tabulated below:

State	Interest in %
Andhra Pradesh	12%
Kerala	9%
Karnataka	11%
Uttar Pradesh	10.25%
Uttarakhand	11.25%
Maharashtra	9%
Himachal Pradesh	11.5%

Considering the above, Commission proposes an interest rate of 12%. The investor is free to avail a cheaper loan, if available.

8.7 Interest on Working Capital

The Central Electricity Regulatory Commission has included the following components in

working capital in their Terms and Conditions for Tariff determination from Renewable Energy Sources Regulations, 2009:

- (i) Operation and Maintenance expenses for one month;
- (ii) Maintenance spares @ 15% of the O&M expenses,
- (iii) Receivables equivalent to 2 (two) months of energy charges for sale of electricity calculated on the normative CUF;

CERC fixed an interest rate equivalent to short-term Prime Lending Rate of State Bank of India prevalent during the previous year plus 100 basis points. In the Commission's latest orders Nos. 2 and 3 of 2009, receivables equivalent to one month of energy charges was included in the working capital as the distribution licensee has to make payment to the generator within 30 days of receipt of the bill. Hence, Commission proposed to adopt the following components in the working capital:

- (i) Operation and Maintenance expenses for one month;
- (ii) Maintenance spares @ 15% of the O&M expenses,
- (iii) Receivables equivalent to 1 (one) month of energy charges for sale of electricity calculated on the normative CUF;

The table below summarizes the interest rate on working capital that has been considered by other ERCs.

State	Interest on WC
Andhra Pradesh	12%
Kerala	7% on two months bill amount, one month O&M and 1% spares of the Capital cost.
Karnataka	12.5% two months bill
Uttranchal	12.25% on a) Operation and Maintenance expenses for one month; b) Maintenance spares @ 1% of the historical cost escalated @ 5% per annum from the date of commercial operation;
Uttar Pradesh	12.80% on a) one month O&M charges b) Receivables – 2 months c) Spares of 15% on O&M cost.
Maharashtra	11% on a) one-month O & M charges, b) two months average receivables and c) cost of maintenance spares required for one month

Himachal Pradesh	13.75% on a)Operations and Maintenance expenses for one month, b)Maintenance spares equivalent to 50 % of R&M expenses for 1 month, c)Receivables equivalent to 2 months of fixed and variable charges for sale of electricity calculated on the normative Capacity Index.
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Considering the above, Commission proposed to adopt an interest rate of 12% on working capital as considered in order No. 2 and 3 of 2009 by the Commission.

8.8 Return on Equity (RoE)

The Tariff Regulations of the Commission stipulate 14% post tax RoE for conventional fuel based generating stations. With the objective of promoting renewable energy, Commission in its Order No.1 of 2009 dated 20-03-2009 for wind energy tariff determination has considered a 19.85% pre-tax return on equity from 01-04-2009, which is arrived based on CERC's rate of 15.5% post-tax in its Terms and Conditions of Tariff Regulations for 2009 – 14. Based on the above, Commission proposes to adopt the same rate of 19.85% pre-tax RoE for the SHP projects also. The RoE adopted in other States are given below:

State	RoE
Andhra Pradesh	16% pre-tax
Kerala	14% post-tax
Karnataka	16% pre-tax
Uttranchal	14% post-tax
UP	16% pre-tax
Maharashtra	16% pre-tax
Himachal Pradesh	14% post-tax

8.9 Life of Plant and machinery

The CERC in their Terms and Conditions for Tariff determination from Renewable Energy Sources Regulations, 2009 have considered 35 years as useful life of the Small Hydro Plant. The Central Board of Irrigation & Power has also mentioned in the manual on development of small hydro electric projects that the life of the SHP projects is around 35 years. The life of the plant considered by other States are as follows:

State	Life Period in years
Kerala	20
Uttar Pradesh	20
Uttanchal	35
Maharashtra	30
Himachal Pradesh	40

Considering the uncertainties involved in projects such as run of the river hydro units, Commission proposes to consider as 30 years as life of the small hydro power plants.

8.10 Depreciation of plant and machinery

The CERC's regulations recommended 'Differential Depreciation Approach' over loan tenure and period beyond loan tenure over useful life computed on 'Straight Line Method'. Since the Commission proposed to consider 'cost plus single part average tariff' for fixing tariff for SHP projects, 'Differential Depreciation Approach' has not been considered. Hence, for the purpose of tariff determination, it is prudent to assume depreciation by the Straight Line Method (SLM) wherein the asset life is to be depreciated to a residual value of 10% of its initial value over the entire asset life of 30 years. **This translates to an SLM depreciation rate of 3 % per annum.** The depreciation rates that have been used by different SERCs (based on the life of the respective SHP projects) are summarized in the table below:

State	Depreciation in %
Kerala	4.5% on SLM
Karnataka	7% on SLM
Uttar Pradesh	SLM rate – 7 % p.a. for first ten ears and 2% p.a. for subsequent ten years
Uttanchal	2.57% SLM
Maharashtra	3% SLM
Himachal Pradesh	2.25%

8.11 Operation and Maintenance Expenditure

As per the CERC's regulation, the O&M expenses for SHP projects for the first year of the Control period shall be Rs.17.0 Lakhs per MW and shall be escalated at the rate of 5.72% per annum for the remaining periods. The O&M cost is inclusive of insurance cost for the hydro machines. Considering the above, it is proposed to adopt the rate prescribed in CERC's Terms and Conditions for Tariff determination from Renewable

Energy Sources Regulations, 2009. i.e. Rs.17.0 Lakhs per MW for the first year with 5.72% escalation from the second year onwards.

