ANDHRA PRADESH ELECTRICITY REGULATORY COMMISSION
4th & 5th Floors, Singareni Bhavan, Red Hills, Hyderabad-500 004

O.P No. 20 of 2011

Dated 26.09.2012

Present

Sri A. Raghotham Rao, Chairman
Sri C.R.Sekhar Reddy, Member

Between

M/s. Sagar Sugars & allied Products Ltd
Rayala Towers, 1st Floor, 158,
Anna Salai, Chennai – 600 002. …Petitioner

AND

1. Andhra Pradesh Power Co-ordination Committee,
2. Transmission Corporation of AP Ltd (APTRANSCO)
3. Central Power Distribution Company of AP Ltd (APCPDCL)
4. Southern Power Distribution Company of AP Ltd (APSPDCL)
5. Northern Power Distribution Company of AP Ltd (APNPDCL)
6. Eastern Power Distribution Company of AP Ltd (APEPDCL)

... Respondents

This petition is coming up for hearing on 06.08.2011 in the presence of Sri. C.Gunaranjan, Advocate for the petitioner and Sri. P. Shiva Rao, Advocate for the respondents, the Commission passed the following:

ORDER

The petitioner has filed original petition u/s 11 (2) and the Conduct of Business Regulations (CBR) seeking determination of tariff in respect of the power supplied by Bagasse based Co-generation projects by using coal during non-crushing period in terms of G.O. Rt. No. 54 Energy (Power-II) Department dated 22.04.2010 and G.O.Rt. No. 83 Energy (Power-II) Department dated 19.06.2010.

2. The petitioner is a company incorporated under the provisions of the Companies Act, 1956 having its registered office at Nelavoy Village, S.R Puram Mandal, Chittoor District, interalia, engaged in the business of manufacture and sale of sugar and allied products. The petitioner company has sugar unit located at

Nelavoy with an installed capacity of 4000 TCD. The petitioner company has also established Non-Conventional Energy Project i.e., Bagasse based co-generation project within the sugar unit premises with a capacity to generate 20 MW. The State Government notified the Third Transfer Scheme in G.O.Ms. No. 58, Energy (Power-III) dated 07.06.2005 in exercise of the powers conferred by the Reform Act, whereby the generating capacities of the non-conventional energy stations including all obligations of APTRANSCO to purchase unallocated energy from the non-conventional energy stations stood allocated and transferred by operation of law to the various DISCOMs. Consequently purchase of surplus energy in respect of the petitioner's power plant which was hitherto vested in APTRANSCO stood severed, transferred and vested in the respondent 4.

3. Parliament enacted the Electricity Act, 2003 with the object of consolidating and amending the laws relating to the regulation of electricity. In the Electricity Act, 2003 it is contemplated that generation of electricity be freed from regulation substantially and the renewable sources of energy have been given mandatory promotion and protection. There is mandatory purchase by the Distribution Licensees of a minimum amount of the consumption in their local areas from renewable energy sources at tariffs to be determined by the State Commission upon application by the generating company. The Electricity Act 2003 was brought into force with effect from 10.06.2003.

4. The Commission in terms of order dated 20.06.2001 in O.P. No. 1075 of 2000 has undertaken review of incentives including purchase price to be given effect from 01.04.2004 in respect of Non-Conventional Energy Projects. Accordingly, vide orders dated 20.03.2004 in R.P. No. 84 of 2003 in O.P. No. 1075 of 2000, this Commission, fixed purchase price of power from New and Renewable Energy Projects. The purchase price thus fixed consisted of fixed cost and variable cost. The fixed cost is determined for a period of ten years and the variable cost is fixed for the period from 2004-05 to 2008-09 i.e., for a period of 5 years. In the said order, it is also stated that, further review of the tariff structure is valid for a control period of 5 years and shall be reviewed on completion of the said period after consultation with the developers.

5. The Commission has undertaken the process of determining the power purchase / tariff, variable cost and after hearing the respective stake holders has by its order dated 31.03.2009 determined the variable cost in respect of Bagasse based co-generation projects for the years 2009-10 to 2013-14. The petitioner for present is not concerned either with the power generated during season by using Bagasse as fuel nor the tariff payable on account of supplies made thereunder.

