

**Before the Karnataka Electricity Regulatory Commission,**  
**Bangalore**

**Dated 18<sup>th</sup> January 2005**

Present:

1. K.P. Pandey, Chairman
2. Sri H.S.Subramanya, Member
3. Sri S.D.Ukkali, Member

**In the matter of Determination of Tariff in respect of Renewable  
Sources of Energy**

**ORDER**

**1.** Section 62(1) of the Electricity Act 2003 empowers the Commission to determine the tariff for supply of electricity by a Generating Company to a Distribution Licensee in accordance with the provisions of the Act. Section 61 of the said Act further provides that the Commission shall specify the terms and conditions for the determination of tariff and in doing so shall be guided by the principles listed in clauses (a) to (i) of the said section. Accordingly and in pursuance of section 86(1)(e) read with section 181 of the Electricity Act 2003, the Commission has issued KERC (Power Procurement from Renewable Sources by Distribution Licensee) Regulations 2004 vide Notification No.S/03/1 dated 27.09.2004. The said regulations also specify the quantum of purchase of electricity from renewable sources of energy by a distribution licensee in his area of supply.

**2.** Clause 5.6 of the said regulations stipulates that the following procedure shall be followed by the Commission for determination of Tariff for renewable energy projects:

- i. Invite tariff proposals from Licensees/Generating companies for different categories of renewable energy projects.

- ii. Inviting Public response on the proposals of the Licensee/ Generating Companies.
- iii. Public hearing on the above
- iv. Issue order on the Tariff for the purchase of electricity from renewable sources

3. In pursuance of the above requirement, the Commission had invited tariff proposals for different categories of renewable projects from Licensees /Generating companies. The Commission had issued notice in the following newspapers inviting tariff proposals:

- 1. Times of India dated 5.10.2004.
- 2. Deccan Herald dated 5.10.2004.
- 3. Samyuktha Karnataka dated 5.10.2004.
- 4. Udayavani dated 5.10.2004.
- 5. Vijaya Karnataka dated 5.10.2004.

4. In response to the above, KPTCL and 15 companies /Associations/ Developers have filed their tariff proposals with the Commission. A list of companies, which have filed the tariff proposals, is enclosed as Annexure-1. In addition, a tariff proposal in respect of a Bio-mass project was received just before the public hearing date. KREDL, the nodal agency in the State, has furnished operational and financial parameters for renewable sources.

5. According to the tariff proposals received, the first year tariff proposed for various categories of renewable energy projects is in the following range:

<b>Renewable Source</b>	<b>Tariff Proposed</b>
Mini-Hydel	Rs. 2.90 per unit- Both Redak & KPTCL
Wind	KPTCL: Rs. 3.10; Others: Rs. 3.16 to Rs. 3.66* per unit
Co-generation	KPTCL: Rs. 2.80; SISMA: Rs. 3.83 per unit
Biomass	KPTCL: Rs. 2.80; Others: Rs. 3.32 to Rs.4.00 per unit

\* Rs.3.66 considered as first year tariff for FY04.

6. On the tariff proposals received from KPTCL and the generating companies/developers and the operational and financial parameters provided by KREDL, the Commission invited public response by enabling the interested persons to obtain the copies of the proposals from the Commission and participate in the public hearing. The Commission decided to hold the public hearing in the matter on 28.12.04 and issued notice accordingly in the following newspapers:

1. Times of India dated 8.12.2004
2. Deccan Herald dated 7.12.2004
3. Vijaya Karnataka dated 7.12.2004
4. Udayavani dated 7.12.2004

7. The Commission conducted the hearing on 28.12.2004, which was attended by the representatives of the Developers/ Associations/ Generating Companies in addition to KREDEL & KPTCL. The list of persons who were present in the hearing, is enclosed vide Annexure-2.

**8. Common Issues raised in the discussion paper on renewable energy projects:**

The Commission, while inviting comments earlier on the draft KERC(Power Procurement from Renewable Sources by Distribution Licensee) Regulations 2004, had also issued a discussion paper titled "Consultation Paper on Background Issues on treatment of Renewable Energy Projects in the light of EA, 2003". The issues relating to tariff that were raised in the Consultation paper and the response of stakeholders which being common to all projects of renewable sources were also deliberated in the public hearing held on 28.12.04, the same are discussed below:

**(i) Tariff to be two part or single part** - Is it advisable to have two part tariff for co-generation and bio mass projects and single part tariff for infirm sources such as mini hydel and wind ?

KPTCL/ESCOMs have expressed that they are agreeable for 2-part tariff for co-generation & biomass projects provided the generators agree to provide

telemetering and to back down when not required. Otherwise single part tariff shall be applicable. SISMA has favoured a single part tariff. Most of the Biomass developers have favoured a 2-part tariff, while the wind developers have favoured a single part tariff. IREDA has suggested a single part tariff for all renewable sources with cost plus approach. KREDL & Consumer care society and a few others have favoured a 2-part tariff for Biomass & co-generation plants.

The Commission, after examining the response is of the view that although a two part tariff for co-generation and biomass projects is desirable, considering the practical difficulties in implementing a two part tariff for a large number of such projects with low capacity, seasonal variation in availability of fuel, monitoring its despatch on a day to day basis and the required administrative machinery, **decides to continue the single part tariff for all renewable sources of energy including co-generation projects.**

**(ii) Consideration of Incentives allowed by the Government-** Whether the incentives in the form of tax concessions, direct subsidies etc. from the central and state Governments need to be factored in the Tariff or not ?

KPTCL in their response furnished in August 2004, have suggested to factor in the incentives provided for the projects of renewable sources of energy, while determining the tariff. The developers of renewable sources of energy and KREDL/IREDA have stated that the incentives should not be factored in, and if so factored in, it will defeat the very purpose of providing the incentives to promote the projects and that the developers will be left with no incentive.

**After examining the responses of the stakeholders, the Commission agrees with the view expressed by the developers and KREDL/IREDA.**

**(iii) Rate of return -** Whether ROR on equity of 16% to renewable sources of energy projects to be allowed? Is it reasonable to allow a higher rate of return (of 3 to 5% ) over the above ROR for wind and mini hydel projects to cover the systemic risk.