The table below gives the O&M expenditure as percentage of capital cost that has been adopted in different States.

State	O&M Expenses
Kerala	1.5% of the capital cost with 4% escalation.
Andhra Pradesh	1.5% of the capital cost with 4% escalation.
Karnataka	1.5% of the capital cost with 5% escalation.
Uttar Pradesh	2.5% of the capital cost for first year of operation with 5.72% escalation per annum for subsequent years.
Uttanchal	Up to 5 MW - 5.00% 5 to 10 MW - 4.75% 10 to 15 MW - 4.50% 15 to 20 MW - 4.25% 20 to 25 MW - 4.00% of the capital cost with 5% escalation per annum for subsequent years.
Maharashtra	2.5% of capital cost for first year with an escalation of 4% every year.
Himachal Pradesh	2.25% of capital expenditure with 4% escalation every year.

9.0 Tariff Rate

The financial and operating parameters proposed in the paper and the projected cost plus single part average tariff for 20 years for the SHP projects are tabulated below:

Description of financial and operating parameters	Values proposed in the paper for the financial and operating parameters and the cost plus single part average tariff worked out for 20 years for the SHP Projects to be Commissioned in the forthcoming control period
Plant Load Factor	30%
Life of the machine	30 years
Project Capital cost / MW	For SHP projects with capacity upto 5 MW = Rs. 4.71 Crores / MW.
Debt: Equity ratio	70:30
Interest on Loan	12.00%
Return on Equity	19.85% Pre-Tax
Loan Repayment period	10 years with 1 year moratorium period

O&M Charges	Rs.17.0 Lakhs per MW for the first year with 5.72% escalation from the second year onwards.
Depreciation	3% Straight Line Method
Residual Value	10% of capital cost.
Auxiliary Consumption	1%
Interest on working capital	(i) Operation and Maintenance expenses for one month; (ii) Maintenance spares @ 15% of the O&M expenses, (iii) Receivables equivalent to one month of fixed cost. Rate of interest on working capital – 12%.
Cost plus single part average tariff for 20 years	For SHP projects with capacity upto 5 MW = Rs.3.35 per kWh.

The tariff rates adopted in other States are tabulated below:

State	Tariff Rate
Andhra Pradesh	Rs.2.60/kWh for 1 st year and Rs.1.88/kWh for 10 th year.
Kerala	Rs.2.44/kWh
Karnataka	Rs.2.80 /kWh
Uttanchal	Upto 5 MW - Rs. 2.80/kWh 5 to 10 MW - Rs. 2.80/kWh 10 to 15 MW - Rs. 2.75/kWh 15 to 20 MW - Rs. 2.70/kWh 20 to 25 MW - Rs. 2.65/kWh
Uttar Pradesh	For a PLF range of 35-40% tariff varies from Rs.3.83/kWh in 2010 to Rs.3.34/kWh in 2014 with incentive of 35 paise/kWh for excess generation beyond normative PLF.
Maharashtra	Rs.2.84/kWh for 1 st year and Rs.3.26/kWh for 20 th year.
Himachal Pradesh	Rs.2.87/kWh

In their manual on development of small hydro electric projects published in 2009, the Central Board of Irrigation & Power has reported that the cost of generation of small hydro power projects ranges from Rs. 2.00 to 2.50 per unit.

CERC, based on their Terms and Conditions for Tariff determination from Renewable Energy Sources Regulations, 2009 have fixed the following tariff rates for the SHP projects vide their order dated 03-12-2009 in petition No. 284/2009 (Suo Motu):

Region	Levelling total tariff (Rs/kWh)	Benefit of Accelerated Depreciation, if availed (Rs/kWh)	Net Levelling Tariff upon adjusting for accelerated Depreciation benefit, (if availed) (Rs/kWh)
HP, Uttarakhand and NE States (Below 5MW)	3.90	(0.23)	3.67
HP, Uttarakhand and NE States (5MW to 25 MW)	3.35	(0.21)	3.14
Other States (Below 5 MW)	4.62	(0.27)	4.35
Other States (5 MW to 25 MW)	4.00	(0.25)	3.75

10.0 Related issues

The following are the issues related to small hydro power generation, transmission, wheeling and consumption:

1. Banking
2. Transmission and wheeling charges
3. Cross subsidy surcharge
4. CDM benefits
5. Reactive power charges
6. Grid availability charges
7. Adjustment of energy generated
8. Scheduling and system operation charges
9. Application fees and Agreement fees
10. Billing and payments
11. Payment security and Security deposit
12. Power factor incentive / disincentive

