BEFORE THE GUJARAT ELECTRICITY REGULATORY COMMISSION
AHMEDABAD

Shri G. Subba Rao, Chairman
Shri K.P. Gupta, Member
Shri Man Mohan, Member

Date: January 3, 2007

Order No. 1 of 2007

Order

In the matter of: Determination of price for procurement of power by the Distribution Licensees in Gujarat from Bagasse based Cogeneration Projects

In exercise of the powers conferred under section 181 read with sections 61(h), 62(a) and 86(1)(e) of the Electricity Act, 2003 (Act 36 of 2003) and all other powers enabling it in this behalf, the Gujarat Electricity Regulatory Commission (the Commission) has determined the price for procurement of power by Distribution Licensees in Gujarat from bagasse based cogeneration projects.

Discussion paper on Tariff for bagasse based cogeneration projects

The Commission prepared a discussion paper on "Tariff for Bagasse based Co-generation projects". The discussion paper was placed on the website of the Commission on 30-08-2006 and also circulated to various stakeholder/member of State Advisory Committee of the Commission, inviting comments/suggestions. The last date for filing objections/comments on the discussion paper was fixed as 30-09-2006. A list of those who have communicated their views is given in Annexure – I.

The Commission has considered the views of the stakeholders and also perused the orders of the other SERCs on tariff for bagasse based cogeneration. The salient features of tariff as determined by the Commission are discussed below.

1. **Single Part vs. Two Part Tariff**

In the discussion paper the commission considered single part tariff.

Shri Raj Tillan and others are supported the Commission's proposal. Shri Raj Tillan submitted that fixed cost of such project may be rewarded as an element of energy rate. He further suggested that since bagasse based power is outside the merit order despatch schedule, single part tariff should offer built in incentive.

After careful consideration, the Commission has decided that there should be single part tariff for power procurement from bagasse based cogeneration projects.

2. **Capital cost of project**

In the discussion paper the Commission had proposed the capital cost for 1 MW of bagasse based cogeneration project at Rs. 3.50 Crores.

In the comments received from various stakeholders, the Commission found that there is a wide variation in the project cost estimated by different stakeholders ranging from Rs. 3 Crores to Rs. 5.12 Crores per MW.

The project cost depends on several factors such as nature and scope of the project (Greenfield /expansion), selection of the boiler technology (pressure levels, back pressure type, extraction cum condensing type cogeneration) and nature of contractual arrangement (turnkey, non-turnkey) etc.

According to NITASH the capacity of a modern commercial bagasse based cogeneration plant built on BOOT basis varies from 25 MW to 100 MW. The project includes: high pressure boilers of rating of 86 to 89 kg/cm2, demineralized water plant, condensing type turbines and distributed control system etc. According to MITCON the earlier estimate of Rs. 3.5 Crores/MW was correct during financial year 2003-04. However, further rise in steel and other material costs has pushed up the project cost to more than Rs. 4 Crores/MW (exclusive of evacuation arrangement).

MITCON suggested that the cost of power evacuation from the HV/EHV switch yard of bagasse cogeneration project to the switchyard of Distribution Licensee needs to be apportioned. Shri Chalthan Vibhag Sahakari Khand Udyog Mandali Ltd. and others suggested that installation of transformer and evacuation of power from the point of generation should be borne by the purchaser.

The Commission obtained data from recently commissioned /to be commissioned cogen plants. The bagasse based co-generation projects make use of the available infrastructure and also meet energy requirements of sugar mills. Therefore, the Commission is of the view that to that extent project cost should be reduced for purposes of determining generation tariff.

The Commission also decides (in line with its Order No.2 of 2006 on wind energy tariff) that the responsibility for the evacuation arrangement should be of the developer of the bagasse cogeneration project. In other words the bagasse cogenerators are supposed to lay down a transmission line from their switch yard to the nearest GETCO Sub-station, or GETCO will lay down transmission line at the cost of the developer.

Based on the analysis of capital cost of recent plants and other inputs received from the various stakeholders, the Commission has decided that Rs. 4.00 Crores (inclusive of evacuation arrangement) would be a reasonable estimate for capital cost per MW for the purpose of sale of surplus power to GUVNL/Discoms.