KPTCL/ESCOMs have suggested to follow CERC norms. SISMA, has favoured higher ROE. Most of the BIOMASS developers have favoured 16% ROE.

IREDA has proposed 3-5% higher ROE over and above 16% and that the same should be at least 16%. KREDL has favoured 16% ROE for co-gen and Biomass and has favoured 2% higher rate for wind and mini-hydel. WIND developers have favoured 16% and REDAK have opined that 16% ROE is reasonable but higher ROE is advisable.

The Commission notes that as per Gol/ CERC earlier norms for conventional plants, the ROE was 16%. Since most of the renewable sources of energy projects that are coming up are through private sector, to promote investments in projects of renewable sources of energy, the Commission decides that the ROE shall be 16%.

**(iv) Factorisation of Environmental benefits-**Whether Consideration of environmental benefits in the tariff determination is required or not ? If required, whether an additional 10 paise/kWh could be considered separately in the tariff without having much impact on retail tariff ?

KPTCL/ESCOMs have suggested to share the environmental benefits like the carbon credit between the licensees and the developers. In the public hearing, the developers stated that the issue of carbon credit is still in its infancy and no developer has got any benefit so far. They are strongly opposed to any kind of sharing of carbon credit with KPTCL/ESCOMs stating that the investment on the project has been made by the developers and the benefit, if any, on account of carbon credit should accrue to the developers only. They also suggested that they are prepared to give up the claim on carbon credit if KPTCL takes up the responsibility of the entire documentation required on this account. IREDA, KREDL and the developers have favoured an additional 10 paise/unit to be included in the tariff towards environmental benefits.

The Commission is of the view that since the tariff is being determined for renewable sources of energy also under the cost plus approach with reasonable ROE, considering incentives separately may not be required. Similarly the issue of carbon credit is still in its infancy and any order to share such benefit between the developer and KPTCL may act as counterproductive for new investments. **Hence the Commission does not consider it necessary to factor in such benefits in the tariff.**

**(v) Wheeling charges, Surcharges, Banking in the case of third party sales-**

This issue before the Commission is whether the Commission should consider to allow different wheeling charges / surcharges in respect of electricity generated from renewable energy sources in the case of open access.

KPTCL have expressed that these charges should be uniform for all the projects and no exception shall be provided to projects of renewable sources of energy. Further, these charges should be fixed in such a way that when added to the cost of generation, the same shall be equal to the average cost of supply to HT consumers.

SISMA has favoured nominal charges on the above account for renewable sources of energy in order to promote third party sale under open access. Biomass developers have suggested that wheeling & other charges should not exceed 10%. IREDA has suggested that projects of renewable sources of energy should not be burdened with excessive wheeling & other charges and should be limited to charges as per MNES guidelines. M/s Jindal has suggested 2% as wheeling charges & 2% as banking charges and IWPA has suggested 4-6% as wheeling charges. IWPA is not in favor of paying surcharge. REDAK has suggested 13 –15% wheeling and banking charges.

**The Commission has decided to consider the determination of wheeling and banking charges and surcharge separately while determining charges as required under KERC (Terms and Conditions of open Access) Regulations, 2004.**

**(vi) Merit Order Dispatch- whether Merit order should be applied while purchasing power from Renewable Sources of Energy ?**

KPTCL/Escoms have opined that merit order should be applicable to renewable sources of energy also as otherwise they will be constrained to purchase this high cost power when adequate power is available at much lower tariff especially during monsoon season. Such purchase would not be in the interest of the licensees and consumers. With the introduction of ABT, KPTCL also explained that if merit order is not applied, KPTCL may be purchasing power at higher tariff from renewable sources of energy when it is not required and will be forced to sell the same outside the state at lower tariff incurring huge losses. While most of the developers of renewable sources have opposed merit order dispatch for renewable sources and

have argued that if merit order is applied, they will not be able to achieve normative PLF during any year which may result in huge financial losses. They have also stated that electricity from mini hydel and wind projects are infirm as they are subjected to vagaries of nature which are beyond the control of the developers and that if they are constrained to generate electricity when the availability of such sources is only seasonal, it may defeat the very purpose of the project. Since the Electricity Act mandates promotion of generation from renewable sources, application of any merit order would be counter productive. Developers of renewable sources of energy have also stated that since single part tariff is applied to them, if merit order is applied, there is no way that they can recover their fixed charges fully and it may also result in non-utilisation of available resources. They have suggested that instead of applying merit order to renewable sources, generation from major hydro stations could be regulated so that available renewable resources are exploited fully which would help conserve precious water in major reservoirs for future consumption when the demand increases. The developers have strongly urged for assured off take from renewable sources.

The Commission finds sufficient merit in the arguments put forth by the developers. Since the tariff for renewable sources is on a single part, application of merit order would be detrimental to the interest of promoting renewables. There is also need to exploit the resources available for the projects of renewable energy fully for optimum utilisation of investments, while the generation from major hydro sources can always be regulated if adequate demand is not there at any point of time. The Act also mandates promotion of generation from renewable sources. **Considering all these points, the Commission decides that merit order shall not be applied for power purchase from renewable sources.**

**(vii) Tariff determination for old and new projects-**Whether the tariff in respect of projects, which complete 10 years has to be considered differently from new projects?

KPTCL/ESCOMs have proposed that the tariff should be different for old & new projects as debt repayment would be over for old projects that have completed 10 years. Projects of renewable energy sources should supply to the licensees even after 10 years for another 10 years as licensees have contributed to the debt repayment and option of 3<sup>rd</sup> party sale should not be provided.

SISMA has suggested that it is not necessary to differentiate the tariff between old & new units at this stage. However, for new projects tariff may be examined every 3 years considering the higher cost of investment. IWPA has favoured levelised tariff over the life of the project. REDAK has not favoured differential tariffs. Some of the developers have suggested that after 10 years the projects are not obliged to sell to the licensees and in competitive market, market prices will prevail.