13. Metering and communication arrangements
14. Evacuation of small hydro generation
15. Energy purchase agreement
16. Energy wheeling agreement
17. Renewable energy purchase obligation
18. Tariff Review Period / Control Period
19. Water Royalty
- 10.20 Policy adopted by other States for allotment of SHP sites

10.1 Banking

There are no perennial rivers in Tamil Nadu. Most of the SHP potential projects are run off river based or canal drops. Hence generations in SHP projects are seasonal and irrigation linked. Considering its seasonal and irrigational linked nature of the SHP, it is justifiable to extend banking provisions for small hydro generators. The Uttarakhand ERC considered a banking period of one month with 12.5% banking charges. Commission in order No. 1 of 2009 dated 20-03-2009 on wind energy considered the following towards banking mechanism:

The banking charges of 5% shall be realized every month for the quantum of units generated during the billing month less the consumption of the captive users / third party sale. Slot-wise banking is permitted to enable unit to unit adjustment for the respective slots towards rebate / extra charges. No carry over is allowed beyond the banking period. Unutilized energy at the end of the financial year may be encashed at the rate of 75% of the relevant purchase tariff. The banking period commences on 1st April and ends on 31st March of the following year. The energy generated during April shall be adjusted against consumption in April and the balance if any shall be reckoned as the banked energy for April. The generation in May shall be first adjusted against the consumption in May. If the consumption exceeds the generation during May, the energy banked in April shall be drawn to the required extent. If the consumption during May is less than the generation during May, the balance shall be reckoned as the banked energy for May and banking charges for May will be leviable only for this component. As and when the distribution licensee enforces restriction and control measures for restricting the consumption of wind energy generators, the unutilized energy at end of the financial year may be encashed at full value of the relevant tariff for sale to the licensee.

It is proposed to adopt the same banking mechanism to the SHP projects also.

10.2 Transmission & Wheeling charges and line losses

Commission has uniformly adopted transmission and wheeling charges including line losses at 5% and 7.5% for HT / EHT and LT services respectively in respect of wind, biomass and bagasse based generation in its orders issued recently. It is proposed to adopt the same for SHP projects.

10.3 Cross subsidy surcharge

Commission in its order No. 1 of 2009 dated 20-03-2009 fixed 50% of the cross subsidy surcharge for wind energy generators as a promotional measure for renewable energy. On similar lines, Commission proposes 50% of the cross subsidy surcharge in force for SHP projects.

10.4 CDM Benefits

The Forum of Regulators has recommended that CDM benefits should be shared on gross basis starting from 100% to developers in the first year and thereafter reducing by 10% every year till the sharing becomes equal (50:50) between the developer and the consumer in the sixth year. Thereafter, the sharing of CDM benefits will remain equal till such time the benefits accrue. The Commission adopted this formula in its order No. 1 of 2009 on comprehensive tariff order on wind energy. Commission proposes the same formula for SHP projects. STU / Distribution Licensee shall account for the CDM receipts in the next ARR filing.

10. 5 Reactive Power Charges

In Small Hydro Generating Stations, generally synchronous type generators are used. However, for the past few years, induction type generators have also been used in micro / mini hydro power stations. This reduces the cost of generator, installation cost and simplifies control & operation.

Commission in Order No.1 of 2009 dated 20-03-2009 stipulated a charge of 25 paise / KVARh for the WEGs who draw reactive power up to 10% of net active energy generated and 50 paise per KVARh who draw more than 10% of net active energy generated, where induction generators are being used predominantly.

Commission in its tariff order No. 2 and 3 of 2009 on biomass and bagasse based Co-generation has fixed the reactive energy charges as prescribed in Indian Electricity Grid Code, where synchronous generators are used.

Therefore, Commission has proposed to adopt the reactive energy charges at the rates prescribed in the order No. 1 of 2009 for those SHP projects which use induction generators and at the rates prescribed in the order Nos. 2 and 3 of 2009 for those SHP projects which use synchronous generators.

10.6 Grid Availability Charges

Commission fixed grid availability charges such as startup power, standby power, energy charges and demand charges as per order No. 2 dated 15-05-2006 to biomass and bagasse based Co-Gen power plants issued recently vide order No. 2 and 3 of 2009. The Commission proposes to retain the same charges for SHP projects also. When the adjustment is permitted in LT consumption, LT consumers shall pay the tariff applicable to temporary supply in the case of outage of the small hydro generators. Similarly, the LT captive consumer shall pay to the licensee the appropriate tariff whenever the SHP generation does not materialize or when consumption exceeds generation.

10.7 Adjustment of generated energy

Section 9 (2) of the Electricity Act 2003 confers on the captive generator the right to open access for the purpose of carrying electricity from the captive plant to the destination of his use. Therefore, a small hydro generator shall be entitled to adjust the generated energy both for LT / HT captive consumption. As regards sale to third parties, Clause 11 of the Intra State Open Access Regulations 2005 of the Commission, which prescribes a minimum limit of load, shall apply to SHP generators also.