3. Number of operating days: During crushing season and non crushing season

In the Discussion paper, the Commission had determined (proposed) the tariff for co-generation plant based on operation of the plant for 180 days during the crushing season on bagasse and 60 days during the non-crushing season with fossil fuels.

Gujarat State Federation of Co-operative Sugar Factories Ltd. is in agreement with the Commission's proposal. MITCON suggested that off season period may not be limited and that year around purchase should be encouraged. They further mentioned that they are not proposing any fuel pass-through for off season. Based on economically available biomass and permissible fossil fuel for auxiliary or support needs, the sugar mills are operating cogen plants on year around basis.

NITASH has submitted that in order to be viable, modern cogeneration plants have to be operated throughout the year and through purchase of fuel (conventional and non conventional) during the non crushing season. They have further mentioned that bagasse cogeneration plants can run at about 50 % of the rated capacity during the crushing season. As such power purchase price during the non-crushing season decides the viability of the projects.

Considering above, the Commission is of the view that off season period may not be limited and year around purchase based on 80% PLF should be considered. The developer of the cogen project should select the plant size design considering the year around operation (i.e. 80%) subject to use of any fossil fuels upto 25% of annual fuel consumption.

Therefore, the Commission has decided the tariff considering 80% PLF with 25% of annual fuel consumption as fossil fuel.

4. Station Heat Rate (SHR)

In the Discussion paper, the Commission proposed average Station Heat Rate (SHR) at 3700 kCal/kWh for bagasse based co-generation projects for tariff determination purposes. As brought out in the discussion paper, this figure of SHR is by and large in line with that considered by other state regulatory Commissions.

The Commission also studied the data of a typical (21 MW size) bagasse based cogeneration plant. This plant uses: bagasse and coal in the ratio of 70:30; has high pressure boiler (87 kg/cm2; has

minimum efficiency of 70%); and operates double extraction cum condensing turbine.

From the heat mass balance diagrams it was found that the SHR was around 4963 kcal/kWh during season and around 3777 kCal/kWh during off season (without any steam bypass for process). From the data of the fuel consumption during the season and off season, the overall Plant heat requirement in kcal/kWh worked out as around 4815 and 3663 kCal/kWh.

The Commission is of the view that the consumption of fuel corresponding only to the supply of power to the distribution licensee needs to be considered. During the off season there is no steam by-pass for process use resulting in full utilization of generation potential of steam.

Therefore, taking into account of the heat requirement per unit "during the off season" (when there is no usage of process steam i.e. when all the steam is used for generating electricity), the heat requirement per unit at 3700 kCal/kWh appears reasonable for tariff determination purpose.

5. Fuel values of bagasse

Fuel values of bagasse are influenced principally by the moisture it contains. In the discussion paper, the Commission had proposed gross calorific value of wet bagasse at 2250 kcal/kg for determining bagasse price based on the study carried out by L. Wong Sak Hoi, of Mauritius Sugar Industry Research Institute,

Mauritius. According to him mill run bagasse has a gross calorific value (GCV) of about 9 000 - 10 000 kJ/kg, (i.e. 2150- 2388 kcal/kg).

CERS is in agreement with the Commission's proposal. The other Commissions like MERC have also considered the gross calorific value of wet bagasse at 2250 kcal/kg as the basis for determining bagasse price.

Based on the foregoing facts, the Commission has decided the gross calorific value of wet bagasse at 2250 kcal/kg.

6. Fuel Cost

In the discussion paper the Commission considered price for bagasse (inclusive of cost of 25% conventional fossil fuel) at Rs. 740/MT with 5.00 % escalation per annum.

MITCON suggested economical cost of bagasse at Rs. 900 per MT on the grounds that market price of bagasse is generally 20% lesser than the coal price in the sugar mill region and that most of the sugar mills are in South Gujarat where imported coal of 5500 kcal/kg costs about Rs. 3300/MT.

NITASH submitted that bagasse based cogeneration projects on BOOT basis require to pay 12.5% VAT on bagasse during the crushing season and on other fuel during the non crushing season.

GUVNL suggested that the fuel cost should be Rs. 559/MT as adopted by MERC based on "equivalent heat value of coal" as it is determined scientifically and factors in the opportunity cost appropriately.

