Petition No. 24/2000 dated 31st March 2000

before the

CENTRAL ELECTRICITY REGULATORY COMMISSION

in the matter of

6x660 MW HIRMA POWER PROJECT

Consultants' Report

Submitted by

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21st August 2000

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CHAPTER I: INTRODUCTION

I.1 Background of the Project

The 6x660 MW (net) Hirma Power Project, an Independent Power Project jointly being developed by M/s. Southern Energy Asia-Pacific Limited, USA and Others (Reliance Group of Industries, India), will be located at Hirma in the district of Jharsuguda in the State of Orissa, India.

The primary fuel for the Project will be domestic coal, which would be sourced from the coal block of the IB-Valley coal fields located at a distance of about 40 kms from the Project site. The energy generated by the power station will be delivered to M/s. Power Trading Corporation of India Limited for sale on a back to back basis to five States of India, viz. Gujarat, Haryana, Madhya Pradesh, Punjab and Rajasthan.

I.2 Background of the Petition

Mega Power Project

A Memorandum of Understanding (MoU) was signed between M/s. Power Grid Corporation of India Limited (POWERGRID) and M/s. Consolidated Electric Power Asia Limited, Hongkong (CEPA) {name now changed to M/s. Southern Energy Asia-Pacific Limited (SEAP)} on 22nd September 1994, setting out SEAP's intention to set-up coal fired power projects and the proposed arrangement for the offtake and sale of power. This MoU has been extended from time to time through Supplementary Agreements.

In November 1997, the Government of India (GoI) constituted a Standing Independent Group (SIG) for overseeing the development and implementation of projects designated as mega power projects. The GoI also decided to dispense with the need for a Techno-Economic Clearance (TEC) from the Central Electricity Authority (CEA) for projects referred to SIG.

Pursuant to the Revised Mega Power Policy Guidelines of GoI, M/s. Power Trading Corporation of India Limited (PTC) was established to buy power and sell power from identified mega power projects and sell the same to various States. The Hirma Power Project was also identified as a mega power project to be set up in the private sector. As such, on 6th December 1999, PTC signed an MoU with CEPA (now SEAP) for the purchase of power from the Hirma Power Project (the "Project"). The MoU is currently valid upto 22nd September 2000.

Tariff Offer of SEAP

The Project is being developed under the fixed tariff route wherein SEAP has offered a pre-determined tariff stream for the duration of Power Purchase Agreement. The tariff offer of SEAP is a "Standalone Tariff Based Offer" (STBO), and not based on the Cost Plus Tariff Structure as detailed under GoI norms. In an STBO, the entire risks and costs of funding and operations are not 'pass through' to the consumer, but borne by the developer / the power generation company. Thus, SEAP's tariff offer comprises only the pre-determined tariff stream and certain broad assumptions & principles underlying the tariff offer.

CEPA submitted its initial tariff offer on 23rd / 24th December 1996. To analyse this tariff offer and compare it with the tariff of certain

other thermal Independent Power Projects (IPPs), a Tariff Committee comprising representatives from Ministry of Power, GoI (MoP), CEA, M/s. ICICI, PTC and Advisor (PTC) was formed vide MoP Office Memorandum dated 28th June 1999. On 11th August 1999, SEAP submitted a revised tariff offer to take into account the negotiations between the parties and also the various concessions granted under the Mega Power Policy.

On the 24th August 1999, the Tariff Committee apprised SIG about the approach and methodology adopted by it to analyse and compare SEAP's initial and revised tariff proposals with the tariffs of similar projects accorded TECs by CEA. Subsequently, PTC informed SEAP that under all scenarios the fixed charge component of SEAP's tariff offer was found to be higher than that of other projects under comparison; therefore the tariff offer would need to be brought down to a level comparable with other projects.

On 27th October 1999, SEAP furnished its final tariff offer for a minimum guaranteed Plant Load Factor (PLF) of 68.5%. This tariff offer is now under consideration.

Reference to CERC

In view of the significant time lapse in finalisation of the tariff for the Project, SEAP vide its letter dated 17th December 1999 addressed to the Secretary (Power), MoP, requested that the tariff finalisation process be referred to the Central Electricity Regulatory Commission (CERC). The SIG also, in its meeting held on 30th December 1999 recommended that since no agreement had been reached on the tariff, all tariff related issues should be referred to the CERC. SEAP's tariff offer was thus forwarded to CERC on 14th January 2000.

While the SIG was constituted to oversee the development of mega power projects, it has now ceased to exist. CERC is thus the ultimate authority to approve tariffs even for mega power projects. On 4th February 2000, MoP advised PTC to file a formal petition as per the CERC Conduct of Business Regulations, which petition (No. 24 of 2000) was filed by PTC before the CERC on 31st March 2000.