***Considering the debt repayment obligations, the Commission opines that differential tariff should be applicable for projects that have completed 10 years. However in the present case the Commission is limiting the determination of tariff to new projects only.***

#### **9. Commission's Analysis on Tariff Proposals:**

The Commission has analysed the tariff proposals of the KPTCL and other stakeholders duly considering the comments/views received through written submissions and those received during the public hearing. Some of the financial parameters can be uniformly considered for all renewable sources which are discussed below:

**(1).Debt Equity Ratio:** KPTCL as well as KREDL and the developers have proposed a debt equity ratio of 70:30 for each category of the renewable sources of energy. The Commission notes that there is a consensus on 70:30 Debt: Equity ratio which provides a reasonable debt service coverage ratio (DSCR). Further, CERC has also adopted a normative 70:30 Debt: Equity ratio for conventional plants. **Hence, the Commission decides to adopt a debt equity ratio of 70:30.**

**(2) Interest on Term Loan:** KPTCL has proposed 11% towards interest on terms loans for all renewable sources. KREDEL has suggested 11% for wind projects and 10% for all other projects of renewable energy. REDAK representing mini-hydel projects has proposed interest of 10%, while the wind developers have proposed 10%, the co-gen developers have proposed a rate of 13% and biomass developers 12.5% to 13.75%.

***The Commission notes that the interest on term loan would be dependent upon various factors including nature of the project, financial strength of the developers and the risk profile apart from other factors. However, the Commission considers that providing a uniform interest rate of 11 % on term loans for all projects of renewable energy would be reasonable considering the present interest rates.***

**(3) Return on Equity:** KPTCL has proposed 16% ROE for all the categories of projects and have suggested to follow CERC norms. KREDL has proposed 18% ROE for mini hydel while REDAK has proposed a minimum of 20%. For wind projects, while wind project developers have proposed ROE of 16%, KREDEL has proposed 18%. For co-generation SISMA, even though, in their comments on the discussion paper earlier issued by the Commission have proposed more than 16% ROE, in their tariff calculation they have considered 10% as ROE. For co-generation projects, KREDL has proposed 16% ROE. The biomass developers have proposed an ROE in the range of 16-20%, while KREDL has proposed 16%.

**As discussed earlier, the Commission decides to provide ROE at 16%.**

**(4) Depreciation:** The rate of Depreciation proposed by KPTCL is 3.5% for mini-hydel, 3.79% for wind, 6% for co-generation and 10% for bio-mass. KREDL has suggested a rate of 7.8% for mini-hydel, co-generation & bio-mass and for wind it has suggested 80% in the first year and balance 10%

in next 9 years. REDAK has proposed depreciation of 5% for mini-hydel. Wind developers have proposed rate of depreciation of 7.83% and SISMA has proposed 6% for co-generation. Biomass developers have proposed the rate in the range of 8-10%.

In the public hearing it was pointed out by various developers that the assumption of KPTCL on rate of depreciation for wind, mini-hydel and co-generation is very much on the lower side and the same is not justified since it will not cover the debt repayment obligations fully. The developers have argued that the rate of depreciation should be sufficient to cover their debt obligation fully. On the question of debt repayment period, while some developers have indicated 7 years from the year of commissioning, a few others have indicated 10 to 12 years period.

The Commission notes that the moratorium and debt repayment period may vary from project to project depending upon various factors including the bargaining strength of the parties. However, a uniform rate of depreciation could be provided for all the projects of renewable energy sources, so that it covers loan repayment in a normative period. The Commission notes that CERC guidelines also provide for an advance against depreciation to cover the debt repayment obligation. The Commission considers that with a debt: equity ratio of 70 : 30 as discussed above, and considering normative debt repayment period as 10 years from the year of commercial operation of the project, a uniform 7% depreciation under Straight Line Method would cover fully the debt repayment obligation. **Accordingly, the Commission decides to provide 7% depreciation per annum under SLM for all renewable sources.**

**(5) Minimum Alternative Tax (MAT):** While KPTCL has considered 7.5% on RoR towards MAT payable, most of the developers have proposed a rate of 7.5 to 7.84%.

***The Commission notes that several tax concessions and tax holidays are available for various projects. Since uniform tariffs are being determined for renewable sources by considering common parameters, the Commission decides to provide a uniform MAT at 7.5% on the RoE for all renewable sources.***

**10.** Certain issues, which are specific to the renewable projects, such as project cost, PLF, O & M Cost, Fuel Cost etc. are discussed below, category wise. The developers have raised various points both in their written submissions and during the public hearing held on 28.12.04 on the cost per MW, PLF and fuel cost assumed by KPTCL for various renewable sources in the tariff computation. The Managing Director/KPTCL did not touch upon all the points raised by the developers. He has stated that KPTCL has not independently examined these aspects. The Commission expects that the KPTCL ought to have studied the various points and responded accordingly.

#### **A. Mini-Hydel Projects:**

##### **a) Project Cost :**

The project cost as indicated by KPTCL, KREDL & REDAK is as under:

KPTCL	Rs.450 lakhs per MW
KREDEL	Rs.400 lakhs per MW
REDAK	Rs.390 lakhs per MW

The figures given above indicate that the capital cost varies from Rs.390 lakhs to Rs.450 lakhs per MW. The Commission notes that the project cost of mini-hydel projects varies depending upon the location of the project, type of the scheme such as 'run of the river', canal based etc. Further the mini-hydel tariff is quite sensitive to project cost as well as PLF. KREDL being the

nodal agency would have arrived at the figures based on the project reports of the developers. However the developers themselves have proposed a project cost of Rs.390 lakhs and therefore, ***the Commission is of the view that it would be reasonable to adopt a project cost of Rs. 390 lakhs per MW, for Mini Hydel Projects.***

**b) Plant Load Factor(PLF):**

The PLF as proposed by KPTCL, KREDL and REDAK is 35%. KREDL has stated that mini-hydel projects would be viable only when they achieve 35% PLF and that projects below this PLF should not be encouraged.