10.8 Scheduling and system operation charges

The scheduling and system operation charges for wind energy generators has been prescribed in Order No.2-5 dated 11-10-2008 at Rs.300/- per day per 1.65 MW for each service connection. If the generation capacity of a service connection exceeds 1.65 MW, the same charge of Rs.300/- per day would apply. If the generation capacity of a service connection is less than 1.65 MW, the charges shall be proportionate. Considering and

comparing the capacity range and CUF / PLF for wind energy and SHP, the Commission proposes the same rate for SHP projects also.

10.9 Application fees and agreement fees

The Intra State Open Access Regulations 2005 of the Commission were amended in 2008 to provide for concessional application fees and agreement fees for generators of non conventional and renewable sources of energy. The application fees under the Energy Wheeling Agreement was fixed at Rs.200 per MW subject to a maximum of Rs.5000 and the agreement fees under Energy Wheeling Agreement was fixed at Rs.2000 per MW subject to a maximum of Rs.50000 on the consideration that generators of renewable sources of energy have small capacities compared to generators of conventional energy. The agreement fees for Energy Purchase Agreement has been fixed at Rs.2000 per MW or part thereof. As regards the Energy Purchase Agreement, Commission's Fees and Fines Regulations 2004 prescribes Rs.2000 per MW or part thereof as the fees for approval of Power Purchase Agreement by the Commission as against Rs.2500 per MW or part thereof leviable for conventional power plants. This fee shall be collected by the licensee and passed on to the Commission. In case of frequent changes in the usage of the energy as well as the change of drawal point necessitate extra clerical work. Therefore, the Commission proposes that every time a generator seeks such a change either through an amendment to an existing agreement or through a fresh agreement, an additional charge equivalent to the application fees and agreement fees shall be leviable by the licensee on the generator.

10.10 Billing and Payment

As adopted in the Commission's Order No.1 of 2009 dated 20-03-2009, when a Small Hydro Generator (SHG) sells power to the distribution licensee, the generator shall raise a bill every month for the net energy sold after deducting the charges for start up power. The distribution licensee shall make payment to the generator within 30 days of receipt of the bill. Any delayed payment beyond 30 days is liable for interest at the rate of 1% per month.

If a SHG utilizes the power for captive use or if he sells it to a third party, the distribution licensee shall raise the bill at the end of the month for the net energy supplied. The licensee should record the generation and consumption simultaneously. While preparing

the bill, peak hour generation shall be adjusted against peak hour consumption. Off peak generation shall be adjusted against off peak consumption. Normal generation shall be adjusted against normal consumption. Peak hour generation and normal hour generation can be adjusted against lower slot consumption. Excess consumption will be charged at the tariff applicable to the consumer. Transmission and wheeling charges, scheduling and system operation charges and cross subsidy surcharge, wherever applicable, shall be recovered from the bill. The net amount recoverable from the consumer shall be raised in the bill.

10.11 Payment Security and Security Deposit

The National Tariff Policy calls for adequate and bankable security arrangements to the generating companies. This mechanism has been found impractical, as there are 176 SHP potential sites in Tamil Nadu and it will be difficult for the monolith Distribution Licensee to offer security for such a large number. Therefore, as adopted by the Commission in its order No. 1 of 2009 dated 20-03-2009, penalty of 1% per month for delayed payment by the licensee to the small hydro generators is proposed.

As regards the security deposit of the consumer, the Commission decides to retain the present arrangements. i.e., two times the maximum net energy supplied by the distribution licensee in any month in the preceding financial year shall be taken as the basis for the payment of security deposit by the consumers.

10.12 Power factor incentive / disincentive.

As per Clause 7.17 of the Tariff Order dated 15-3-2003 of the Commission, power factor incentive / disincentive is applicable to a consumer as a percentage of current consumption charges. The average power factor recorded by the meter shall be the reference for calculation of the incentive / disincentive. On the same analogy, captive / third party consumers shall be eligible for incentive or liable for disincentive based on the gross energy consumption and the applicable demand.

10.13 Metering and Communication Arrangements

The metering and communication shall be in accordance with the following:

- (1) Central Electricity Authority (Installation and Operation of Meters) Regulations, 2006
- (2) Tamil Nadu Electricity Distribution Code 2004

- (3) Tamil Nadu Grid Code 2004
- (4) Tamil Nadu Electricity Intra State Open Access Regulations 2005

The consumers have been given the option to procure meters as specified in the Central Electricity Authority (Installation and Operation of meters) Regulations 2006.

10.14 Evacuation of small hydro generation

With regard to evacuation facilities the guide lines specified in the Regulations on “Power Procurement from New and Renewable Sources of Energy, 2008” are reproduced below:

3(3) Evacuation facilities shall be provided by the State Transmission Utility (STU) /Distribution licensee as per the Commission’s Intra State Open Access Regulations 2005, Central electricity Authority (Technical Standards for connectivity to the Grid) Regulations, 2006 and Tamil Nadu Electricity Grid Code. The cost of interfacing lines, switch gear, metering, protection arrangement and related other equipments up to the interconnection point shall have to be borne by the generators, but the work shall be executed by STU/distribution licensee. The developer may be permitted to execute the works as per the terms and conditions of the STU/Licensee.