The Commission has also considered for comparative purposes the bagasse price approved by some other State Commissions as in the following Table:

Other Commission	Bagasse price in Rs. /MT	Annual escalation
KERC	800	5%
APERC	575	5%
UPERC	740	6%
TNERC	575	5%
MERC	559	8%

For determination of economical cost of bagasse, the Commission adopted equivalent heat value of coal approach as it appears more scientific. For a co-generation project as there is no element of transportation of bagasse, The Commission considered the pit head price of coal having equivalent calorific value of bagasse i.e. 2250 kCal/kg.

The heat value of the 'G' grade coal ranges between 1300 to 2400 kcal/kg. In Gujarat, the GSECL's Ukai generating stations source coal from the WCL mines. The Coal India Limited has fixed the basic price of 'G' grade coal (for WCL mines) at the Pit-head (excluding statutory levies) at Rs. 540 per MT. With the statutory levies like: Royalty, Stowing Excise Duty, CST, the total price works out to about Rs. 637 per MT. The Commission therefore considers Rs. 637/ MT as a reasonable and fair price for Bagasse.

The Commission recognises that the prices of bagasse and permissible fossil fuel are the key parameters influencing the project economics and determination of tariff. The cost of permissible fossil fuel such as coal and Lignite (up to 25%) and its transportation has to be considered along with 75% bagasse for calculating the aggregate cost of fuel.

The domestic coal is required to be transported from a long distance; it may not be a viable proposition. Therefore it is expected that such small cogeneration plants may rely on locally available lignite as supplementary fuel.

The GMDC has fixed lignite price at Rs. 780 per MT (including royalty and taxes) for the Panandhro mine having fuel value around at 3097 kCal/kg. The Commission has considered the cost of lignite including transport cost through trucks from the Katchh to Central/South Gujarat at Rs. 1625 Per MT. (In comparison the coal which is being transported to Ukai TPS at around Rs. 1954 per MT)

Considering the permitted usage of fossil fuel up to 25% and taking the transport costs into account, the weighted average cost of fuel per MT works out to Rs. 775 per MT (gross calorific value at 2250 kcal/kg) with 5.00 % escalation per annum for tariff determination purpose.

7. Auxiliary power consumption

In the discussion paper, the Commission has proposed an Auxiliary Power Consumption of 8.0% for bagasse based cogeneration project.

MITCON submitted that according to available data, well-engineered plants have 9.5% auxiliary consumption as annual average. Technical data submitted by NITASH for the proposed 50 MW bagasse based cogeneration plant for Narmada Sugar shows power consumption of 9.375% during crushing season and 7% during non crushing season.

The Commission has also looked at the Auxiliary Power Consumption norms adopted by other SERCs. UPERC has considered 8.50 %, KERC 8%; and APERC 9%.

The Commission is of the view that these co-generation projects should operate efficiently and considers 8% Auxiliary consumption as reasonable for determination of tariff.

8. Agreement period

In the discussion paper the commission proposed agreement period of 20 years.

GUVNL is in agreement with the Commission's proposal. They further suggested that the Developer should not be allowed to change the option from sale to wheeling once he opts for sale for the entire agreement period. Shri Chalthan Vibhag Sahakari Khand Udyog Mandali Ltd. submitted that the assurance of purchase of total exportable power for minimum 10 years should be given. Shri Raj Tillan suggested that 20 years agreement period is too long and that since the investment decisions of sugar factories are not guided by sales to grid, it should be 5 years.

The Commission is of the view that provision of long term agreement of 20 years with the distribution licensee will attract the sugar mills towards invest in advanced cogeneration systems. As such the Commission is of the view that that the Developer should not be allowed to change the option from sale to wheeling once he opts for sale for the entire agreement period.

9. Depreciation Rate

In the Discussion paper the Commission considered depreciation on SLM method wherein asset life is to be depreciated up to 90% of its initial value (considering residual value of 10% of its initial value) over the entire asset life (which is 20 years). It was also proposed that as such projects are entitled to accelerated depreciation benefits (under IT Act), Advance Against Depreciation (AAD) need not be allowed for tariff determination purpose.

GUVNL suggested that accelerated depreciation benefits to the organization installing bagasse based cogeneration plant should also be considered.

The Commission believes that while determining the tariff, the Income Tax benefit through Accelerated depreciation has been considered. Therefore, any accelerated depreciation benefits to the organization installing bagasse based cogeneration plant need not be separately considered.