From the information available with the Commission, it is noted that the PLF of the mini-hydel projects already in service ranges from 2.5% to 64% with average PLF at 31%. Considering the fact that all potential mini-hydel sources are likely to have been largely exploited, the future projects that may come up may have lower PLF. Although it is not desirable to encourage projects with very low PLF, the Commission considers that projects with a PLF of about 30% could still be viable at a project cost of Rs.390 lakhs per MW and hence be exploited in view of environmental and other benefits. With these points in view, ***the Commission decides to adopt a normative PLF of 30% for all mini-hydel projects.***

**c) Operation and Maintenance Expenses( O & M Expenses):**

KPTCL has proposed 1% per annum on 95% of the project cost as O&M expenses without any annual escalation. KREDL has proposed a rate of 2.5% and is silent about the escalation on the O & M expenses. REDAK has stated that the manpower requirement, the administration and management cost is almost uniform and therefore the % O&M Cost increases as the size of the project decreases. REDAK has proposed an O & M cost of 2.5% of the project cost with an escalation of 3.86% on the

base. Sri. R. Govindarao, representing REDAK, stated that O & M cost of 1% assumed by KPTCL is very low and it should be revised upwards to 3-3.5%. Also escalation in the range of 5% has to be provided every year.

The Commission opines that by following prudent O & M practices, the O & M cost could be contained. However, a reasonable level of O&M expenses has to be provided in the tariff. For the conventional hydel projects, CERC norms specifies 1.5% as O & M cost. Since the mini-hydels are much smaller units, the O&M expenses are expected to be at least 1.5% and upwards. The increase in O&M expenses on account of inflation should also be provided for considering the general increase in price indices. **Hence the Commission adopts O&M expenses at 1.5 % on the project cost, including insurance with an annual escalation of 5%.**

**d) Interest on working capital:**

While KREDL has not suggested any rate, REDAK has proposed an amount in the range of Rs.4.78 lakhs to Rs.5.05 lakhs per annum. Even though KPTCL has indicated 12.5% p.a. as the working capital interest, the same has not been considered in their tariff working.

The Commission is of the view that two months bill can be considered as working capital requirement on a normative level and interest thereon at 12.5 % may be agreed to. **Accordingly, the Commission decides to provide interest on working capital at the rate of 12.5% on two months bills.**

**e) Auxiliary Consumption:** While KREDEL has proposed auxiliary consumption at 1%, KPTCL and the developers have not indicated the auxiliary consumption specifically. **Considering the transformation loss and auxiliary requirement the Commission decides to consider 0.5% auxiliary consumption in the tariff computation.**

**Approved Tariff:**

Tariff proposed by various agencies are as follows:

KPTCL	Rs.2.90 per unit without escalation
KREDEL	has not proposed any specific tariff rate.
REDAK	Rs. 2.90 per unit with 2% annual escalation

Considering the parameters as approved by the Commission in the preceding paragraphs, the Commission has worked out tariff for mini hydel projects and the year wise tariff so worked out is indicated below.

Year	Tariff (Rs./unit)
1 <sup>st</sup> Year	3.24
2 <sup>nd</sup> Year	3.14
3 <sup>rd</sup> Year	3.04
4 <sup>th</sup> Year	2.93
5 <sup>th</sup> Year	2.83
6 <sup>th</sup> Year	2.73
7 <sup>th</sup> Year	2.63
8 <sup>th</sup> Year	2.53
9 <sup>th</sup> Year	2.43
10 <sup>th</sup> Year	2.33
Average Tariff for the above 10 years	2.79 rounded off to 2.80

As seen from the above, the first year tariff is Rs. 3.24 per unit and would reduce from year to year and the 10<sup>th</sup> year tariff would be Rs.2.33 per unit and the average tariff for the 10-year period works out to Rs.2.80 per unit. The reduction in tariff from year to year is mainly on account of repayment of debts and also that there are no running costs other than O&M, which increases only marginally. The Commission opines that for mini hydel projects, varying tariff from year to year on a reducing scale is not appropriate and may not give good signal to the developers to attract new investment. Therefore, the Commission decides to have a uniform average tariff for the first 10-year period for the mini hydels. **Accordingly, the**

**Commission determines the tariff for mini hydel projects at Rs.2.80 per unit without any escalation for the first 10 year period from the year of commercial operation of the plant.**

**B. Wind Projects:**

**a) Project Cost :**

KPTCL	Rs. 425 lakhs per MW
KREDL	Rs. 425-475 lakhs per MW
InWEA	Rs.475 to 500 lakhs per MW
IWPA	Rs.475 lakhs per MW

InWEA has stated that the project cost varies from Rs.475 to Rs.500 lakhs per MW, but for tariff estimation project cost of Rs.475 lakhs/MW has been considered by them. IWPA has stated that the capital cost for wind projects would be higher as it involves vast land acquisition and construction of sub-station and transmission lines. Further they have stated that the increase in cost of steel, increase in excise duty by 4% and depreciation of Rupee against Euro has increased the investment costs. KREDL has stated that in revenue land the cost of the project varies between Rs.425 lakhs to Rs.450 lakhs per MW and in forest land it varies between Rs.450 to Rs. 475 lakhs per MW. Synergy Global, during the public hearing, has proposed a project cost of Rs.475 to Rs.500 lakhs per MW.

*After examining the proposals, while the Commission agrees with the view that the project cost varies from project to project depending upon various factors including location of the project, size of the project, technology, source of plant and machinery etc, a reasonable project cost shall be considered on a uniform basis for all wind projects for tariff determination. The Commission notes that as per the information published by MNES, there is significant progress in development of technology in respect of wind energy that has resulted in higher capacity machines with large rotor*

diameter and higher hub height. MNES has stated that the cost could fall as a result of economies of scale due to expansion of market. ***The Commission, therefore, is of the view that it would be reasonable to adopt a project cost of Rs. 425 lakhs per MW for the purpose of tariff determination.***

**b) Plant Load Factor (PLF):**

The PLF as proposed by KPTCL, is 30% and KREDL has proposed a PLF of 25%. InWEA has stated that the PLF for wind energy varies between 23% to 28% and has proposed 26% for tariff determination and no separate provision for auxiliary consumption has been made. IWPA has stated that in Karnataka, over the last three years the PLF achieved is 23%. However it is stated that the PLF could be improved by 3% due to technological advancement. Hence a PLF of 26% is proposed. Reliance Energy, in the public hearing has proposed 25% PLF. Synergy Global, during the public hearing, has proposed a PLF of 23% to 28%. The Commission notes that provision for auxiliary consumption has to be made on normative basis to provide for transformation losses.