Appointment of SBICAP

A petition before the CERC, for a Tariff Order, usually specifies the tariff and is generally filed by the generation company. However, in Petition No. 24/2000, filed by PTC, the proposed tariff has not been specified – in fact the petition requests for the determination of tariff.

In view of the peculiar nature of the petition, pending admission of the petition, at the hearing held on 21st June 2000, PTC (the Petitioner) SEAP (Respondent No. 1), and Gujarat Electricity Board (GEB), Haryana Vidyut Parsaran Nigam Limited (HVPNL), Madhya Pradesh Electricity Board (MPEB), Punjab State Electricity Board (PSEB) & Rajasthan State Electricity Board (RSEB) {Respondents 2-6}, agreed to the appointment of M/s. SBI Capital Markets Limited (SBICAP) as Consultants to CERC for analysing the contentions of the Petitioner and Respondent No. 1 on the various tariff related issues and for independently arriving at the most competitive tariff and terms & conditions, for the CERC to evaluate and decide.

Pursuant to CERC's order dated 21st June 2000 for appointment of SBICAP as Consultants, on July 31st 2000, SBICAP was accorded the authorization to proceed on the assignment.

Terms of Reference

The detailed Terms of Reference for SBICAP are -

I. a. Evaluate the proposals of the Petitioner, and
   b. Simultaneously match with the proposal of Respondent No. 1 in order to arrive independently at the most competitive tariff and terms & conditions.

II. a. Review the tariff contained in the Petition filed by the Petitioner, and
   b. Hold discussions with the concerned parties to assist CERC in assessing the rival contentions of the parties. The areas of disagreement are as furnished by the Petitioner in its submission of 10th June 2000.

III. Assess the competitiveness of the tariff in the light of the Mega Power Policy of Government of India and taking into account the various policies, relief and concessions.

IV. Compare the fixed components of tariff of the Project at 68.5%, 75%, 80% & 85% annual PLF/availability with other CEA cleared coal based thermal power projects with appropriate correction for size and number of units, economies of scales and any other relevant aspects.

V. Study and suggest the reasonableness of tariff at higher operating levels of 75%, 80% & 85% -
   a. Duly taking into account the commitment made by the SEBs, and
   b. The avoided cost of electricity for the five off taking SEBs.

VI. Benchmark the Hirma tariff with any other competitively bid power project in India.

VII. a. Examine the various issues raised by the SIG as contained in the minutes of SIG meeting of 30th December 1999, and
b. Analyse their impact of tariff with suitable recommendations

VIII. Any other issues as directed by CERC with a view to properly assessing the feasibility and competitiveness.

As per the proposal submitted by the consultants, the Commission has approved the execution of the assignment in three phases. This report pertains to Phase-I of the assignment. The report on the avoided cost of electricity will be submitted separately in Phase-III.

CHAPTER II: APPROACH ADOPTED BY SBICAP

This chapter details the approach adopted by SBICAP to assess the rival contentions of the parties, evaluate the tariff offers and arrive at a reasonable and competitive tariff for the Project.

II.1 Appointment of M/s. Black & Veatch International Company

SBICAP, in consultation with the Petitioner and the Respondents and with the approval of the CERC, appointed M/s. Black & Veatch International Company, (B&V), an international technical consultant with wide experience in power and infrastructure projects, with a view to obtaining technical inputs for the assignment.

The inputs of B&V have been sought on –

- Indicative pricing cost estimates for major plant items and a fair estimate of total project cost
- Recommendation of Boiler Technology including the performance of a technical and economic comparison between super & sub critical boilers suitable for a 660 MW coal fired unit, and examination of the impact fixed and variable charge component of tariff such as station heat rates, operations & maintenance expenses
- Comparison with other coal based projects using appropriate correction for size and number of units, economies of scales and any other relevant aspects

II.2 Examination of Various Documents

To review the tariff contained in the petition, and assess the rival contentions of the parties, SBICAP has carried out a detailed study

and examination of the various documents submitted as part of the petition, as also the Detailed Project Reports (DPRs) forwarded by SEAP to CEA in 1997 and 1998, among others. The primary documents perused, include -

- Petition to CERC dated 31st March 2000
- Annexures to Form No. 1
- Enclosures to Form No. 1
- Submission of Names & Areas of Agreement & Disagreement pursuant to CERC's order dated 31st May 2000
- Preliminary Reply on Petition by Respondent No. 1
- Additional Reply on Petition by Respondent No. 1
- Rejoinder to Preliminary Reply of Respondent No. 1
- CERC Orders & Submissions / Application filed by PTC Subsequent to the filing of the Petition
- DPR dated 28th February 1997, Vol. I (Technical) & Vol. II (Finance)
- DPR dated 1st September 1997, Vol. I (Technical) & Vol. II (Finance)
- DPR dated September 1998, Vol. I (Technical) & Vol. II (Reference Plant)
- Environment Impact Assessment Report for Hirma, Jharsuguda, Orissa, dated February1997
- Supplementary information on Environment Impact Assessment Report, dated 17th August 1998
- Final Report submitted to ICICI on Power Plant Cost, Technical Parameters & Cost Comparisons for the 6x660 MW CEPA Project, dated September 1996 by Lahmeyer International
- Report on EPC Prices for Coal Fired Power Plants in India, dated July 2000, by Lahmeyer International

