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Singareni Bhavan, Red Hills, Lakdi ka Pool
Hyderabad

31 July 2014

Sub: Study report on Determination of Fixed Cost norms for existing Mini Hydel Projects

Ref: Lr. No. APERC/E – 801(H)/Dir-Engg/JD(PPP)/D.No. 74/2014-01 Dated 17-01-2014

Dear Sir,

We have been retained by APERC to provide consultancy services vide the LOI cited under reference above.

Accordingly, we have analysed the performance of the Mini Hydel players based on information furnished to us. Based on our findings, analysis and discussions held with the Commission, we have prepared the Study Report on “**Determination of Fixed Cost norms for existing Mini Hydel Projects**”.

Please find enclosed Final Study Report for your reference.

Yours Sincerely

Best Regards,

Srinivasa Rao Patnana

Associate Director, KPMG Advisory Services Private Limited

STUDY REPORT FOR DETERMINATION OF FIXED COST NORMS FOR EXISTING MINI HYDEL PROJECTS

31 JULY 2014

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Introductory Note

This study report has been done by KPMG for Andhra Pradesh Electricity Regulatory Commission for determination of Fixed cost norms for Mini Hydel projects in erstwhile Andhra Pradesh state for the future. This exercise was done over the period January, 2014 to July, 2014 and the recommendations on the adoption of fixed cost norms for Mini Hydel projects have been documented in the study report.

1 Background

Government of India (GoI) formulated a policy framework in FY 1993-94 for promotion of generating capacity from Non-Conventional Energy (NCE) sources with the objective of conserving fossil fuels and to reduce environmental pollution arising out of the emissions following the combustion of fossil fuels. The NCE sources consists of the following:

- Biomass based Power Projects
- Bagasse based co-generation Power Projects
- Industrial Waste to Energy Projects
- Municipal Waste to Energy Projects
- Mini Hydel Projects
- Wind Electricity Generation Projects

The policy framework provided incentives and facilities for promoting capacity addition through NCE sources. Among other parameters under the policy framework, the tariff payable for power from the NCE sources was predetermined in 1993-94 to take effect from 01-04-1994 with escalation year-on-year.

APERC directed APTRANSCO and NREDCAP to file tariff proposals for tariffs and incentives for various categories of NCE projects to be applicable from 01 April 2004. APERC while determining the tariff for NCE sources was guided by the following principles of the Electricity Act, 2003

- Section 86 (1) (e) of the Electricity Act, 2003 provides that State Regulatory Commission would promote renewable and NCE sources
- Section 86 (1) (a) of the Electricity Act, 2003 empowers the State Commission to fix the tariff for generating stations in the State.

APERC analysed the proposals submitted by APTRANSCO and NREDCAP, considered the environmental benefits from NCE sources and determined the tariff for NCE sources in its March 2004 order.

A two part tariff methodology was adopted for sources which involved a fuel component. The fixed cost was determined for Biomass, Bagasse, Industrial Waste and Mini Hydel projects for their 1-10th year of operation. The variable cost was determined for Biomass, Bagasse and Industrial Waste projects for the period FY 2004-05 to FY 2008-09. A single part tariff for Municipal Waste projects and Wind projects was determined for the period FY 2004-05 to FY 2008-09.

Subsequently, APERC in its July 2004 order revised the norms for Mini hydel projects and revised the fixed cost of Mini hydel projects for their 1-10th year of operation.

Subsequently, APERC in its March 2009 order determined the variable cost for Biomass, Bagasse and Industrial Waste projects and single part tariff for Wind and Municipal Waste projects for the period FY 2009-10 to FY 2013-14.

The APERC orders on tariff determination for NCE sources have been challenged by various NCE generators on grounds that the tariff was not remunerative and prayed for a revision in the tariff.

The Hon'ble APTEL after hearing to the prayers of NCE generators passed an order in December 2012 where in it revised the norms for Biomass, Bagasse and Mini Hydel players and directed APERC to determine the tariff based on revised norms for Biomass, Bagasse and Mini Hydel players for the period FY 2004-05 to FY 2013-14 covering their 1-10th year of operation.

APERC, pursuant to the Hon'ble APTEL order of December 2012 had determined the revised fixed cost with effect from FY 2004-05 for 1-10th year of operation for Biomass, Bagasse, Mini Hydel projects and revised variable cost for the period FY 2004-05 to FY 2008-09 by order dated 22nd June 2013 based on the norms specified by Hon'ble APTEL.