***The Commission, after considering the above proposals and after examining the actual PLF achieved by the plants in operation, decides that a PLF of 26.5% would be reasonable for tariff computation.***

**c) Operation and Maintenance Expenses( O & M Expenses):**

KPTCL has proposed 1% on 95% of the project cost as O&M expenses without any escalation. KREDL has proposed a rate of 1% without indicating anything about escalation. IWPA has proposed O&M cost including security charge at 1.25% with an annual escalation of 5%. InWEA has stated that the O & M Cost varies from 1% to 2% with escalation varying from 5% to 10%. However for tariff calculations, they have considered 1.25% with 5% escalation.

Reliance Energy, in the public hearing, has proposed O & M expenses of 2.5% on 95% of the project cost.

The Commission notes from the above that the O & M expenses vary from 0.95% to 2% of the project cost with an escalation varying from 5 to 10%.

**Considering these proposals, the Commission decides to adopt O & M expenses at 1.25% of the project cost with an annual escalation of 5% .**

**d) Interest on working capital:**

While KPTCL has agreed to provide interest on working capital at 12.5% p.a , the same has not been factored in while computing the tariff. IWPA has considered an interest rate of 10% on working capital based on 45 days receivables and 30 days O & M expenses. InWEA has considered interest of Rs.1.26 lakhs in the first year and varying from year to year with 0.39 lakhs in the 10<sup>th</sup> year.

The Commission is of the view that two months bill can be considered as working capital requirement on a normative level and interest thereon at 12.5 % may be agreed to. **Accordingly, the Commission provides interest on working capital at the rate of 12.5% on two months bills.**

**e) Auxiliary Consumption:** KREDEL has proposed auxiliary consumption at 0.5%. KPTCL and the developers have not indicated the auxiliary consumption specifically. **Considering the transformation loss and auxiliary requirement the Commission decides to consider 0.5% auxiliary consumption in the tariff computation.**

**Approved Tariff:**

The tariff proposed by KPTCL and various developers are as follows:

KPTCL - Rs.3.10 per unit without any escalation

InWEA-- Option-I : Rs.3.16 per unit with 2% escalation over 20 year period

Option-II: Rs.3.20 per unit with 5% escalation for 10 years. From 11<sup>th</sup> year the tariff shall be Rs.2.50 per unit with 2% escalation p.a. or leave it open for negotiation.

IWPA- Option I: Rs. 3.17 per unit with 2% escalation till the 10<sup>th</sup> year and freezing the tariff there after at Rs.3.74 per unit till the completion of 20 years

Option-II: Rs.3.48 per unit for all the 20 years.

Ramgadh Minerals & MSPL: Rs.3.66 per unit in FY04 with 5% compounded increase.

Ghodawat Pan Masala Products Pvt. Ltd has proposed a levelised tariff of Rs.3.50 per unit for 10 years with PPA for 20 years.

CEPCO Industries: Rs. 3.35 per unit with 2% escalation over base tariff with PPA for 20 years.

Jindal Aluminium Products: Rs. 3.30 per unit with 2% escalation on the base tariff.

Considering the parameters as approved by the Commission in the preceding paragraphs, the Commission has worked out tariff for wind projects and the year wise tariff is indicated below:

Year	Tariff (Rs./unit)
1 <sup>st</sup> Year	3.95
2 <sup>nd</sup> Year	3.82
3 <sup>rd</sup> Year	3.69
4 <sup>th</sup> Year	3.56
5 <sup>th</sup> Year	3.43
6 <sup>th</sup> Year	3.30
7 <sup>th</sup> Year	3.18
8 <sup>th</sup> Year	3.05
9 <sup>th</sup> Year	2.93
10 <sup>th</sup> Year	2.80
Average Tariff for the above 10 years	3.37 rounded off to 3.40

From the above it is seen that the first year tariff is Rs. 3.95 per unit and would reduce from year to year and the 10<sup>th</sup> year tariff would be Rs. 2.80 per unit. The average tariff for the 10 year period works out to Rs. 3.40 per unit. The reduction in tariff from year to year is mainly on account of repayment of debts and also that there are no running costs other than O&M costs which increases only marginally from year to year. The Commission feels that for wind projects, as in the case of mini hydels, varying tariff from year to year on a reducing scale is not appropriate and may not give welcome signal to the developers to attract new investment. Therefore, the Commission decides to have a uniform average tariff for the first 10 year period for the wind projects. The Commission notes that the tariff that was proposed by the Government and adopted by the Commission prior to 10.06.2004 was Rs.3.10 per unit with an annual escalation of 2% (without compounding) which works out to an average tariff of Rs.3.38 per unit for the first 10 year period. The average tariff of Rs.3.40 per unit now worked out by the Commission for the first 10 year period is also in the same range. **Hence, the Commission determines the tariff for wind projects at Rs. 3.40 per unit without any escalation for the first 10 year period from the year of commercial operation of the plant.**

### **C. Co-Generation Projects:**

#### **a) Project Cost :**

KPTCL	Rs. 300 lakhs per MW
KREDL	Rs. 350 lakhs per MW
SISMA	Rs. 375 lakhs per MW

SISMA, during the public hearing stated that the project cost of Rs. 300 lakhs per MW considered by KPTCL is on the lower side as the cost at present has increased to over Rs.400 lakhs/MW due to increase in steel prices and therefore at least Rs.375 lakhs/MW should be considered.

The Commission notes that co-generation projects have come into existence to exploit the available infrastructure and the fuel. In fact to some extent, the co-generation projects have helped the sugar mills to become financially viable. For these reasons the Commission feels that the project cost of co-generation projects should be quite less.