It may be mentioned here that the 1996 Report of Lahmeyer International had till date remained undisclosed (except for certain extracts). For an understanding of the rival contentions of the parties however, the said report was obtained by SBICAP from MoP.

Further, as SEAP has till date contented the methodology for application of the Lahmeyer's Curve contained in the 1996 Report, the 2000 Report is essentially an updated version of the earlier report, with the exercise having been carried out on behalf of SEAP and M/s. Reliance Thermal Energy (P) Limited.

In order to assess the competitiveness of the tariff proposal in the light of the Mega Power Policy, and comparing fixed components of tariff of the Project at various PLF/availability levels with other CEA cleared coal based thermal power projects, the following documents were perused –

- Power Purchase Agreement of the Mangalore Power Project
- Power Purchase Agreement of the Vishakhapatnam Thermal Power Station
- Power Purchase Agreement of the Bhadravati Thermal Power Station
- TEC of the Mangalore Power Project
- TEC of the Vishakhapatnam Thermal Power Station
- TEC of the Bhadravati Thermal Power Station
- TEC of the Korba East Thermal Power Station
- TEC of the Cuddalore Thermal Power Project
- TEC of the North Madras Thermal Power Project – II
- TEC of the Simhadiri Thermal Power Station
- Revised Mega Power Policy Guidelines

To benchmark the tariff of the Project with other competitively bid power projects, the following additional documents were considered for the principles / assumptions underlying the determination of tariff –

- Request for Proposal document of the Pipavav Power Project
- CERC's Consultative Paper on Bulk Tariff Norms
- Documents pertaining to other competitively bid projects in India

II.3 Discussions with the Parties

To clearly understand the contentions of the various parties on the tariff related issues, the raison d'être for differences, and to discuss SBICAP's analysis at regular intervals, a series of extensive discussions were held with the Petitioner & the Respondents, and insights on the approach of the previous tariff evaluation exercises were sought from representatives of MoP and CEA.

The various meetings and discussions were held as on the dates mentioned below -

- PTC : 1st, 2nd, 4th, 7th, 16th, 19th August 2000
- SEAP : 31st July 2000, 2nd, 4th, 7th, 8th, 16th August 2000
- Member of Tariff Committee from CEA : 2nd August 2000
- Representative of MoP : 3rd, 7th August 2000
- PTC, SEAP & SEBs Joint Meeting : 12th, 14th, 17th August 2000
- PTC & SEAP Joint Meeting : 18th, 19th, 20th August 2000
- PTC & SEBs Joint Meeting : 8th, 20th August 2000

In addition to the above, Review meetings were held by the Commission on August 3rd, 9th 14th & 17th August, 2000 with a view to ensuring smooth progress of the assignment and to providing guidance and direction for completion of the assignment.

The overwhelming objective of above methodology was the effective discharge of the functions as per the terms of reference. In addition, the approach to the assignment was aimed at narrowing down the areas of disagreement between the parties, and arriving at a consensus on most of the tariff related issues.

CHAPTER III: CHRONOLOGY OF TARIFF PROPOSALS

To take into account the effect on tariff of the negotiations between the parties and also the various concessions granted to mega power projects, SEAP's tariff offer has undergone a change on a number of occasions. The sequence of the tariff proposals for the Project by the Tariff Committee and SEAP is detailed in this chapter.

III.1 Tariff Offers

SEAP's Tariff Offer dated 23rd / 24th December 1996

SEAP, vide their letter dated 23rd December 1996 made an offer of a total levelised tariff of US 5.13 cents/KWh for 30 years based on a minimum guaranteed power purchase (offtake) at 68.5% PLF. The levelised fixed charge component of tariff was US 4.28 cents/KWh at constant prices as per the schedule below -

PLF 68.5%	Years 1 – 12	Years 13 - 30
Capacity charges	US 4.07 cents (fixed)	US 4.07 cents (fixed)
O&M charges	US 0.21 cents (escalable)	US 0.21 cents (escalable)
Total Charges	**US 4.28 cents/KWh**	**US 4.28 cents/KWh**
@1US$ = Rs. 35	***Rs. 1.498/KWh***	***Rs. 1.498/KWh***

The US$ and Rs. components of tariff were to be denominated in the ratio of 50:50 for the first 12 years and in the ratio of 25: 75 for the subsequent years.