6. The Government of AP having noticed the severe power shortage in the current year because of increase in demand of power and corresponding generation not meeting the requirement has been directing the distribution companies in the State to procure power under short-term purchases through power exchanges. Inspite of the same the demand and supply gap could not be fulfilled. The Government of AP also noticed the fact that the Bagasse based co-generation projects have been facing shortage of Bagasse due to short-fall in cultivation of sugarcane in general and therefore these co-generation projects were not operating even to the optimum level. The Government after consulting the Distribution Companies, the request to permit for open access has been denied for the reason that the developers have already entered into power purchase agreements with Distribution Companies and therefore obligated to supply entire energy. However, the request for usage of coal as fuel during non-crushing period has been considered favourably in view of large gap in the demand and supply in the State. Accordingly, the Government exercising the powers conferred under Section 11 (1) of the Electricity Act, 2003 issued G.O.Rt. No. 54, Energy (Power-II) Department dated 22.04.2010 directing the co-generation projects to operate the projects to full capacity by using coal as fuel and supply the said power to respondents and further the respondents and directed to pay the tariff as in force and also pay additional amounts as per the orders that may be passed by this Commission under section 11 (2) of the Electricity Act, 2003.

7. The Government therefore to over come the power shortage and in the interest of general public decided to utilize the idle capacity of the co-generation projects during this non-crushing season by permitting the co-generation projects to operate, maintain and generate to full capacity of the projects by using coal as fuel initially for a period of three months and supply the power to distribution companies.

8. In pursuance to the directions issued in the G.O.Rt. No. 54, the 1st respondent through the Chief engineer / IPC issued notice dated 27.04.2010. The petitioner and its members herein attended the meeting on 01.05.2010 and provided the details of (a) the expected power generation using coal and net capacity export to the grid for sale to DISCOMs and anticipated the date of commencement of generation using coal (b) source of coal (c) expected cost of generation and (d) stock details of Bagasse and its usage period. The members of the association attended the meeting and submitted the relevant information and details as sought for. Later on the members of the petitioner through association submitted representation dated 05.05.2010 requesting to fix the tariff of ₹ 6.67 per unit. Further the members of the petitioner have submitted another representation dated 13.05.2010 requesting the respondents to pay ₹ 5.50 per unit on adhoc basis pending finalization and approval of tariff by this Commission.

9. In the meanwhile the Government issued G.O.Rt. No. 83, Energy (Power-II) Department dated 19.06.2010 extending the orders issued in G.O.Rt. No. 54, Energy (Power-II) Department dated 22.04.2010 till 15.11.2010 or commencement of crushing, which ever, is earlier. The Government also issued G.O.Rt. No. 87, Energy (Power-II) Department dated 21.06.2010 whereby a High Level Committee was constituted to assess the quantum of power available and also fix interim price for the power so generated using coal as fuel, subject to final orders that may be passed by this Commission in the pending proceedings.

10. The petitioners have commenced the generation of power by using coal as fuel during the present non-crushing season in terms of the directions issued by Government and the said power is being supplied to the 4th Respondent. As on 24.06.2010, the petitioner company supplied 1,21,85,474 units and raised invoices for ₹ 8,12,77,108/- (₹ 1,82,49,952/- for May, 2010 and ₹ 6,30,27,156/- for the month of June 2010) at the rate of ₹ 6.67 per unit and against which the respondents paid ₹ 85,67,950/- at ₹ 3.19 per unit duly adjusting the cost of import of power and other levies for the month of May 2010 as per the tariff applicable as per the Commission tariff order dated 20-03-2004 and 31-03-2009. The remaining billed amount is yet to be settled by the respondents. In respect of the power so supplied and in terms of the directions issued by the Government the respondents have to pay the tariff as is

in force and also pay additional amounts as per the orders that may be passed by the Commission. In as much as there is no tariff fixed for generation of power by co-generation projects using coal as fuel, the petitioner is constrained to approach this Commission to fix the tariff.