***Considering the above aspects, the Commission is of the view that it would be reasonable to adopt a project cost of Rs. 300 lakhs per M.W.***

**b) Plant Load Factor (PLF):**

KPTCL has proposed a PLF of 75% based on 280 days(225 season days and 55 off season days) of co-generation, which works out to 57.5% annually. KREDL has proposed a PLF of 60% threshold. SISMA has proposed 75% PLF based on 240 days of co-generation(180 season days, 60 non-season days) which works out to 49.3% annual PLF. As per the data furnished by SISMA in respect of 5 representative sugar mills, the average annual PLF is 47.34%. In the public hearing SISMA stated that PLF of 75% on 280 days considered by KPTCL is on the higher side. SISMA stated that they could achieve a PLF of 65% in the operating season. Further, export capacity of 60% in season and 87% in off season has to be considered instead of 60% export capacity on an overall basis as suggested by KPTCL.

The Commission, after considering the above facts, is of the view that a an annual PLF of 60% would be reasonable as suggested by KREDEL. ***Hence the Commission hereby decides annual PLF of 60% for co-generation plants for the purpose of tariff determination.***

**c) Operation and Maintenance Expenses (O & M Expenses):**

KPTCL has proposed 1% on 95% of the project cost as O & M expenses without any escalation. KREDL has proposed a rate of 3% without

indicating anything about escalation. SISMA has proposed O & M expenses of 4% of the capital cost. In the public hearing SISMA stated that O & M cost varies between 3-5% and therefore at least 4% should be considered. The APERC has considered an O & M cost of 3% with 4% escalation annually.

The Commission notes that in case of sugar co-generation, there are several common expenses between the sugar factory and co-generation unit. However, it is not possible to classify the expenses relating to the co-generation unit only. KREDL has proposed 3% O&M expenses for the co-generation units. This rate appears to be reasonable. **Hence the Commission decides that the O & M expenses for co-generation units shall be taken at 3% with an annual escalation of 5% per annum for the reasons explained earlier.**

**d) Interest on working capital:**

The rate proposed by KPTCL is 12.5% p.a which however has not been factored in by them while computing the tariff. SISMA has proposed an interest rate of 13% on a working capital of 3 months receivables.

The Commission is of the view that two months bill can be considered as working capital requirement on a normative level and interest thereon at 12.5 % may be agreed to. **Accordingly, the Commission approves to provide interest on working capital at the rate of 12.5% on two months bills.**

**e) Auxiliary Consumption:** KPTCL has not proposed any auxiliary consumption even though it has assumed export capability of 60%. Both KREDEL and SISMA have proposed an auxiliary consumption of 10%.

The Commission is of the view that a reasonable level of auxiliary consumption should be allowed. Since fuel processing is lower in the case of

co-generation plants, when compared to conventional coal based thermal plants, providing 8% auxiliary consumption appears to be reasonable. **Hence the Commission approves an auxiliary consumption of 8%.**

**f) Fuel Price:** KPTCL has considered Rs.250 per MT for bagasse with 5% escalation during crushing season and has considered supplementary coal firing during the off-season at the rate of Rs.2000 per MT with 5% escalation. KREDEL has proposed the overall fuel cost in the range of Rs.600-800 per MT with 2% annual escalation. SISMA has proposed Rs.800 per MT for in-house bagasse. Further they have stated that the in-house bagasse generated will not be able to sustain the off-season power generation for 60 days. The purchase cost of bagasse is estimated at Rs.1300 per MT including all charges with an escalation of 7.5%. During public hearing SISMA stated that Fuel price of Rs. 250/MT considered by KPTCL is too low. They have stated that for in-house bagasse the price should be based on pit head coal cost on energy equivalent basis, which works out to Rs. 600/MT for in-house bagasse and the cost of purchased bagasse is about Rs. 1250/MT. KPTCL stated during the hearing that the rationale for bagasse price of Rs.250/MT considered by them is that the cost of sugarcane is about Rs.900/MT and 30% of sugarcane gets converted to bagasse and therefore Rs.250/MT has been considered. The developers and KREDL faulted the methodology adopted by KPTCL and stated that in that event, even according to KPTCL, the price of bagasse should be Rs.1000/MT.

The Commission is of the view that since co-generation tariff is sensitive to fuel cost, computation of reasonable fuel cost is essential. The fuel cost indicated by various agencies vary widely. The bagasse, eventually a bi-product, is generated without any additional investment by the sugar industry. However, if co-generation plant does not exist, the bagasse would fetch revenue to the sugar industry and therefore opportunity cost should be

considered. APERC & MERC have based the bagasse pricing on equivalent heat value of coal. It would not be out of place to mention here that MERC in their order dated 16<sup>th</sup> August 2002, have arrived at a Gross Calorific Value (GCV) of bagasse to vary between 2210 Kcal per kg to 2340 Kcal per kg base on the available literature in the matter. Based on this, MERC has considered a GCV of 2250 Kcal per kg on wet basis. APERC has also considered a GCV of 2300 Kcal per kg. According to a study conducted by CRISIL, the calorific value of bagasse is 2270 Kcal per kg. SISMA has also proposed the calorific value of bagasse is 2270 Kcal per kg. The Commission, based on the above facts, is of the opinion that a calorific value of 2300 Kcal per kg would be reasonable.

APERC has worked out the fuel price as Rs.562 per MT based on the GCV and pithead cost of coal. However they have approved Rs.575 per MT. MERC has approved a fuel cost of Rs.559 per MT based on the landed cost of coal at the nearest point.

Considering the above points, the Commission decides to adopt the price as furnished by KREDL, the nodal agency. ***The Commission decides the overall fuel price at Rs.800/- per MT for the purpose of tariff determination of co-generation plants.***

**g) Fuel Cost escalation:**

SISMA has linked the fuel cost escalation with the escalation of cane prices. Accordingly, they have proposed an escalation of 7.5% annually. KPTCL has assumed 5% as fuel cost escalation in their tariff calculation. KREDL has proposed an escalation of 2% p.a.