Tariff Committee Report to MoP on 19th July 1999

The Tariff Committee worked out SEAP's fixed tariff at Rs. 1.49/KWh at 68.5% PLF under the mega power policy concessions.

However, SEAP contended that the fixed tariff at 68.5% was Rs. 1.64 /KWh and not Rs. 1.49/KWh. The difference was due to the conversion of the foreign exchange portion of the tariff at 1US$ = Rs. 35 instead of then prevailing exchange rate of 1US$ = Rs. 42.5 as on the Tariff Committee report date.

SEAP's Revised Tariff Offer of 11th August 1999

On 11th August 1999, SEAP offered a revised tariff (followed subsequently by letters dated 12th August 1999 and 16th August 1999) to take into account the effect of negotiations on the tariff. SEAP offered a tariff, which was to be the lower of levelised tariff of US 2.996 cents/KWh at guaranteed availability of 85% or US 3.0051 cents/KWh at guaranteed availability of 68.5%. The levelised tariff at constant and current prices is given below -

	68.5% Guaranteed Availability	**85% Guaranteed Availability**
Constant Prices	US 3.0051 cents/KWh	US 2.9959 cents/KWh
@1US$= Rs. 42.5	***Rs. 1.2772/KWh***	***Rs. 1.2733/KWh***
Current Prices		
6% Re. Inflation,	US 2.6224 cents/KWh	US 2.6314 cents/KWh
6% Re. Devaluation	***Rs. 1.5511/KWh***	***Rs. 1.549/KWh***
6% Re. Inflation,	US 2.7281 cents/KWh	US 2.7382 cents/KWh
4.255% Re. Devaluation	***Rs. 1.4692/KWh***	***Rs. 1.4704/KWh***

SEAP also presented their tariff offer (both under constant and current prices) under the following scenarios -

- Using 75% guaranteed availability factor
- Project size 4 x 660 MW
- Using subsidised JPY funding

SIG Meeting dated 24th August1999

The Tariff Committee apprised SIG of the approach and methodology adopted by the Tariff Committee for analyzing SEAP's original and revised offer and comparing the same with similar techno-economically approved projects by the CEA.

SIG, while approving the above approach of the Tariff Committee opined that SEAP's tariff should be competitive as compared to other similar projects. Also, it was mentioned that the present scenario in the power sector did not permit the option of Take or Pay off-take level at more than annual 68.5% PLF.

SEAP's Tariff Offer of 29th September 1999 / 27th October 1999

The Tariff Committee opined that SEAP's tariff was higher than that of comparable coal based projects and therefore SEAP should submit a revised offer. In line with the above, SEAP furnished a revised tariff offer vide their letter dated 27th October 1999 at the minimum guaranteed offtake at 68.5% Take or Pay which is the latest tariff offer now under consideration before the Commission.

III.2 Tariff Structure

The areas of agreement which form the basis of the final tariff offer by SEAP are as follows -

- The tariff will comprise of fixed charges and variable charges
- Fixed charges shall comprise capacity and O&M charge
- Fixed charges will be based on an annual take or pay level of 68.5% PLF
- Fixed charges will be denominated in US$ & Rupees in the ratio of 50:50 in the first 12 years and 25:75 in the remaining 18 years

- The Rupee component of fixed charges will be converted at 1 US$ = Rs. 35
- MGR cost and O&M charges on the same are included in the fixed charge component of tariff
- Capacity charges will be fixed and not subject to indexation
- For power sold above 68.5% annual PLF level, an incentive @25% of total fixed charge will be payable in Indian Rupees only and no additional O&M charge will be payable. Incentive charges will be converted at 1 USD = Rs. 35
- The fixed charge component of tariff is inclusive of income tax limited to Return on Equity not exceeding 16% of the equity
- Dividend tax, if any, would not be a pass-through
- Tax on other streams of income, if any, payable by SEAP will also not be pass-through in tariff
- Fixed charge component is based on the custom duty exemption as per the Indian Mega Power Policy
- There would be a mechanism for tariff adjustment on account of variations in statutory taxes and duties (change in law) from the levels assumed by SEAP. The detailed assumptions on taxes & duties and underlying SEAP's offer are annexed as Exhibit 1.
- SEAP would be allowed the right of Sale of Power to third parties subject to first right of refusal by Respondents 2-6
- The tariff as per SEAP's latest offer (subject to areas of disagreement) at a guaranteed availability of 68.5% is as below-