11. The Commission in various proceedings concerning fixation of tariff has outlined the factors needed to be considered in the process of determination of variable cost. These factors are (a) Auxiliary power consumption (b) Cost of fuel (c) Heat rate of the plant (d) Calorific value of the fuel (e) Specific fuel consumption (f) Any other parameters. The petitioner now hereby make following submissions in support of the rate that is sought to be fixed by the Commission.

a)	Auxiliary Power Consumption	:	10.11%
b)	Cost of Fuel	:	₹ 4000/- per tonne
c)	Heat rate of the plant	:	4500 K.Cal / kWh
d)	Calorific Value of the fuel	:	4371 K.Cal / kg
e)	Specific fuel consumption	:	1.144 Kg / kWh
f)	Any other parameters	:	₹ 0.41 towards miscellaneous expenses like water treatment cost, coal and ash handling charges.
g)	Fixed Cost	:	₹ 1.43 Average

12. The petitioner therefore prays that the Commission may be pleased to

a) fix the tariff as ₹ 6.42 Ps per unit for generation and supply of power from the petitioners co-generation power plants to the respondents by using coal as fuel;

b) direct the respondents to pay ₹ 6.42 Ps per unit for the power generated and supplied by the petitioner's co-generation plants using coal as fuel during non-crushing season.

c) pass such other order or orders as this Commission may deem fit and proper in the circumstances of the case.

13. The material averments made in the reply filed by the respondents are briefly as follows.

a) The Govt. of AP (GoAP) issued directions vide G.O.Rt. No. 54 dated 22.04.2010 under Section 11 of the Electricity Act 2003 to Bagasse Cogeneration Project Developers, who are having Power Purchase Agreements (PPAs) with DISCOMs for sale of energy at tariff determined by the Commission, to generate power with coal after availing the available Bagasse fuel and supply to APDISCOMs. The GoAP directed APDISCOMs to pay the tariff as is in force from time to time immediately and also to pay any additional amount as per the orders that may be passed by the Commission under Section 11 (2) of the Electricity Act, 2003. The GoAP also sought Commission to decide the adverse financial impact, if any, on the Bagasse cogeneration developers in complying with the said directions.

b) Subsequently, the GoAP vide G.O.Rt. No. 83 Energy (Power-II) Department dated 19.06.2010 extended the earlier orders upto 15.11.2010 or commencement of crushing operations, whichever is earlier.

c) As per the Commission orders, the Bagasse cogen projects will recover their fixed cost at 55% PLF level. As such, the fixed cost may not be payable after the projects reach 55% PLF level even with usage of coal. The adverse financial impact to be considered shall be the additional expenditure incurred by the plants for generation with coal. The Commission in orders dt. 27.07.2010 in OP No. 37 of 2009 between M/s. Vemagiri and DISCOMs allowed difference in additional variable cost incurred by generating company due to GoAP section 11 directions and stated that fixed cost shall be paid as per PPA only.

d) The parameters adopted by Commission and Hon'ble CERC for determination of variable cost for Bagasse cogen projects are mentioned below

Parameter	APERC	CERC
Station Heat Rate (SHR) in Kcal / kWh	3700	3600
Auxiliary Consumption (AC)	9%	8.5%
Gross Calorific Value (GCV) bagasse in Kcal / Kg	2300	2250
Specific Fuel Consumption (SFC) in Kg / kWh as SHR / GCV	1.60	1.60

e) The impact of coal usage on Station Heat Rate and Auxiliary Consumption is examined as detailed below:

Station Heat Rate (SHR)

Station Heat Rate (SHR) is defined as the heat energy input in kCal required to generate one kWh of electrical energy at generator terminals.

Station Heat Rate (SHR) of thermal projects is indicated below:

Category	SHR (Kcal / kWh)	
	CERC	APERC
Thermal Power Plants	2500	2500

The thermal plant's SHR is lower than Bagasse plant's SHR

The Station Heat Rate (SHR) is determined by the formula:

{Turbine Heat Rate (kCal / kWh) / Boiler efficiency} / Generator capacity

The Boilers in most of the Bagasse cogen projects are designed and constructed for multi fuel firing i.e., coal and bagasse / biomass and other agri-waste fuels since these projects are permitted for using coal upto 25% of their fuel requirement. The Bagasse projects which have facility of multi fuel firing have commenced generation with coal immediately after GoAP orders were issued. Remaining projects, which do not have such facility of multi fuel firing did not generate power with coal.

The variation in usage of fuel will impact the Boiler efficiency.