10. O&M Expenses

The Commission, in its discussion paper, has considered O&M expenses at 2.50% of capital cost for the first year, to be increased thereafter by 5% per annum.

GUVNL suggested O&M expenses at 1.5 % of project cost for the first five years and escalation as proposed thereafter. MITCON suggested O&M expenses at 5 paise per unit with 3% escalation per annum. NITASH has submitted data for the proposed Narmada Sugar project wherein O&M cost is derived at 2.8% which also includes special repair fund in FY 2009(three years after the proposed commissioning date in 2006).

The Commission has also looked at the O&M cost norms adopted by other SERCs. KERC has allowed 3 % of project cost as O&M expenses with 5% escalation every year. UPERC has adopted 2.5 % of project cost as O&M expenses with 4% escalation every year. APERC has adopted 3% for five years with 5% annual escalation thereafter.

In the Bagasse based co-generation project, part of the steam generated will be utilized for the process plant of sugar mill. Therefore, the Commission is of the view that O&M cost of the steam generator should not be totally apportioned to power generation. Further, no elaborate equipment will be required for preparation of bagasse for use as fuel.

Considering the above, the Commission decides to allow O&M expenditure of 2.5% of capital cost per annum (including insurance) with escalation of 5 % every year.

11. Debt : Equity ratio

The debt-equity ratio for the Project will be considered as 70:30.

12. Loan tenure and Loan repayment schedule

The Commission has considered loan tenure of 10 years, with quarterly repayment in equal installments.

13. Interest on long term debt

The Commission has considered interest on long term debt at 10.25% per annum.

14. Return on Equity (RoE)

The Commission in its discussion paper proposed to consider return on equity at 14%, post tax per annum.

MITCON proposed return on equity of 16% as bagasse cogen projects do not have any firm fuel supply agreement and as they are subject to vagaries of nature and uncontrolled variation in the fuel cost.

The Commission has considered return on equity at 14%, post tax per annum while determining tariff for wind energy projects.

The Commission, considering the above, allows Return on Equity at 14% post tax.

15. Interest on Working Capital:

GUVNL submitted that interest on working capital should not be payable on the "Cost of fuel" as cost of fuel for the cogen projects is only notional without any cash implication.

In Gujarat, all the sugar mills are in co-operative Sector. Their capacity of raising funds for cogen power plants independently is rather limited. As such, majority of bagasse cogen projects may come up on BOOT basis. In such cases, the Developer would be required to pay price of bagasse to sugar mill. Therefore, the Commission is of the view that it is necessary to consider "Cost of fuel" for the working capital.

The Commission has considered the interest on working capital based on:

(i) Cost of fuel for one and half months;

(ii) O&M expenses for one month;

(iii) Receivables equivalent to half month's charges for sale of electricity calculated; and

(iv) Maintenance spares at 1% of the Capital cost escalated @ 6% per annum.

The Commission considered the rate of interest on working capital at the rate of 10.75% (equal to the short-term Prime Lending Rate of State Bank of India as on 1st April of the year) for determination of tariff.

16. Income Tax liability

In the Discussion paper for tariff determination the commission considered: the effect of Income tax, Minimum Alternate Tax (MAT) and surcharge at prevailing rate and the effect of tax holiday available under Section 80-IA of the Income Tax Act 1961 and Income Tax benefit through Accelerated depreciation.

GUVNL suggested that while determining tariff accelerated depreciation benefits available to the developer installing bagasse

based cogeneration plant should be considered. This aspect, as mentioned above, has been considered.

17. Tariff Rate

The Commission in its discussion paper proposed a fixed tariff of Rs. 2.97 during the project life of 20 years.

MGVCL and CERS are in agreement with Commission's proposal Shri Raj Tillan suggested that rate should be at least equal to that of wind power generation. GUVNL is of the view that the proposed tariff is higher than that of conventional power projects. Shri Kanubhai Patel suggested that Tariff should start with Rs. 2.50/kWh and increase by 5 paise every year. MITCON suggested that annual escalation of 3 to 5% may be provided (as provided by other Commissions) and that annual escalation could be reconsidered after the loan tenure. They further suggested that incentive for higher PLF during peak power requirement period should be considered. NITASH suggested tariff of Rs. 3.25/kWh during both crushing and non crushing season regardless of fuel used in the non crushing season and 5% annual escalation. Shri Chalthan and Kamrej Vibhag Sahakari Khand Udyog Mandali suggested that tariff should be Rs. 3.50 per kWh with 5% escalation. Gujarat State Federation of Co-operative Sugar Factories Ltd. suggested that tariff should be Rs. 3.25 per kWh with 5% escalation.