Provided that, in the case of sale of entire power to the distribution licensee by any new and renewable source based generator, the cost of interfacing lines up to the interconnection point shall have to be borne only by the STU/ distribution licensee.

Provided further that in case where the new and renewable source based generator referred to in the first proviso who has entered into an EPA with the distribution licensee referred to therein for the sale of entire power to the said distribution licensee decides to use such power agreed to be sold to the said distribution licensee, for his captive use or for sale of such power to a third person or to a distribution licensee other than the distribution licensee referred to above before the expiry of the period referred to in such EPA, then he shall be bound to reimburse the depreciated (Written down value) cost of interfacing lines to the distribution licensee with whom he has executed such EPA, before the wheeling of power to his captive use or sale to third person or distribution licensee other than the distribution licensee with whom the said EPA has been executed by him”

In addition to the above stipulation, the Commission proposes the following procedure for creation of evacuation facilities.

- (a) STU shall within 30 days of receipt of application from generators, intimate whether or not the long term access can be allowed without further system strengthening.
- (b) If further system strengthening is essential, the results of study conducted by the STU based on the request of generators shall be intimated within ninety days of such request of generators.

- (c) Feasibility based on system studies shall be established within six months at the latest.
- (d) Clearances, approvals, certificate, if any, required by generators shall be issued within a month time.
- (e) The distribution licensee is not liable to pay compensation to the consumer on Open Access for deemed generation benefits in case the distribution licensee is unable to evacuate power due to failure of the Transmission and Distribution facility

10.15 Energy Purchase Agreement

The Commission proposes that the format of the Energy Purchase Agreement (EPA) shall be evolved by the Commission after discussion with SHP generators and the distribution licensee within a month of this order. The agreement shall be valid for a minimum period of 20 years. The distribution licensee shall execute the Energy Purchase Agreement within a month of receipt of application from the generator. The parties to the agreement may be given the option of exit in case of violation with three months notice to the other party.

10.16 Energy Wheeling Agreement (EWA)

The Commission proposes that the format of the Energy Wheeling Agreement (EWA) shall be evolved by the Commission within a month of the order after consultation with the SHP generators and the distribution licensee. The agreement shall be valid for a minimum period of 5 years. The parties to the agreement shall be given the option to exit for violation of the agreement after serving a notice of three months on the other party. The distribution licensee should execute the EWA within one month from the date of submission of application with all relevant details for such agreement by the SHP generators or the third party purchaser, as the case may be.

10.17 Renewable Purchase Obligation

With regard to fixing of minimum purchase requirement from NCES, the following important factors have to be considered.

- Total quantum of energy required for the State
- Total potential for renewable energy generation in the State
- Quantum of renewable energy being generated

- Power purchase tariff for renewable energy
- Firm or infirm nature of the NCES power
- Quantum of penetration of NCES power and its impact on the grid
- Commercial impact on retail tariffs due to purchase of renewable power

Considering the above, Commission in its order No.1 of 2009 dated 20-03-2009 fixed Renewable Energy Purchase Obligation at minimum of 13% for 2009-10 and minimum of 14% for 2010-11 for the distribution licensee from NCES sources out of his total consumption in his area of supply as required by Section 86(1)(e) of the Act.

10.18 Tariff Review Period / Control Period

With regard to tariff Review Period / Control Period, the specific provisions of Regulation 6 of Regulations on “Power Procurement from New and Renewable Sources of Energy, 2008” are reproduced below:

*“The tariff determined by the commission in the tariff order shall be applicable for the power purchase agreement period of **twenty years**. The control period may ordinarily be **two years**. When the Commission revisits the tariff and allied issues after the control period, the revision shall be applicable only to the generator of new and renewable energy sources commissioned after the date of such revised order”*

10.19 Water Royalty

Water royalty payment is under the purview of government of Tamil Nadu. Hence, any change effected in the existing value of royalty payments by the State government, shall be treated as an uncontrollable element. In the current scenario, it may be appropriate to keep the water royalty charges out of tariff determination process. But it is the cost, the small hydro generator is actually incurring as declared by the GoTN time to time and hence it needs to be treated as a pass through. This will ensure that the consumers will pay the actual amount of water royalty as notified by the Government. Hence, Commission proposes that the actual rate of water royalty as declared by the State government from time to time shall be reimbursed by the licensee every month to the SHP project developer along with the payment of energy purchase charges.

10.20 Policy adopted by other States for allotment of SHP sites

Some of the states have issued guidelines for allotment of sites for development of SHP projects through private sector participation. The abstract of the guidelines obtained from the websites are given below:

1. Maharashtra

The bidders shall quote a premium payable to Government of Maharashtra over and above threshold premium and support his bid by Earnest Money Deposit (EMD). Upfront premium will be the primary consideration for allotment of the projects. Upfront premium offered by both IPPs/CPPs will be evaluated. The highest bid so evaluated will be the criteria for selection.