Considering the general increase in inflation from year to year and also increase in sugarcane prices, the Commission opines that 5% escalation per

annum would be reasonable. **Hence, the Commission determines the fuel cost escalation at 5%per annum for factoring the same in tariff computation.**

**h) Fuel Consumption:** KPTCL has assumed 3232 MT of bagasse in season and 790 MT of coal in off-season to generate gross units of 5.04 MU per year. The specific fuel consumption in season and off-season works out to 1.33 kg/unit. KREDL has not furnished information on fuel consumption. SISMA in their tariff model have assumed total bagasse requirement of 1,90,718 tons to generate 69,264 MWh, indicating a specific fuel consumption of 2.75 kgs/unit. During public hearing SISMA has stated that Specific fuel consumption considered by KPTCL is about 1.33 kg/KWh which is low. However the actual requirement is 2.32 ton/ MW in season and 1.86 T/MW in off-season. Further during season it is assumed that 35% of the steam is used for process heat.

APERC has approved a figure of 1.60 Kg/unit as the rated average of specific fuel consumption during crushing and non-crushing season based on a calorific value of 2300 kcal/kg and station heat rate of 3700 kcal/kWh.

**The Commission, after considering the above points, decides to consider 1.60 kg/unit as the reasonable specific fuel consumption.**

**Approved Tariff:**

The tariff proposed by KPTCL and various developers are as follows:

KPTCL           Rs.2.80 per unit without escalation.

KREDL has not proposed any specific tariff.

SISMA           Rs. 3.83 per unit with 2% annual escalation.

Considering the parameters as approved by the Commission in the preceding paragraphs, the Commission has worked out tariff for Co-generation projects and the year wise tariff is indicated below:

Year	Tariff (Rs./unit)
1 <sup>st</sup> Year	2.87
2 <sup>nd</sup> Year	2.90
3 <sup>rd</sup> Year	2.94
4 <sup>th</sup> Year	2.98
5 <sup>th</sup> Year	3.02
6 <sup>th</sup> Year	3.07
7 <sup>th</sup> Year	3.12
8 <sup>th</sup> Year	3.18
9 <sup>th</sup> Year	3.24
10 <sup>th</sup> Year	3.31
Average Tariff for the above 10 years	3.06

According to the above computation, the first year tariff is Rs. Rs.2.87 Per unit and would vary from year to year, the 10<sup>th</sup> year tariff would be Rs.3.31 per unit and the average tariff in the 10 year period would be Rs.3.06 per unit. In order to provide a uniform escalation from year to year, the base year tariff has been reworked with 2% annual escalation keeping the average tariff for the first 10 year period at the same level of Rs.3.06 per unit. Accordingly the first year tariff works out to Rs.2.80 per unit.

***The Commission determines the tariff for co-generation projects as Rs.2.80 per unit in the first year of commercial operation of the plant and for the subsequent period of 9 years, an annual escalation of 2% per annum on the base tariff (without compounding) shall be applicable.***

#### **D. Bio-mass Projects:**

##### **a) Project Cost :**

KPTCL           Rs. 410 lakhs per MW

KREDL           Rs. 400 lakhs per MW

Developers   In the range of 390 lakhs to 500 lakhs per MW

Sri. S.Venu of Koganthi, during the public hearing, stated that the project cost has to be increased by 10% considering the excise duty of 16% and sales tax of 14%.

The Commission notes that the project cost proposed by the developers varies widely ranging from 390 lakhs per MW to Rs.500 per MW. The Commission agrees that the project cost varies on account of various factors including location of the project, capacity, technology etc. It appears to be a complex exercise to determine a normative cost per MW. **Having regard to the facts, the Commission agrees with the proposal made by KREDL and decides to adopt RS.400 lakhs per MW as reasonable project cost for computation of tariff.**

**b) Plant Load Factor (PLF):**

KPTCL has proposed a PLF of 75% for 330 days, which works out to 67.8% annually. KREDL has proposed a PLF of 75% threshold. The developers have proposed a PLF in the range of 70 to 95%.

The Commission, after considering the above proposals agrees to the proposal of KREDL to consider an annual PLF of 75% as reasonable.. **Hence the Commission hereby determines an annual PLF of 75% for Biomass plants.**

**c) Operation and Maintenance Expenses (O & M Expenses):**

KPTCL has proposed 2.5% on 95% of the project cost as O & M expenses without any escalation. KREDL has proposed a rate of 4% without indicating any escalation. Developers have proposed O & M expenses in the range of 3% to 5% with 5% to 6% escalation.

The Commission notes that in case of bio-mass plants fuel procurement and fuel handling requires additional manpower and equipments and therefore the O&M expenses required is slightly higher when compared to that in the co-generation plants. Considering the proposals, the Commission considers that 4% O & M expenses would be reasonable. Therefore, **the Commission determines O & M expenses at 4% of the**

**project cost with an annual escalation of 5% per annum for the reasons explained earlier.**

**d) Interest on working capital:**

While KPTCL has proposed interest on working capital at 12.5% p.a, the same has not been factored in by them while computing the tariff. The Developers have proposed a working capital interest in the range of 11% to 14.5%. Dev Powergen, during public hearing, has stated that the interest on working capital ranges between 13.5% to 13.75% due to non-payment risk.

The Commission is of the view that two months bill can be considered as working capital requirement on a normative level and interest thereon at 12.5 % may be agreed to. **Accordingly, the Commission decides to provide interest on working capital at the rate of 12.5% on two months bills.**

**e) Auxiliary Consumption:** KPTCL has not proposed any auxiliary consumption. KREDEL has proposed an auxiliary consumption of 8%. The Developers have proposed an auxiliary consumption in the range of 10% to 11%.

The Commission is of the view that in the case of bio-mass plants the auxiliary consumption would be slightly higher when compared to co-generation plants, due to processing of the biomass required. **Hence the Commission decides that the auxiliary consumption of 9% is reasonable.**

**f) Fuel Price:** KPTCL has considered Rs.600 per MT for biomass fuel. KREDEL has proposed in the range of Rs.800 to Rs.1000. The Developers have proposed in the range of Rs.900 to Rs.1900. During the public hearing M/s Hassan Bio-Mass suggested that at least Rs.1000 per MT shall be considered. Further it was opined that energy plantation has to be

encouraged and KERC has to advise the GoK suitably in this regard. M/s Dev Powergen stated that there is no need for price escalation if the fuel price is hedged with coal price.