The Commission considered for comparative purposes the tariff for Bagasse based cogeneration projects approved by some other State Commissions as in the following Table.

Table: 1
Tariff of Bagasse based Co-generation projects in different States

Sr. No.	States	Tariff Rate In Rs. / kWh
1	Tamil Nadu	Rs. 3.15 per unit
2	Andhra Pradesh	Fixed cost tariff **Year of operation (nth year)** — **Fixed Cost Rs / Unit** 1st — 1.72 2nd — 1.67 3rd — 1.63 4th — 1.59 5th — 1.55 6th — 1.51 7th — 1.47 8th — 1.43 9th — 1.35 10th — 0.90 The variable cost tariff for bagasse based projects is as follows: **Financial Year — Variable Cost Rs/kWh** 2004-2005 — 1.02 2005-2006 — 1.07 2006-2007 — 1.12 2007-2008 — 1.18 2008-2009 — 1.24
3	Maharashtra	Rs.3.05 for the first year of operation And the tariff shall be escalated at the rate of 2% per annum on compounded basis
4	Uttar Pradesh	Tariff Year — paisa per unit

	FY-06	FY-07	FY-08	FY-09	FY-10
FY 2006	286	289	293	297	302
FY 2007		298	302	306	310
FY 2008			311	315	320
FY 2009				325	329
FY 2010					339

The Commission has considered levelised cost and opted for a fixed tariff for 20 years. The Commission also believes that such a tariff

will provide reasonable incentive to developers as it gives stable tariff over a longer period.

Based on the various parameters as discussed above, the levelised cost of generation including RoE using discounting rate at 10.60% (as notified by the Central Electricity Regulatory Commission for bid evaluation purpose), works out to Rs. 3.00 per KWh.

The Commission has determined the tariff for such project at Rs. 3.00 (constant) for its entire project life of 20 years i.e. from the first year to the twentieth year. This tariff rate shall be applicable for purchase of such energy by GUVNL/Distribution Licensees for complying with the purchase obligation that may be specified by the Commission from time to time.

Other issues:

18. Control period

The Commission decides that the initial control period should be three years. The tariff decided in this order shall apply to all projects that come up within the control period for their 20 years of project life. Moreover, this tariff shall continue to be applicable till it is revised or till a new control period regime comes into existence.

19. Power Purchase Agreement (PPA)

In the discussion paper it was proposed that the bagasse based cogeneration project Developer / Distribution Licensee/ other parties who are willing to supply/purchase power shall have to

sign a Power Purchase Agreements (PPA), for a period of at least 20 years.

MITCON and others suggested provisions of interest on delayed payment and payment security mechanism like Letter of credit in favor of bagasse co-generator.

The Commission has considered the views it has received and decided that GUVNL/Distribution licensee and bagasse based cogeneration project should enter into a PPA for a period of at least 20 years. The GUVNL/Distribution licensee may use Model PPA for wind energy project with necessary changes.

20. Reactive Energy charges:

MITCON suggested that the Commission may fix percentage KVAR to be fed in the Grid.

The prevailing provisions for CPP pertaining to reactive energy shall be applicable to bagasse co-generation projects. The reactive energy charges fixed by the Commission in the Commission's Order on Intra State ABT (No.3 of 2006) as well as GETCO's Tariff order 862/2006 as applicable to CPPs and wind farms will be applicable to bagasse co-generation projects.At present such rates are as under:

(According to Tariff order dated 6th May 2006 in respect of GETCO's ARR/Tariff Petition 862/2006)

10paise/KVARH	For the drawal of reactive energy at 10% or less of the net active energy exported.

25paise/kVARH	For the drawal of reactive energy at more than 10% of the net active energy exported.

Such charges shall be according to Tariff orders that may be issued by the Commission from time to time.