APERC, pursuant to the Hon'ble APTEL orders of December 2012 had determined the revised variable cost for Biomass, Bagasse and Industrial Waste projects for the period FY 2009-10 to FY 2013-14, by order dated 6th August 2013 based on the operating norms specified by Hon'ble APTEL.

APERC has undertaken this exercise for determination of fixed cost norms for:

- Existing Mini hydel projects who have completed 10 years of operation. Some Mini hydel generators have already crossed their 10th year of operation and such generators are being paid at an interim tariff decided by APERC.

The Hon'ble APTEL in its December 2012 order while revising the norms had directed APERC to carry out a scientific study for determination of norms. Following is the relevant excerpt from the order - *“we feel that there is a need for carrying out a scientific study for determining the normative parameters specific to the state for future. The study should also take into consideration the technological improvements that have since taken place in the generation by non-conventional energy sources. We direct the State Commission to arrange to undertake the study on priority and frame its Tariff Regulations for purchase of power by distribution licensees from NCE sources after considering the Study Report, Central Commission's Regulations and any other relevant information”*

APERC in line with the directive of the Hon'ble APTEL has commissioned a study report to determine parameters for:

- Determination of fixed cost norms for the 11-20th year of operation for existing Mini hydel projects.

This report covers the factors governing the determination of fixed cost norms for existing Mini hydel projects that have completed 10 years of operation.

2 Determination of norms for Mini Hydel players

Mini Hydel projects form an important part of the renewable energy space in erstwhile undivided Andhra Pradesh. The following sections present a detailed analysis on the factors to be taken into account while fixing norms for tariff determination for mini hydel projects in the state.

2.1 Additional revenue to Mini Hydel players from APERC order of June 2013 and August 2013

The Mini Hydel players had approached the Hon'ble APTEL for revision of the fixed cost norms on grounds that:

- O&M expenses and escalation should be higher than the existing value.
- Allowed auxiliary consumption was on the lower side.
- PLF should be lower.
- Allowed capital cost was on the lower side.

The Hon'ble APTEL in its December 2012 order has revised the norms for Mini Hydel plants. APERC issued a revised order in June 2013 and August 2013 pursuant to the Hon'ble APTEL order of December 2012. The below table summarises the original and revised norms for Mini Hydel projects in the erstwhile undivided Andhra Pradesh.

	Units	APERC Order Dt.07-07-2004	APERC June 2013 Order (Based on APTEL norms)
Applicability (Fixed Cost)	Period	1-10th year of Operation	1-10th year of Operation
Capital Cost	Rs. Cr/MW	3.75	4.5
PLF	%	35%	32%
O&M expenses (1st year of operation)	% of Capital Cost	1.5%	3.5%
O&M Annual escalation	%	4%	6.69%
Debt: Equity Ratio	Ratio	70:30	70:30

Depreciation	%	6.7% (First 10 years)Balance is spread over for the life of the project	7.0% (First 10 years)Balance 20% spread evenly over 15 years
Interest on Debt	%	12%	12%
ROE	%	16%	16% (MAT/Income Tax pass through)
Interest on Working Capital	%	12%	12%
Auxiliary Consumption	%	1%	1%

The Hon'ble APTEL had revised O&M expenditure and escalation, PLF and Capital Cost for mini hydel players pursuant to the order dated 20th December 2012.

The revised APERC order of June 2013 provided a significant relief to the Mini Hydel players in terms of a higher fixed cost per unit. The below table summarises the initial and revised fixed cost for Mini Hydel players.

Table 2: Initial Fixed cost and Revised Fixed cost for Mini Hydel players		
Year of Operation	Fixed cost as per APERC 07-07-2004 order	Revised fixed cost as per APERC June 2013 order
1	2.69	3.89
2	2.60	3.79
3	2.52	3.69
4	2.43	3.60
5	2.34	3.51
6	2.26	3.42
7	2.17	3.33
8	2.09	3.25
9	2.00	3.17
10	1.92	3.10

The revised APERC order of June 2013 has ensured that mini hydel players get additional revenue to the tune of Rs. 2.0 Cr./MW even while operating at a low PLF. This revenue is sufficient to meet any cost overrun during the last 10 years or to pay off any outstanding liabilities.

The below table summarises the additional revenue which a mini hydel player would get for different PLF's owing to the APERC June 2013 revised order.