The Boiler efficiency is given by:

Boiler efficiency = 100 – losses in Boiler

The Boiler losses are:

(i) heat loss in dry flue gases
(ii) heat loss due to moisture in fuel
(iii) heat loss due to burning of hydrogen in fuel
(iv) heat loss due to radiation
(v) heat loss due to un-burnt fuel

The heat loss due to moisture and burning of hydrogen depends on type of fuel used and can be calculated by the formulas mentioned below

Heat loss due to burning of Hydrogen in fuel:

$$\frac{9 \times H2 \times \{584 + Cp\,(Tf-Ta)\} \times 100}{\text{GCV of fuel}}$$

H2 - kg of H2 in 1 kg of fuel
Cp – Specific heat of superheated steam (0.45 kCal/kg ^{o}C)
584 – Latent heat corresponding to the partial pressure of water vapor
Tf - Flue gas temperature in ^{o}C
Ta - Ambient temperature in ^{o}C

Heat loss due to Moisture in fuel:

$$\frac{M \times \{584\ Cp\ (Tf - Ta)\} \times 100}{\text{GCV of fuel}}$$

M – kg of moisture in 1kg of fuel

The characteristics of imported coal and bagasse are provided below:

Parameter	Indonesian Coal, %	Bagasse, %
Moisture	9.43	40
Mineral Matter	13.99	--
Carbon	58.96	23.5
Hydrogen	4.16	3.25
Nitrogen	1.02	--
Sulpher	0.56	--
Oxygen	11.88	21.75
GCV	5500	2272 (about 2300)

The Gross Calorific Value (GCV) of imported coal is much higher than Bagasse and the Moisture content of coal is less compared to Bagasse. As such, the Boiler losses due to coal shall be less compared to Bagasse resulting in reduction of Station Heat Rate (SHR).

Therefore, the petitioner's request for consideration of higher SHR need not be accepted.

f) Auxiliary Consumption (AC)

The usage of coal cannot have any impact on Auxiliary Consumption (AC) as these plants are already designed and installed with equipment required for firing of coal. The Auxiliary Consumption (AC) adopted by APERC is already higher than CERC norm. The petitioner has not filed any justification for enhancement of AC.

In view of the above, the petitioner's request for consideration of higher Auxiliary Consumption (AC) need not be accepted.

g) Gross Calorific Value (GCV) & Fuel Cost

The GCV of coal quoted by Bagasse cogen developers is ranging from 4371 kcal / Kg to 5500 Kcal / Kg. The coal price is within range of

₹ 4800 / MT to ₹ 4000/ MT. The petitioner proposed the GCV and cost of coal as indicated below:

GCV	Coal Cost (Rs / MT)	Transport cost (Rs)	Total Cost (Rs./MT)
4371	3600	400	4000

(Data as per cost of generation)

The transportation cost of coal through road as ascertained from APGENCO is about ₹ 1 / KM / MT. As such, the transportation cost is proposed as indicated below

Coal importing port	Approx. distance to Plant (KM)	Transport cost
Chennai	150	150

h) Considering the parameters as submitted above, the variable cost for generation with coal is calculated as indicated below:

Coal cost (Rs / MT)	Trans. Cost (Rs)	GCV	SHR	AC	Variable Cost (Rs / kWh)
3600	150	4371	3700	9%	3.49

i) The petitioner proposed expenses for DM water, Coal / ash handling repairs etc. as indicated below:

Rs / kWh
0.41

The expenditure / cost components proposed by developers cover under the fixed cost. As such, the same need not be considered.

j) With the above analysis, the cost of generation / kWh with coal for petitioner's project may be considered as submitted below:

Variable cost Rs / kWh	Fixed Cost Rs / kWh	Total Cost Rs / kWh
3.49	1.43	4.92

k) The fixed cost liability would be considered only to the extent of threshold PLF of 55%. Since projects achieved less than 55% PLF with Bagasse, that part of differential units of energy shall be paid variable cost and fixed cost. Beyond 55% PLF, only variable cost shall be paid.

l) The respondents pray the Commission to consider the above submissions and pass appropriate orders in the matter.

14. During the hearing, both the petitioner and the respondents reiterated their views as contained in their respective petition and counters.