PLF 68.5%	**Years 1 – 12**	**Years 13 – 30**
Capacity charges	(US 2.159 cents + Rs. 0.756) / KWh	(US 0.302 cents + Rs. 0.317) / KWh
O&M charges	Rs. 0.074 / KWh	Rs. 0.074 / KWh
Levelised Charges	**US 3.4431 cents/KWh, viz. Rs. 1.4633/KWh**	

CHAPTER IV: INITIAL AREAS OF DISAGREEMENT

The SEAP tariff offer dated 27th October 1999 is the basis for the areas of disagreement between the parties. The following are the areas of disagreement

IV.1 Boiler Technology

Position of the parties as per Annexure V of the Petition No. 24/2000

PTC POSITION	SEAP POSITION
SEAP shall use Super-critical boilers technology for the plant for such a large size of generating unit as recommended by CEA	SEAP have expressed their strong reservations on the issue of Super-critical boilers technology for the plant

PTC Position :

PTC is of the opinion that Super-Critical Boiler (SCB) technology is essential due to the following reasons:

- SCB technology is environment friendly and is necessary to meet the global environment norms relating to CO_2 / greenhouse gas reduction.
- SIG has also suggested use of the SCB technology for the project.
- All new (& large) NTPC stations like Sipat, North Karanpura etc. are being implemented with the SCB technology.
- International funding agencies like KFW have stipulated the use of SCB technology as a pre-condition for one of the projects in Andhra Pradesh and therefore it is likely that similar conditions would be stipulated by such agencies for this project also.

- The Implementation schedule may not be delayed due to the use of SCB.
- The increase in Project Cost would depend on the specification of the SCB and may be only marginal for the next stage of temperature / pressure than that used for sub-critical boilers. This increase in project cost would, however, be more than offset by the savings in the fuel charges due to the use of SCB technology.

SEAP Position :

SEAP has the following reservations on use of SCB Technology:

- SEAP agrees to implement the project using SCB technology if adequately compensated for increase in fixed costs. According to SEAP changing over to SCB technology would lead to an overall net increase in the tariff due to the following reasons:
  - There would be an increase in the implementation schedule, thereby increasing the Interest During Construction. Also, there would be increase in O&M costs.
  - As the power plant is a pit head station and the coal being used has low calorific value, the savings on account of reduced fuel costs would not be sufficient to offset the increased costs (fixed and O&M).
- SEAP opines that as all global environmental norms would be met by the plant with its current configuration of sub-critical boiler with an FGD unit, there is no requirement for SCB for environmental considerations.

IV.2 Fixed Charge Component

Position of the parties as per Annexure V of the Petition No. 24/2000

PTC POSITION	SEAP POSITION
PTC is of the view that the levelised tariff for 30 years shall be @ Rupees 1.27/kWh without FGD or Rs. 1.35.kWh with FGD, if stipulated by the Indian Environment Regulatory Authority and shall comprise of: Capacity charge: will be fixed and not subject to indexation O&M charge : will be limited to 5% of the capacity charges and will be subject to indexation (as given in the next point)	SEAP furnished their tariff proposal at minimum guaranteed off-take level of annual 68.5% PLF in two levelised streams i.e 1-12 and 13-30 alongwith the resultant levelised fixed charges for year 1-30 vide their letter dated 27.10.99 as given under : Levelised fixed charge component of tariff with FGD in Rs. per kwh 1-12 yr 13-30yr 1-30yr 1.7475 0.5185 1.4633

Both the parties have agreed that the installation of the FGD plant would be required for the following reasons:

- The OPCB clearance for the said project provides for installation of a FGD plant.
- Multi lateral funding agencies would require the developer to comply with internationally acceptable environmental norms, which would inter alia include the installation of FGD for a coal based project.

IV.3 Operation & Maintenace Charges

Position of the parties as per Annexure V of the Petition No. 24/2000

PTC POSITION	SEAP POSITION
O&M charge will be limited to 5% of the capacity charges. Indexation on O&M shall be calculated based on the following: The Base date for O&M indexation will be fixed on Commercial Operation Date (COD) of the project. Indexation of O&M charges shall be done based on 70% WPI and 30% CPI. First escalation will be applicable w.e.f. a date falling one year after COD Indexation would be lower of : 1) 100% of the US cents of 0.21 may be converted into Rupees at the COD of Unit 1 at the then prevailing exchange rate and indexation be allowed as contemplated under GOI notification. 2) 2% of actual completed project cost and indexation be allowed as per GOI norms. Subject to : Incentives payable @ 25% of the	SEAP have suggested the following four alternatives vide their letter dated 5.11.99 1)100% of the US cent 0.21 may be converted into Rs. at the current exchange rate and indexation be payable from this point onwards 2)100% of the US cents of 0.21 may be converted into Rupees at commissioning of unit 1 at the then prevailing exchange rate and indexation be allowed as contemplated under GOI notification 3)The project can follow GOI norms by having the O&M portion of the tariff linked to actual completed project cost and indexation be allowed as contemplated under GOI notification. This will be in line with what is offered to other IPPs but are willing to accept O&M charges (including insurance) at 2% of the actual

capacity charges instead of SEAPs's offer of 25% of fixed charges (i.e. capacity plus O&M charges)	completed capital cost, rather than 2.5% as available to other IPPs. 4) SEAP is willing to accept lower of either 2.5% of actual completed project cost or 100% of US cents 0.21 converted into Rupees at commissioning of Unit 1 and indexation be allowed as per GOI norms