Table 3: Additional Revenue from revised APERC order for Mini Hydel players at different PLF - Rs Crs/MW*			
Year	PLF		
	20%	25%	30%
1	0.21	0.26	0.31
2	0.21	0.26	0.31
3	0.20	0.25	0.30
4	0.20	0.25	0.30
5	0.20	0.25	0.30
6	0.20	0.25	0.30
7	0.20	0.25	0.30
8	0.20	0.25	0.30
9	0.20	0.25	0.30
10	0.20	0.26	0.31
Total	2.02	2.53	3.03

* Auxiliary consumption considered - 1%, Assuming that FY 04-05 is the first year of operation for the mini hydel player

2.2 Determination of fixed cost norms for existing Mini Hydel projects

2.2.1 Comparative analysis of Mini Hydel players actual data as against the Fixed Cost norms

This section of the report looks into detail the performance of Mini Hydel players in Andhra Pradesh for the period FY 2004-05 to FY 2012-13 and the issues faced by them.

M/s.Manihamsa Power Projects Limited, M/s.PMC Power Private Limited and M/s.Janapadu Hydro Power Project Private Limited were analysed as part of this study. Data was collected on parameters including the capital cost incurred for the project, loan amount taken, equity amount infused, operating and maintenance expenditure etc. The audited balance sheet and profit and loss statements were also looked at to gain further insight into their performance.

The following table summarises a comparative analysis of the mini hydel players as against the norms specified by various APERC orders.

Table 4: Comparative analysis of Mini Hydel players as against the APERC norms for the period FY 04-05 to FY 12-13¹

Parameter	Norms as per APERC order Dt.20-03-2004 & Order Dt. 07-07-2004	Norms as per APERC 2013 Order (APTEL suggested norms)	Manihamsa (Yeleswaram , East Godavari)	PMC	Janapadu Hydro Projects Pvt. Ltd.
Capacity (MW)			3	0.65	1
Capital Cost (Rs. Lakh/MW) **	375	450	570 492	692	648
PLF (%)	35%	32%	30-75%	25-46%	31-54%
Debt (Rs. Lakh/MW)	262.50	315	358	543	513
Equity (Rs. Lakh/MW)	112.50	135	134	149	135
Interest on Term Loan (%)	12%	12%	5-17%	7-15%	4-11%
Incremental Debt (Yes/No) (Rs. Cr.)			Yes (5.2)	0.00	0.00
Outstanding Debt at the end of 10 years (Rs. Cr.)			5.86	5.68	3.18
O&M Expenses (Rs. Lakh/MW)*	8-11	20-34	20-43	26-35	12-28
No. of years where Net Profit is +ve			7	2	6

**After excluding outliers*

*** Capital cost has been considered as the sum of the equity infused and the debt incurred by the developer*

The average interest rate of the term loans taken by the mini hydel players is around the normative value of 12%. The PLF of the mini hydel players is in the range of 25-75%, which shows that the players would not have any issue in achieving the normative PLF value of 32%. Apart from PMC, the other mini hydel players, i.e. Manihamsa and Janapadu recorded a positive net profit for 7 and 6 years respectively in the 9 year period FY 04-05 to FY 12-13.

It can be observed that some parameters like Capital Cost, Interest on term loans have already been incurred by the mini hydel players in the past and these parameters need not be changed for the future tariff determination exercise.

¹Annual accounts

Manihamsa had taken incremental debt to either fund operations or pay off their debt. Hence, any relief to the mini hydel players for taking incremental debt in the form of depreciation or loan repayment tenure is not required. Other fixed cost items like Return on Equity, Debt:Equity ratio are common for other NCE sources as well and no change is required in these norms.

O&M expense would be incurred by a mini hydel player every year. Hence, the O&M expenses should be set accordingly, so as to meet the actual O&M expenses for mini hydel players. O&M expenditure is one fixed cost item which would tend to increase due to the effect of inflation as well as increase in maintenance expenses. The next section covers a detailed analysis of the O&M expenses of mini hydel players.

The following table captures the fixed cost norms wherein revision is required and where no revision is required.

Table 5: Revision of Fixed cost norms for existing Mini Hydel players	
Need no Revision	Need Revision
Capital Cost	O&M expenses
Interest on Term Loans and Working Capital	O&M expenses annual escalation
Return on Equity	
Debt:Equity Ratio	
Depreciation	

2.2.2 O&M analysis of Mini Hydel plants

The O&M expenses of mini hydel players are in line with the O&M expenses allowed as per the revised APERC Order of 2013 barring a few exceptions.