2. Uttarakhand

The SHP projects shall be allotted on payment of threshold premium. i.e. Rs. 5 Lakhs per MW or part thereof. If there is more than one applicant, preference shall be given to the person of the area, or the District. Not more than 3 projects shall be allotted for implementation to a prospective private developer.

3. Himachal Pradesh

Allocation of SHP sites will be done on the basis of marks allocation to the following factor.

a) Financial capability	-	60 marks
b) Technical capability	-	30 marks
c) Personal interaction	-	10 marks

However, to qualify the financial capability, minimum assets (both movable & immovable) should not be less than Rs. 10 Lakhs.

4. Karnataka

The applicant shall submit a pre-feasibility report prepared as per Karnataka Renewable Energy Development Limited's (KREDL) specification based on scientifically conducted survey and factual data obtained from recognized sources. Source of data must be

quoted and may be subjected to such verification as deemed fit by KREDL to establish authenticity and correctness of the data.

The applicant must demonstrate his ability to raise a minimum of 11% of the project cost as promoter's equity. This capacity must be demonstrated by production of a statement of net worth issued by a banker or a certified Chartered Accountant. An application fee of Rs.30,000/- per MW of the exploited potential, of which Rs,5000/- per MW shall be non-refundable part, subject to a minimum of Rs.30,000/- per application shall be paid through DD.

KREDL / Govt. of Karnataka reserves the right to question any data / feasibility report submitted by the applicant which are based on actual measurements conducted either by the applicant himself or by a recognized authority. The allottee shall execute an agreement with the Govt. within three months from the date of issue of the capacity allotment order. The allottee shall prepare and submit a Detailed Project Report (DPR) to KREDL along with processing fee as may be fixed in this behalf within the time frame prescribed.

Policy on allotment of sites in Tamil Nadu to the developers shall be in accordance with the guidelines of Tamil Nadu Government.

(By order of the Tamil Nadu Electricity Regulatory Commission)

**Secretary
Tamil Nadu Electricity Regulatory Commission**

ANNEXURE - I LIST OF SITES IDENTIFIED FOR SMALL HYDRO POWER DEVELOPMENT IN TAMIL NADU

Source:- <http://mnes.nic.in/shp-state/tamilnadu.htm>

(DATA AS ON 30-03-2007)

SI no.	Name of Project	Name of District	Category of Proj	Name of river/ canal	Capacity in kW	Head in m	Discharge in m3/sec	Remarks	Annual Rainfall
1	2	4	5	6	7	8	9	10	11
Future Projects									
1	Agamalai		ROR	Agamalai	2000	300		Site identified	
2	Akkamalai		ROR	Bharathapuzha	14000	562		Site identified	
3	Amarabathy		ROR		2000	18	14	Site identified	
4	Ammankoil	Ooty	ROR		50	30		DPR Ready	
5	Arunguli		ROR	Arunguli	2000	180		Site identified	
6	Attittu		ROR	Attittu	3000	190		Site identified	
7	Barrage-II		ROR		500	15		Site identified	
8	Barrage-III		ROR		2000	7		Site identified	
9	Bhavani Barrage	Coimbatore			6000			Identified for IPP	
10	Chekkadiar	Vellore	ROR		1000	396	0.2	Site identified	
11	Chinna Anamalaiar	Coimbatore	ROR		2000	533	0.2	Site identified	1158
12	Chinnar dam	Dharmapui	Dam Toe		100	12	1	Site identified	855
13	Chinnar Irr.		Canal		205	2		Site identified	
14	Chittar Dam	Nagercoil	Dam Toe		2000	341		Site identified	
15	Coonoor Kallar		ROR	Kallar	10000	642		Site identified	
16	F.C.Vaigai	Madurai	ROR		500	352	1	Site identified	879
17	Gatana HEP				350			Identified for IPP	
18	Genmergan	Nilgiris	Dam Toe		700	20		Identified for IPP	
19	Gomuki dam		Dam Toe		150	7	3	Site identified	
20	Gudakkalhalla	Ooty	ROR		3000	305	1	Site identified	
21	Gudur Periyar	Dindigul	ROR		700	91	1	Site identified	
22	Gunda KH St I		ROR	Gundakal Halla	2000	274		Site identified	
23	Gunda KH St II		ROR	Gundakal Halla	2000	183		Site identified	
24	Gundar	Coimbatore	ROR		2000	975	0.2	Site identified	1158
25	Gundar dam	Tirunelveli	Dam Toe		3000	8	45	Site identified	793
26	Kalakaluviar	Ramanathapuram	ROR		1000	610	0.2	Site identified	829