15. Based on the above, the main issue that needs to be decided by the Commission is the adverse financial impact on the Bagasse co-generation developers in complying with the directions of GoAP under section 11(2) of the Electricity Act, 2003 viz., operating the projects to full capacity by using coal as fuel. In order to decide the adverse financial impact as above, the rate of purchase of power using coal needs to be first determined by the Commission. It's a matter of regulatory practice that the rate of power purchase is determined by cost-plus approach, which in turn depends upon determination of various parameters that go into fixation of power purchase price. The parameters that need to be determined include Plant Load Factor (PLF), Station Heat Rate (SHR), Gross Calorific Value (GCV), Auxiliary consumption, Cost of fuel etc. That being the case and in view of divergent views expressed by the petitioner and the respondents on the parameters to be adopted, it becomes necessary to determine each of the parameters. The same is embarked upon as under:

(1). Plant Load Factor (PLF):

On this issue, the petitioner through SISMA averred that the power supplied during the non-crushing period should not be considered for the purpose of calculation of annual PLF of 55%.

On the other hand, the respondents averred that the fixed cost may not be payable after the project reach 55% PLF level even with usage of coal since,

as per the Commission's Orders, the bagasse co-generation projects will recover their fixed cost at 55% PLF level. They further added that, since the projects achieved less than 55% PLF with bagasse, that part of differential units of energy shall be paid variable cost and fixed cost and beyond 55% PLF, only variable cost shall be paid.

Now the point for the consideration of the Commission is whether fixed charges are to be paid upto 55% PLF only or for the entire units exported on the ground that the power is generated using 100% coal in the non-crushing season.

While addressing this issue, it is to be borne in mind that the fixed costs are paid for the assets gainfully employed in the relevant business. Further, as per Commission's Orders, the co-gen developer will be able to recover his full fixed cost at a performance level of 55% PLF. The type of fuel used (coal in this case) and the period of generation (non-crushing season) has no bearing on the fixed cost recovery as long as the short-fall in PLF on account of shortage of bagasse is allowed to be compensated by duly taking into account, the generation with coal and during the non-crushing season. Hence, Commission is of the view that fixed cost may be paid upto 55% PLF (the generation using coal during non-crushing shall also be taken into account for computing the PLF) and thereafter only incentive needs to be paid. The variable costs are any way payable for all the units supplied to DISCOMs. It is to be kept in mind that paying fixed charges for the entire units exported amounts to paying more than the fixed charges corresponding to the assets gainfully employed and hence, this request of the petitioner though phrased can not be accepted.

(2). Station Heat Rate (SHR):

Station Heat Rate is defined as the heat energy input in kilo calories required to generate one kilo watt hour (kWh) of electrical energy at generator terminals.

As relates to this parameter, the petitioner herein has sought for a value of 4500 kcal / kWh. On the other hand, the respondent having drawn the

attention of the Commission to Station Heat Rate (SHR) fixed by APERC and CERC at 3700 kcal / kWh and 3600 kcal / kWh respectively (for bagasse based plants) labored hard in favour of a reduced heat rate than that claimed by the petitioner herein duly stating that the boiler losses due to coal shall be less compared to bagasse, resulting in reduction of Station Heat Rate (SHR). The respondents further stated that the petitioner's request for consideration of higher Station Heat Rate need not be accepted. Further, the respondent have also indicated the Station Heat Rate for coal plants being fixed as 2500 kcal / kWh both by APERC and CERC.

Commission has examined the issue, the SHR of coal based plants is less than the SHR of bagasse based power plants. Against the above factual position, the respondent has stated that the request of the petitioner for consideration of higher Station Heat Rate need not be accepted. After considering all the above, the Commission is of the view that, the Station Heat Rate of 3700 kcal / kWh fixed for bagasse based plants is in order.

3. Gross Calorific Value (GCV)

On this, the petitioner indicated a figure of 4371 kcal/kg. On the other hand, the respondent having stated that the GCV of coal quoted by bagasse co-gen developers is ranging from 4371 kcal/kg to 5500 kcal/kg had adopted a figure of 4371 kcal/kg. In as much as there is agreement on this issue, the Commission need not delve into this issue in detail and hence decided to adopt a GCV of 4371 kcal/kg for coal.