21. Transmission/Wheeling Charges and wheeling loss:

GUVNL suggested that wheeling Charges and wheeling loss for Bagasse based cogeneration projects may also be specified as for other open access consumers. The Gujarat State Federation of Co-operative Sugar Factories Ltd. and others suggested that wheeling of power should be allowed with reasonable charges and fair amount of transmission loss.

For bagasse based cogeneration projects, those who have opted for sale to the distribution licensee, wheeling charge and loss will not be applicable as the GUVNL/distribution licensee will purchase the same on Ex- Bus basis as in case of wind energy projects.

The existing policy of Government of Gujarat, on energy generation through renewable sources, has provision of levy of wheeling charge of 4% of energy injected in the grid as follows:

> *"... For this purpose wheeling charges will be deducted at 4% of the generated units irrespective of their distance from the project. Third party sale of power shall also be allowed subject to the payment of 4% wheeling charges prescribed under the scheme."*

Considering the above, the Commission decides that the same policy will be applicable for wheeling of such energy. Such wheeling charge shall be levied by the GETCO only.

22. Sharing of benefits from Clean Development Mechanism (CDM)

The GUVNL suggested that the benefits available under CDM for carbon credit should be passed on to the distribution licensee.

The proceeds of the carbon credits will accrue to the bagasse based cogeneration projects and will reduce costs correspondingly. Therefore the Commission, in line with the Commission's Order No.2 on wind tariff, decides to pass on 25% of the gross CDM benefit to the Distribution Licensee.

23. Applicability of Intra-State ABT

As electricity, exported in the grid from the bagasse based cogeneration projects, can be scheduled, it can be brought within the ambit of Intra-State ABT. The Commission has kept bagasse based cogeneration projects in the purview of the settlement mechanism linked with UI rate (which comes into play in case of deviations) under Intra State ABT.

24. Energy accounting and commercial settlement

The Commission has kept the bagasse based cogeneration projects in the purview of the Intra State ABT. Therefore, for the purpose of energy accounting, bagasse based cogeneration projects will have to provide ABT compliant meters at the interface points. Interface metering shall conform to the Central Electricity Authority (Installation and Operation of Meters) Regulations, 2006. Commercial settlement of bagasse based cogeneration projects

shall be in accordance with the Commission's order No. 3 of 2006 dated 11.8.2006.

25. Renewable Purchase Obligation (RPO) Operator

The GUVNL shall enter into PPA with bagasse based cogeneration project Developers on be-half of the four Government Distribution Companies. GUVNL shall apportion such renewable energy purchased amongst DISCOMs based on the total consumption of the different distribution companies on a pro-rate basis. However, bagasse based cogeneration project Developers would have to enter into PPA with Torrent Power AEC Limited (TPAL) and Torrent Power SEC Limited (TPSL) separately.

To summarize the decisions of the Commission on Tariff for bagasse based cogeneration projects are as under:

The Commission has determined the tariff for generation from bagasse based cogeneration project at Rs. 3.00 (constant) for its entire project life of 20 years i.e. from the first year to the twentieth year.

This tariff rate shall be applicable for purchase of such energy by GUVNL/Distribution Licensees for complying with the purchase obligation that may be specified by the Commission from time to time.

Sd/-	**Sd/-**	**Sd/-**
(G. Subba Rao)	**(K.P. Gupta)**	**(Man Mohan)**
Chairman	**Member**	**Member**

Place: Ahmedabad
Date: 3/1/2007

(P.S.Shah)
Secretary
GERC, Ahmedabad

Date: 3/1/2007

Annexure – I

1.	Shri Kanubhai Patel, Member State Advisory Committee
2.	MITCON Consultancy Services Ltd.
3	Nitash Cogeneration Pvt. Ltd.
4.	Gujarat Urja Vikas Nigam Ltd. (GUVNL)
5	Shri Raj Tillan
6.	Consumer Education And Research Society (CERS)
7	Madhya Gujarat Vij Company Ltd. (MGVCL)
8.	Gujarat State Federation of Co-operative Sugar Factories Ltd., Gandhinagar
9.	Shri Kamrej Vibhag Sahakari Khand Udyog Mandali Ltd.
10.	Shri Chalthan Vibhag Sahakari Khand Udyog Mandali Ltd.