SI no.	Name of Project	Name of District	Category of Proj	Name of river/ canal	Capacity in kW	Head in m	Discharge in m3/sec	Remarks	Annual Rainfall
1	2	4	5	6	7	8	9	10	11
27	Kallar	Nagercoil	ROR		1500	285	1	Site identified	
28	Kamban		ROR	Suruliar	10000	23		Site identified	
29	Karakundru		ROR		9000	128			
30	Karuppanandhi Dam	Tirunelveli	DB		150			Identified for IPP	
31	Kodaganar dam	Dindigul	Dam Toe		200	5	4	Site identified	
32	Kodaganar LS		Canal		150	5			
33	Kodaganar RS		Canal		50	5			
34	Kodavanar	Dindigul	ROR		1500	274		Site identified	
35	Koilar	Dharmapuri	ROR		2000	152	1	Site identified	855
36	Konalar Up		ROR		1000	76		Site identified	
37	Kottaiyar	Coimbatore	ROR		500	274	1	Site identified	1158
38	Kovilar				1000	170			
39	Krishnagiri LS	Dharmapuni	Dam Toe		150	7		Site identified	855
40	Krishnagiri RS	Dharmapuni	Dam Toe		150	7		Site identified	855
41	Kudhirayar	Dindigul	ROR		2000	381	1	Site identified	
42	Kukklatorai		ROR	Kukklatorai	2000	130		Site identified	
43	Kundah				25000				
44	Kundali V				16000				
45	Kurumalaiar	Coimbatore	ROR		1200	305	0.3	Site identified	1158
46	Kurumalaiyar				3000	350		Site identified	
47	Kuttiar	Nagercoil	ROR		1500	274	1	Site identified	
48	L Kottaguidar		ROR		6000	205			
49	Mailar	Nagercoil	ROR		1000	107	1	Site identified	
50	Manamabi		ROR		100	137	0.1	Site identified	
51	Manauki				100			Site Identified	
52	Manchalar		Canal		50	5		Site identified	
53	Mangayar	Coimbatore	ROR		1000	221	0.3	Site identified	1158
54	Manimuthar Dam	Cuddalae	Dam Toe		1000	41	2	Site identified	
55	Manimuthar I		Dam Toe		1500	9		Site identified	
56	Manimuthar II		Dam Toe		1000	15		Site identified	
57	Manimuthar III		Dam Toe		100	10		Site identified	

SI no.	Name of Project	Name of District	Category of Proj	Name of river/ canal	Capacity in kW	Head in m	Discharge in m3/sec	Remarks	Annual Rainfall
1	2	4	5	6	7	8	9	10	11
58	Manjalar	Dindigul			6000			Identified for IPP	
59	Marudhanadhi LS		Canal		100	15		Site identified	
60	Marudhanadhi RS		Canal		50	15		Site identified	
61	Marudhanidhi	Dindigul			5000			Identified for IPP	
62	Mettur WBCD	Salem	Canal		350			Under Investigation	
63	Mudagiar II	Kamarajar	ROR		650	100			
64	Mudangiar I	Ramanathapuram	ROR		650	168	0.2	Site identified	829
65	Muthukombai	Dindigul	ROR		1000	472	0.2	Site identified	
66	Nagari	Ramanathapuram	ROR		200	168	0.1	Site identified	829
67	Navadipallam	Coimbatore	ROR		500	304	0.2	Site identified	1158
68	Nellitorai		ROR	Bhavani	13000	28		Site identified	
69	Pachaiar	Tirunelveli	ROR		1500	76	2	Site identified	793
70	Palar	Coimbatore	ROR		2000	218	1	Under Investigation	1158
71	Pambar	Dindigul	ROR		1000	457	0.2	Under Investigation	
72	Pambar		DB		50	5		Site identified	
73	Parambikulam		Canal		200	3		Site identified	
74	Parappalar	Dindigul	ROR		2000	176	1	DPR Under Preparation	
75	Pariyar Vaigaill		Canal	Periyar	2000	7		Site Identified	
76	Periyakulam	Coimbatore	ROR		2000	91	2	DPR Ready	1158
77	Periyar	Ramanathapuram	ROR		1000	648	0.1	Under Investigation	829
78	Periyar Vaigai I		Canal	Periyar	4500	15		IPP	
79	Periyar Vaigaill		Canal	Periyar	4500	15			
80	Ponnanaiyar	Trichy	Dam Toe		200	12	1	Site identified	
81	Poozari patti	Coimbatore	Canal		300	2	35	Site identified	1158
82	Pulavachiar	Dindigul	ROR		3000	436	0.5	Site identified	
83	Pulichimeenthurai	Madurai	ROR		500	213	0.2	Site identified	879
84	Rajamadam	Thanjur	Canal		350	3	10	Site identified	1146
85	Ramanandi Dam	Tirunelveli	DB		150			Under Investigation	
86	Rarangiar	Ramanathapuram	ROR		250	137	0.1	Site identified	829
87	Rasangi		ROR		250	137			
88	Sathanur				4500	41			