PTC Position :

PTC contends that the O&M charges be worked out at 5% of the capacity charges based on SEAP's initial tariff offer of December 24th 1996, of US cents 0.21 for O&M and US cents 4.07 for the total fixed tariff.

SEAP Position :

SEAP contends that no relationship exists between the O&M charges and the capacity charges. Further, linking the two would not be appropriate since the cashflow profile of the two streams do not match i.e. the O&M expenses increase over the years vis-à-vis the fixed charges which have a declining curve. Also, higher O&M charges would lead to excessive front loading which is not desired by the SEBs. SEAP is also not agreeable to accept PTC's counter offer as it contends that the incentives are already much lower than those provided to other projects and any further reduction is not warranted.

IV.4 Indexation of SEAP's Offer if Financial Closure Not Achieved by 31.12.2000

PTC POSITION	SEAP POSITION
PTC contends that no compensation should be given in the form of indexation of the initially assumed exchange rate of Rs. 35 = USD 1 for the Rupee Component of Capacity Charge	SEAP's offer current tariff offer is based on the premise that the financial closure is achieved by 31st December 2000. Thus the exchange rate of Rs. 35 = USD 1 for the Rupee Component of Capacity Charge would be applicable only if financial closure was achieved by 31st December 2000. Incase financial closure is not achieved by 31st December 2000, adjustment would be required for the depreciation in Rupee for the period from December 2000 to the financial closure.
PTC has stipulated that in the event that financial closure is not achieved by 31.12.2000, a suitable provision will be made in the Conditions Precedent of the PPA –1 stating that either party has the right to terminate PPA-1 thereafter or mutually agree for further extension in the deadline of 31.12.2000 for fulfillment of Conditions Precedent including financial close without any impact on the terms affecting the tariff.	SEAP have stated that "This appears to be a PPA issue which can be addressed when we finalise the PPA".

PTC Position :

PTC has given the following reasons for not allowing indexation :

- The CEA clearance for IPP projects does not provide for any escalation in the Rupee Component. However, any exchange rate fluctuation for the forex component is allowed in the project cost.
- SEAP's tariff offer contains 50% Rupee portion (converted at Rs 35/US$) and 50% forex component. In line with the CEA practice as stated above, PTC has agreed to provide exchange rate protection for the forex component.
- Achieving financial closure is primarily the responsibility of SEAP

SEAP Position :

SEAP has contended that the tariff offered to PTC at the exchange rate of Rs 35 per US$ for the Rupee Component of Capacity Charge cannot be frozen at the same level for an indefinite period of time. Any delay in achieving financial closure due to reasons not attributable to SEAP should not affect the project company's financial position.

IV. 5 Front Loading of Tariff

Position of the parties as per Annexure V of the Petition No. 24/2000

PTC POSITION	SEAP POSITION
PTC is of the view that extent of front loading of Fixed Charge Component of tariff at current prices for the first 12 years be capped at 70-74%.	In SEAP's October 1999 offer, the extent of front loading of Fixed Charge Component of tariff at current prices is 88%

PTC Position :

PTC is of the view that the extent of front loading of tariff be capped due to the following reasons :

- The State Electricity Boards do not want excessive front loading of tariff as it would put a strain on their cashflows in the first few years.
- The front loading for the Hirma Project is higher than that of the comparable projects.

SEAP Position :

SEAP's has front loaded the tariff for the following reasons :

- Front loading the tariff results in reduced tax liability for the company and also reduced forex risk in on the Dollar Component of tariff to be paid by PTC in the later years.
- To arrive at the most optimal tariff
- Any change in the amount of front loading would result in increase the levelised tariff.