4. Auxiliary consumption

On this, the petitioner indicated a figure of 10.11% as Auxiliary consumption. On the other hand, the respondent having drawn the attention of the Commission to Auxiliary consumption of 9% and 8.5% as fixed by APERC and CERC respectively (for bagasse co-gen projects) stated that the usage of coal cannot have any impact on Auxiliary consumption (AC) as these plants are already designed and installed with equipment required for firing of coal. The respondents further stated that the Auxiliary consumption (AC) adopted by APERC is already higher than CERC norm and further stated that the petitioner has not filed any justification for enhancement of Auxiliary

consumption. The respondent having averred as above stated that petitioner's request for consideration of higher Auxiliary consumption (AC) need not be accepted.

The Commission has examined the rival contentions of the parties. The boilers in most of the bagasse power plants are designed and constructed for multi fuel firing i.e. coal and bagasse / biomass and other agri-waste fuels since these projects are permitted for using coal upto 25% of their fuel requirement. These plants are already designed and installed with equipment required for firing of coal. That being the case, the usage of coal does not have any impact on Auxiliary consumption. Hence, the Commission hereby determines Auxiliary consumption to be 9%.

5. Cost of fuel

On this, the petitioner indicated a cost of fuel of ₹ 4000/tonne. The break up for the above figure is ₹ 3600 towards cost of coal - Rs/MT and ₹ 400/- towards transport cost. On the other hand, the respondents have also stated that the coal price is within the range of ₹ 4800/MT to ₹ 4000/MT. Further, the respondent has agreed for the coal cost of ₹ 3600/MT, though, suggested a different value for transportation cost of ₹ 150/-. The basis for the above transportation cost as ascertained from APGENCO is Re.1/- per km/MT for approximate distance of 150 kms to the plant from coal importing port viz., Chennai port.

The Commission has examined the rival contentions of the parties. There is an agreement between the parties as far as coal cost is concerned, which is at ₹ 3600/MT. Further, it is to be noticed that there is no dispute raised by the petitioner as regards the distance. The transportation cost of Re.1/km/tonne is infact derived from APGENCO cost, which can be relied upon in as much as that is a public utility company. In the circumstances stated above, Commission believes that the transportation charge of ₹ 150/MT can be adopted. Accordingly, the fuel cost is fixed at ₹ 3750/MT (₹ 3600+150).

(6) **Any other parameter:**

On this, the petitioner requested for ₹ 0.41 towards water treatment cost, coal and ash handling charges etc.

In response to the above averments, the respondents stated that the expenditure / cost components proposed by the developer is covered under the fixed cost.

Commission agrees with the above stand of the respondent and hence no additional cost needs to be given on this count.

16. Based on the above parameters, the variable cost to be paid using coal is to be worked out based on the following formula:

[(SHR/GCV)*(CF/1000)] / [1-(AC/100)]

Where

SHR	=	Station Heat Rate in k.cal/kWh
GCV	=	Gross Calorific Value in k.cal/kg
CF	=	Cost of Fuel in Rs./MT
AC	=	Auxiliary Consumption

With the above formula, the variable cost per unit using coal as fuel works out to ₹ 3.49/unit.

17. In the light of the foregoing discussion, APDISCOMs are directed to compensate the adverse financial impact pursuant to section 11 directions of GoAP by making payments as detailed hereunder:

(i) Paying ₹ 3.49/unit towards variable cost for the units generated using coal.

(ii) For units generated upto the threshold PLF of 55%, paying fixed cost per unit relevant to the year of operation as determined in order dated 20-03-2004 in R.P.No.84/2003 in O.P.No.1075/2000, as duly amended from time to time. The generation using coal during non-crushing shall also be taken into account for computing the PLF.

(iii) For the units generated beyond the threshold PLF of 55%, no fixed costs is payable. However, an incentive of 0.25 paise per unit is to be paid for the units generated beyond 55% PLF as determined in order dated 20-03-2004 in R.P.No.84/2003 in O.P.No.1075 / 2000 as amended subsequently.

(iv) While making payments, the interim payments already made are to be deducted.

18. With the above directions, the petition stands disposed.

19. This order is subject to the final orders on the order dated 12-09-2011 in R.P.No.84/2003 in O.P.No.1075 / 2000 upon remand from Hon'ble Supreme Court in Civil Appeal No.2926 of 2006 & batch dated 08-07-2010.

This order is corrected and signed on this 26th day of September, 2012

Sd/-	Sd/-
(C.R. Sekhar Reddy)	**(A. Raghotham Rao)**
Member	Chairman