The Commission is of the view that the tariff in respect of bio-mass fuel is sensitive to fuel cost. The Developers use various kinds of fuels whose Gross Calorific Values vary between 2400 to 4400 GCV, with price varying between Rs.850 to Rs.2450 per MT as indicated in the proposals. It also notes that the fuel collection and transportation is largely in the un-organised sector and prices are influenced by local factors. One of the Developers has worked out an average cost of Rs.1050 per MT based on use of various kinds of fuels. APERC has also considered the fuel cost as Rs.1000 per MT for bio-mass. The Commission notes that the fuel cost determination for biomass projects is a complex exercise as it depends upon the nature of fuel and its availability, combination of fuels used by different plants, location of the plants near to the fuel source, etc. The prices quoted by various agencies vary widely. *The Commission feels that the proposal of the nodal agency KREDL on the biomass price as reasonable and considers the upper limit of price range proposed by it for tariff computation. **Based on the above facts, the Commission determines to adopt the fuel price at Rs.1000/- per MT.***

**g) Fuel Cost escalation:**

KPTCL has considered an escalation of 3% in their tariff calculations. KREDEL has proposed 2% escalation, where as the Developers have proposed escalation in the range of 5% to 8%.

Considering the increase in price of biomass fuel as provided by the developers and the general increase in inflation, the Commission opines that escalation at 5% per annum would be reasonable. **Hence, the Commission adopts 5% fuel cost escalation.**

**h) Fuel Consumption:** KPTCL has assumed 7900 MT of bio-mass fuel to generate gross units of 5.94 MU per year. The specific fuel consumption works out to 1.33 kgs/unit. KPTCL, in the public hearing has stated that the fuel consumption has to be determined scientifically. KREDL has not furnished any information on fuel consumption. Developers have proposed in the range of 1.33 kg to 1.4 kg/unit.

APERC has approved a figure of 1.16 Kg/unit as the rated average of specific fuel consumption based on a calorific value of 3200 kcal/kg and station heat rate of 3700 kcal/kWh. These figures have been arrived at by APERC based on an expert committee report. The Commission considers this quantum as reasonable for adoption in our tariff computation also.

***The Commission, after considering the above facts, adopts 1.16 kg/unit as the reasonable specific fuel consumption.***

**Approved Tariff:**

The tariff proposed by KPTCL and various developers is as follows:

KPTCL - Rs. 2.80 per unit without escalation.

KREDL has not proposed any specific tariff rate.

Various developers have proposed a tariff in the range of Rs.3.20 to Rs.4.00 per unit with escalation varying between 2% to 5%. Hassan Biomass opined that two part tariff could be considered with the fuel cost as a pass through.

Considering the parameters as approved by the Commission in the preceding paragraphs, the Commission has worked out tariff for Bio-mass projects and the year wise tariff is indicated below:

Year	Tariff (Rs./unit)
1 <sup>st</sup> Year	2.93
2 <sup>nd</sup> Year	2.96
3 <sup>rd</sup> Year	2.99
4 <sup>th</sup> Year	3.02
5 <sup>th</sup> Year	3.06
6 <sup>th</sup> Year	3.10
7 <sup>th</sup> Year	3.15
8 <sup>th</sup> Year	3.20
9 <sup>th</sup> Year	3.26
10 <sup>th</sup> Year	3.32
Average Tariff for the above 10 years	3.10

According to the above computation, the first year tariff is Rs. Rs.2.93 Per unit and would vary from year to year and the 10<sup>th</sup> year tariff would be Rs.3.32 per unit. The average tariff in the 10-year period would be Rs.3.10 per unit. In order to provide a uniform escalation from year to year, the base year tariff has been reworked with 2% annual escalation keeping the average tariff for the first 10 year period at the same level of Rs.3.10 per unit. Accordingly the first year tariff works out to Rs.2.85 per unit.

***The Commission determines the tariff for biomass projects at Rs.2.85 per unit in the first year of commercial operation of the plant and for the subsequent period of 9 years, an annual escalation of 2% per annum on the base tariff (without compounding) shall be applicable.***

#### **11. Date of effect of this order:**

According to proviso to Section 61 of the Electricity Act 2003, the terms and conditions for determination of tariff as they stood before the appointed date (Appointed date is 10.6.2003) shall continue to apply for a period of one year or until the terms and conditions for tariff are specified under this Section, whichever is earlier. The tariff has been determined by the Commission in the present order under the provisions of Electricity Act 2003

read with KERC (Power Procurement from Renewable Sources by Distribution Licensee) Regulations 2004. Hence, the tariff determined under this order shall be applicable to all the Power Purchase Agreements filed before the Commission on and after 10.6.2004. It is reiterated that the tariff determined in this order shall be applicable for a period of 10 years from the date of commercial operation of the plants. According to Section 5.8 of the KERC (Power Procurement from Renewable Sources by Distribution Licensee) Regulations 2004, the Tariff determined by the Commission in this order will be further reviewed after 5 years which shall be applicable to agreements to be entered into after that date.

**12.** It is pertinent to record here that, in the course of Public hearing, Developers have raised several issues regarding terms and conditions of the Power Purchase Agreements and have suggested some modifications. IWPA have also filed a draft PPA during the hearing in respect of wind projects. The Commission directs that KPTCL may respond to the modifications and file Draft Standard PPAs in respect of all the above renewable sources duly incorporating the contents of this Order, within one month from the date of this Order, for the approval of the Commission.

**13.** It is clarified that in respect of the Power Purchase Agreements already approved by the Commission in respect of PPAs received in the Commission upto 10.6.04, the tariff and all the terms and conditions so approved by the Commission in those PPAs shall hold good for the period specified therein.

This order is signed dated and issued by Karnataka Electricity Regulatory Commission on this 18<sup>th</sup> day of January 2005.

Sd/-  
**K.P.Pandey**  
**Chairman**

Sd/-  
**H.S.Subramanya**  
**Member**

Sd/-  
**S.D.Ukkali**  
**Member**