IV.6 Availability Vs Plant Load Factor

Position of the parties as per Annexure V of the Petition No. 24/2000

PTC POSITION	SEAP POSITION
The fixed charge component of Tariff will be based on guaranteed annual offtake level of energy at 68.5% PLF.	SEAP vide their letter dated 09.06.2000 in: List of Agreements and Disagreements" have stated the following: " The fixed charge component of the tariff will be based on an annual take or pay level of 68.5% PLF"

	Agreed by SEAP that the guaranteed minimum annual energy off-take will be at 68.5% PLF for payment of 100% Fixed Charges comprising capacity and O&M charge. However, Tariff stream furnished in SEAP offer dated October, 27th 1999 reveals that it is based on 68.5% availability

PTC Position :

PTC is of the opinion that although the guaranteed PLF level is 68.49%, the plant availability as per the current offer has been assumed at the maximum possible level due to the following reasons:

- The full plant capacity charges are recovered at 68.5% level
- Although the guaranteed PLF is 68.5%, SEAP had been informed about the intention of the SEBs to purchase power from Hirma project at about 80-85%% PLF. This is evidenced by the fact that SEBs have agreed to a provision for take or pay obligation for fuel upto 80% PLF.
- Coal based power project are normally available at 80%-85%

SEAP Position :

SEAP's Tariff offer is based on recovery of fixed charges at 68.5% level (including deemed generation). Although there is a guaranteed availability at 68.5%, SEAP has mentioned that it would endeavour to run the plant at higher levels under prudent operating practices. SEAP has mentioned that any increase in guaranteed availability beyond 68.5% level would lead to increase in the O&M charges and consequently an increase in the tariff.

IV.7 Mechanism for Tariff Adjustment on Account of Statutory Variations in Taxes & Duties

Position of the parties as per Annexure V of the Petition No. 24/2000

PTC POSITION	SEAP POSITION
The benchmark values of various taxes and duties included in the fixed charge component of the tariff along with the details of the quantum and prevailing / existing rates taken in the tariff along with the mechanism for tariff adjustment due to statutory variation in taxes and duties be furnished by SEAP. The tariff will be subject to adjustment on account of any statutory variation, due to Change in Law.	Agreed for a mechanism for tariff adjustment on account of statutory variations in taxes and duties. Details of the various taxes and duties along with the rate and amount included in the tariff not furnished by SEAP.

PTC Position :

PTC is of the view that any reimbursement of statutory taxes and duties due to change in law would be done through an adjustment in the tariff and not through any upfront payments.

Further, the entire change in income tax would not be a pass through since it may include an equity return higher than 16% as allowed by

GoI. Thus, reimbursement of any change in income tax would be based on the following parameters:

- Equity subject to a maximum of 30% of project cost
- Base equity return of 16%
- Income to include only 16% return on equity invested in the Hirma Power project and not any other income

SEAP Position :

SEAP maintained that the underlying tax assumptions with reference to the items and rates of taxes had been provided to PTC during the course of the PPA discussions. Also, SEAP has agreed that the completed capital cost of the project would be made known to the parties at the time of financial closure thereby making it possible to compute the quantum of any changes in taxes, duties etc.

SEAP maintained that any changes in duties and taxes pre-COD should be reimbursed as lumpsum payment. However, incase of taxes, duties etc. (except customs duty) post COD, the adjustment may be made in the tariff through an agreed mechanism. In case of customs duty, since the amount would be substantial, it would be difficult for SEAP to arrange for funds. Therefore, SEAP contended that the entire sum should be reimbursed upfront and not through tariff.

IV.8 Means of Financing

Position of the parties as per Annexure V of the Petition No. 24/2000

PTC POSITION	SEAP POSITION
The denomination of fixed charge component of tariff currency is based on the	SEAP's response vides letter dated December 24th 1999 "currently the funding and

premise that the project is financed through 100% Foreign exchange (debt/equity). In case of change in the financing pattern of the project, suitable adjustment will be made in the denomination of tariff currency in the fixed charge correspondingly.	foreign exchange risks in the project lie with the project company. As we have indicated earlier, we shall be pleased to allow pass through of these risks to PTC alongwith the principle of linking actual foreign exchange payments to financing sources".

IV.9 Average Net Station Heat Rate (NSHR)

Position of the parties as per Annexure V of the Petition No. 24/2000

PTC POSITION	SEAP POSITION
SEAP shall use Super-critical Boilers technology for the plant for such a large size of generating unit. The average NSHR shall be taken on the basis of actual NSHR for the previous year for the project. In case of the first year, NSHR shall be taken at actuals for that year. The above value shall be subject to a ceiling of weighted NSHR as per manufacturers NSHR –Load Curve corresponding to Super-critical boiler technology plant. The above NSHR will be used for calculation of coal consumption, and, in turn, for fuel charge component of tariff.	SEAP have expressed their strong reservations on the issue of Super Critical Boiler technology for the plant.

PTC Position :

PTC has suggested that the Net Station Heat Rate for the first year would be at actuals and for the future years, it would be based on the NSHR of the previous years subject to the overall limit given in the manufacturer's load curve.