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1	2	4	5	6	7	8	9	10	11
89	Sattier		ROR		2000	411		Site identified	
90	Scheme -1		Canal	Aliyar FC	350	6		Site Identified	
91	Scheme -1		Canal	Mettur WB	300	3		Site identified	
92	Scheme -1		Canal	Periyar IX BR	200	4		Site Identified	
93	Scheme -1		Canal	Periyar X BR	300	6		Site Identified	
94	Scheme -1		Canal	Periyar XII BR	200	3		Site Identified	
95	Scheme -1		Canal	PM Canal	300	5		Site Identified	
96	Scheme -1		Canal	Pollachi	250	7		Site Identified	
97	Scheme -1		Canal	Rajamadam GA C	350	4		Site identified	
98	Scheme -1		Canal	Udumalpet	250	6		Site identified	
99	Scheme -2		Canal	Aliyar FC	200	3		Site Identified	
100	Scheme -2		Canal	Periyar IX BR	200	4		Site Identified	
101	Scheme -2		Canal	Periyar X BR	200	5		Site Identified	
102	Scheme -2		Canal	Periyar XII BR	200	3		Site Identified	
103	Scheme -2		Canal	PM Canal	100	4		Site Identified	
104	Scheme -2		Canal	Pollachi	200	6		Site Identified	
105	Scheme -2		Canal	Rajamadam GA C	800	3		Site identified	
106	Scheme -2		Canal	Udumalpet	200	3		Site identified	
107	Scheme -3		Canal	Aliyar FC	400	7		Site Identified	
108	Scheme -3		Canal	Periyar IX BR	100	4		Site Identified	
109	Scheme -3		Canal	Periyar X BR	300	5		Site Identified	
110	Scheme -3		Canal	Periyar XII BR	300	6		Site Identified	
111	Scheme -3		Canal	PM Canal	150	4		Site Identified	
112	Scheme -3		Canal	Pollachi	200	6		Site Identified	
113	Scheme -4		Canal	Aliyar FC	350	7		Site Identified	
114	Scheme -4		Canal	Periyar IX BR	100	5		Site Identified	
115	Scheme -4		Canal	Periyar X BR	200	5		Site Identified	
116	Scheme -4		Canal	Swethumadai	100	7		Site Identified	
117	Scheme -5		Canal	Aliyar FC	250	4		Site Identified	
118	Scheme -6		Canal	Aliyar FC	200	3		Site Identified	
119	Scheme -7		Canal	Aliyar FC	200	4		Site Identified	

SI no.	Name of Project	Name of District	Category of Proj	Name of river/ canal	Capacity in kW	Head in m	Discharge in m3/sec	Remarks	Annual Rainfall
1	2	4	5	6	7	8	9	10	11
120	Scheme -8		Canal	Aliyar FC	250	4		Site Identified	
121	Shanmuzhandi				23000				
122	Sirumalaiar	Madurai	ROR		250	103	0.2	Site identified	879
123	Siruvani	Coimbatore	ROR	Siruvani	3000	323	1	DPR Ready	1158
124	Tatahahalla		ROR	Tatahahalla	3000	280		Site identified	
125	Thirumurthi	Coimbatore	Canal	Thrimurthy	1300	18	12	Identified for IPP	1158
126	Tumbai Kuntam		ROR	Vaigai	7000	100		Site identified	
127	U Kadamparaiair	Coimbatore	ROR		1000	198		Site identified	1158
128	U Pandiyar I		ROR	Pandiyar	11000	896		Site identified	
129	U.Kothagudiar	Dindigul	ROR		3000	100		Site identified	
130	Udutharjihalla		ROR		7500	304			
131	Ulakurithiar	Dindigul	ROR		2000	243	1	Site identified	
132	Upper Amravati				20000				
133	Vadamalai K Odai LS	Erode	Dam Toe		50	7	1	Under Investigation	
134	Vadamalai K Odai RS	Erode	Dam Toe		50			Site Identified	
135	Vaigai Ph I		Canal	Vaigai	3000	10		Site identified	
136	Vaigai Ph II		Canal	Vaigai	3000	9		Site identified	
137	Vaigai Ph III		Canal	Vaigai	3000	9		Site identified	
138	Vaigai Ph IV		Canal	Vaigai	3000	9		Site identified	
139	Vaigai Ph V		Canal	Vaigai	2000	6		Site identified	
140	Vaigai Ph VI		Canal	Vaigai	2000	6		Site identified	
141	Vaigai Ph VII		Canal	Vaigai	2000	6		Site identified	
142	Vaigai Ph VIII		Canal	Vaigai	2000	6		Site identified	
143	Vairanan				24000				
144	Vaniar	Dharmapuri	ROR		3000	226	1	Site identified	855
145	Varaganadhi II	Dindigul	ROR		1000	305	0.4	Site identified	
146	Varahanadhi-I	Dindigul	ROR		2000	305	1	Under Investigation	
147	Varahanadi	Madurai		Varahanadi	2000	120		Site identified	
148	Varattar				5000			Site Identified	
149	Vardhamanadi	Madurai	ROR		5000	213		Site identified	
150	Varhanadi		ROR	Varahanadi	2000	120		Site identified	

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1	2	4	5	6	7	8	9	10	11
151	Varhapallam	Ooty	ROR		2000	131		Under Investigation	
152	Vazhayar	Coimbatore	ROR		1500	610	0.2	Site identified	1158
153	Verkadahalla	Ooty	ROR		2000	436	1	Site identified	
154	Vidur Dam	Coimbatore	Dam Toe		200	5	4	Under Investigation	1158
155	Yerbadhalla	Nilgiris	ROR		2000	214			
					373455				