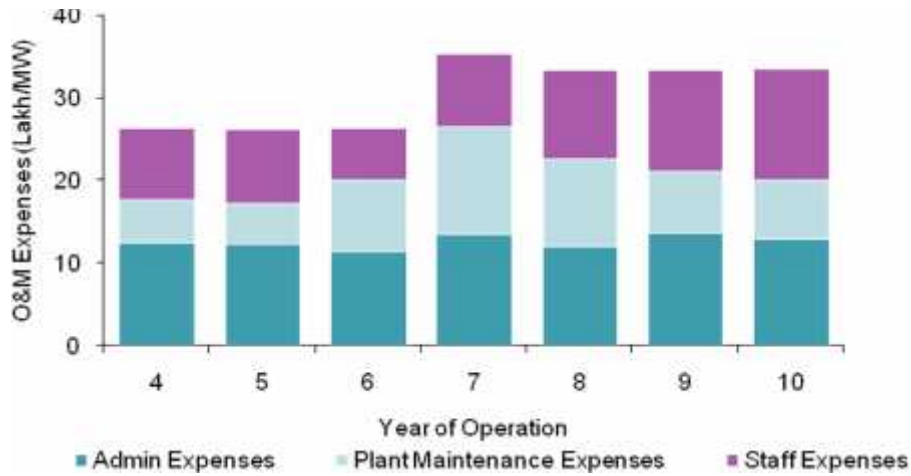
The following graph captures the three main components of the O&M expenditure - Staff Expenses, Plant Maintenance Expenses and Administrative & General Expenses for the period FY 2004-05 to FY 2012-13 for each of the three mini hydel players. Manihamsa, PMC and Janapadu were in the 5th, 4th and 4th year of operation respectively in FY 2004-05.

Figure 1: Component wise O&M Expenses of Manihamsa



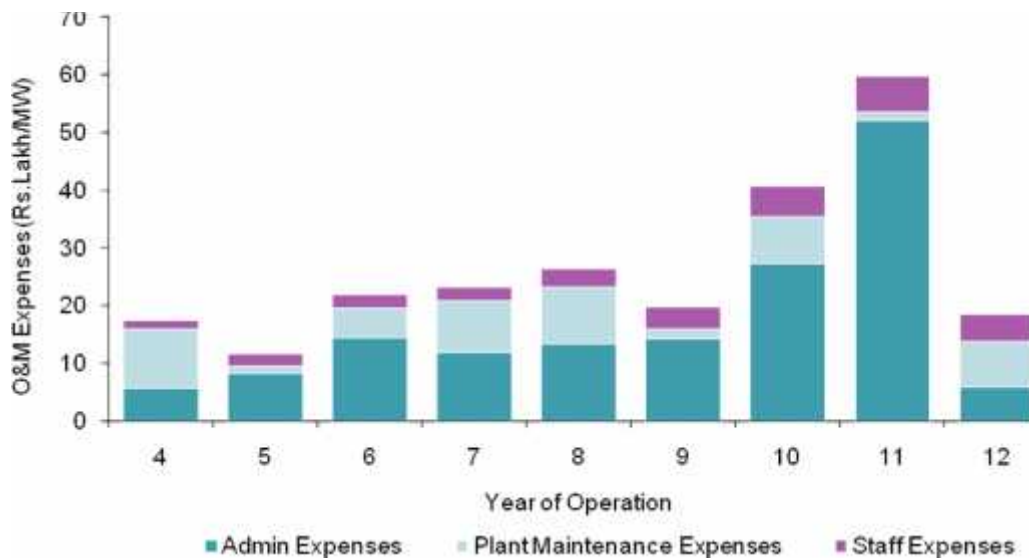
The high O&M expenses in FY 11-12 and FY 12-13 can be attributed to a sudden jump in staff expenses, which should be effectively managed by an organization.

Figure 2: Component wise O&M Expenses of PMC



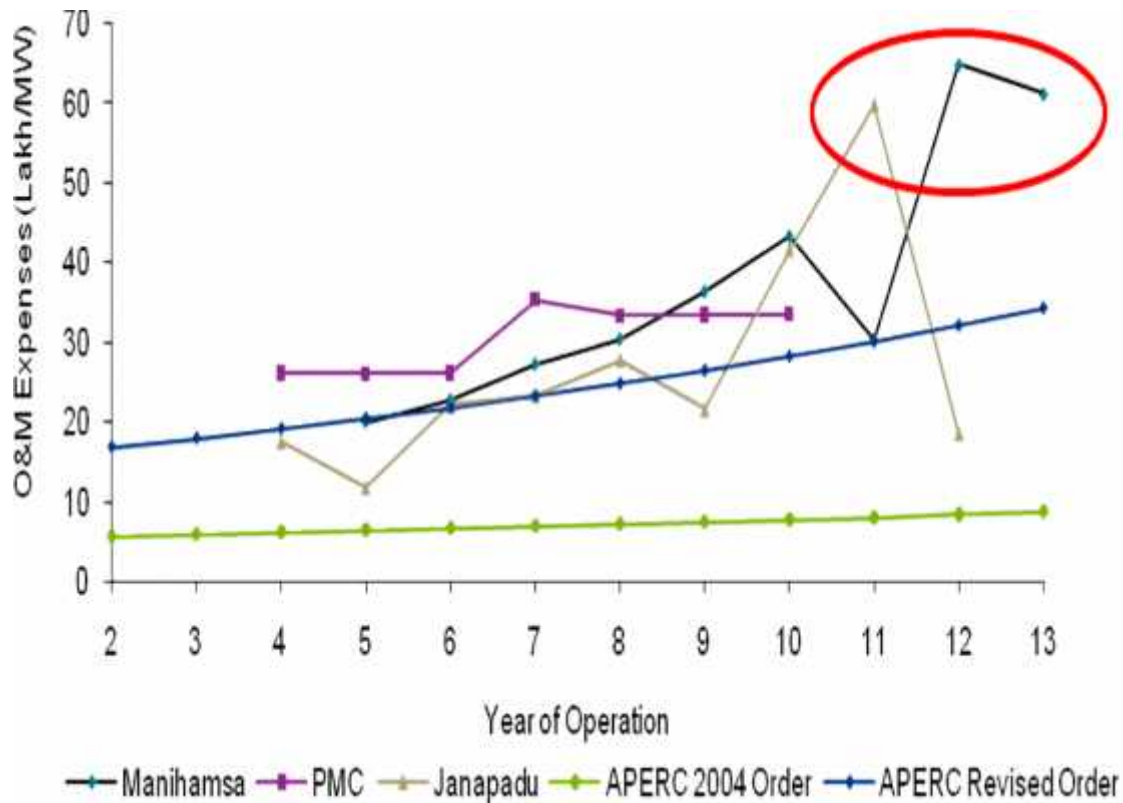
The O&M expenses incurred by PMC are in line with the norms laid down by the APERC revised order.

Figure 3: Component wise O&M Expenses of Janapadu



The high O&M expenses in FY 10-11 and FY 11-12 can be attributed to a steep increase in admin expenses, where there exists a scope for streamlining on the part of the organizations.

Figure 4: O&M Expenses of Mini Hydel players as per the year of operation



As can be seen from the above graph, the O&M expenses of mini hydel players were almost in line with the norms laid down by the APERC revised order, barring a few exceptions. These exceptions were due to a sudden rise in staff costs and admin expenses incurred by the players, as was shown by the previous figures.

Considering the high staff and admin costs incurred by the mini hydel players and scope for streamlining these expenses in the future, the APERC allowed O&M expenditure is found to be sufficient to meet the O&M expenses of the mini hydel players.

The below table captures the O&M expenses allowed by various regulatory commissions for mini hydel plants. As can be seen, the value allowed by APERC is on the higher side and as a result the existing norms for O&M expenses and O&M escalation rates can be continued.

Table 6: O&M expenses allowed by various Regulatory Commissions for Mini Hydel plants

Electricity Regulatory Commission	Date of Order/Regulation	O&M expenses (Rs. Lakh/MW) - First year	O&M annual escalation (%)	O&M expenses (Rs. Lakh/MW) - FY 2014-15
APERC	06/08/2013	16	6.69%	30.6*
CERC	28/02/2013	Below 5MW: 21.1 5MW-25MW: 14.8	5.72%	Below 5MW: 22.3 5MW-25MW: 15.6
KERC	11/12/2009	7.1	5%	9.1
MERC	30/03/2012	Below 5MW: 20.1 5MW-25MW: 14.2	5.72%	Below 5MW: 25.1 5MW-25MW: 17.7
MPERC	14/05/2013	Below 5MW: 19.5 5MW-25MW: 19.1	5.72%	Below 5MW: 20.6 5MW-25MW: 20.1

**Assuming that FY 04-05 is the first year of operation for the mini hydel player*