SEAP Position :

SEAP has opined that the EPC contractor provides guarantee of the NSHR for the first year only and hence it would be difficult to provide a NSHR load curve for the entire term of the PPA. Hence, SEAP is willing to consider the following alternatives to their current offer of a Net Heat Rate of 2460 kcal / kwh at 100% load:

- At Actuals
- As per CERC norms (if any)
- A pre-determined load curve to be incorporated in the PPA

IV.10 Cost of Coal

PTC POSITION	SEAP POSITION
For coal, the cost at the mine end and for secondary fuel oil cost on F.O.R Plant site both, as per PPA & FSA to be approved by PTC, would be the basis, for computation of fuel charge.	The cost of coal should be at the loading point of the MGR system.

IV.11 Secondary Fuel Oil

PTC POSITION	SEAP POSITION
Secondary fuel oil consumption level shall be fixed based on the average consumption obtaining in NTPC's 500 MW units (excluding consumption levels of NTPC's 500 MW units not operating at optimum level due to grid system conditions)	Though confirmed by SEAP during meeting held amongst SEAP, MoP, PTC, CEA, Powergrid, Beneficiary States/SEBs and consultants ICICI on 3rd Nov 1999, SEAP have not included the same in the areas of agreement covered in their letter dated 09.06.2000

PTC Position :

With regard to secondary fuel, PTC mentioned that the Tariff Committee has suggested average consumption obtained in NTPC 500 MW units excluding consumption levels of NTPC's 500 MW units not operating at optimum level due to Grid system conditions. The exclusion is due to the fact that some plants are required to back down heavily during off peak hours like those in the Eastern region and the same cannot be compared with Hirma project where the SEBs have guaranteed 68.5% PLF and are willing to take even more energy.

Further, it would not be appropriate to consider the secondary fuel consumption as per the GOI norms since the consumption level indicated therein is very high. In fact, CERC is considering revising the operating norms and reducing the secondary fuel consumption norm from the present level of 3.5 ml/kwh to 1.0 ml/kwh(gross).

SEAP Position :

SEAP contends that it would be unfair to exclude certain plants of NTPC while calculating the average consumption of secondary fuel oil for the purpose of benchmarking. SEAP also indicated that they would be ready to comply with CERC norms for secondary fuel.

IV.12 Project Specific Issues

SEAP has in its "Preliminary Reply to Respondent No. 1 to the Petition" submitted that there are certain Project Specific Issues which should form part of the scope of issues to be resolved in the context of the petition, such as -

- FGD adjustments and re-agent consumption
- Invoicing, penalties for late payment and prompt settlement discounts
- Start –up charges
- Pre-project COD tariff

SEAP had requested that SBICAP address the above issues as a part of the assignment. However, after discussions and consultation with CERC, it was decided that the above issues be resolved as a part of the PPA.

CHAPTER V: METHODOLOGY ADOPTED BY SBICAP

In line with the spirit underlying the basic approach adopted by SBICAP, the methodology adopted by SBICAP to address each of the issues highlighted in the terms of reference has been discussed in detail with both parties and agreed to by them. The same is detailed in this chapter.

V.1 Independent Estimation of Tariff

Costs & Norms

SEAP's tariff offer being an STBO, the estimated cost of the Project and the tentative financing plan are not available / open for review. Thus, in order to arrive at a benchmark level of tariff with a view to independently verifying the competitiveness of the tariff offered, B&V was asked to estimate the likely capital cost of the Project. Given the cost estimates, SBICAP developed an optimal financing plan for the Project, based on the current market conditions and considering the size and the nature of the Project.

Based on the above, the total cost of the Project was estimated and the operating norms of MoP for MoU based projects in India, (GoI Guidelines 6th Edition – January 2000) were applied to arrive at the resultant indicative tariff level (two-part cost plus tariff structure) at 68.5% & 85% PLF.

EPC Cost Estimates

B&V has estimated the capital expenditure likely to be incurred on the Engineering Procurement & Construction (EPC) contract. The EPC turnkey cost has been estimated at US$ 3644 million, based on

the information given in the Detailed Project Reports (DPR) and the Environmental Assessment Impact Study Report submitted by SEAP. The prices of the equipment have been estimated based on the manufacturers' quotes solicited by B&V and the available in-house data. Wherever the technical details of the Project were not available, suitable assumptions have been made based on the past experience of B&V. The assumptions used by B&V for estimating the Project cost are given in Annexure 1.

The costs above, take into account the Project specific technical requirements of the Merry Go Round (MGR) system including rolling stock (estimated cost US$ 52 million) and the environmental requirement of the Flue Gas Desulphurisation (FGD) unit (estimated cost US$ 175 million using dry scrubber).

Non-Turnkey Costs &Overheads

For estimation of the non-turnkey costs and overheads, SBICAP has analysed the percentage to total cost / component of the said expenses in the TECs of some of the other projects used for comparative analysis and the in-house data available with SBICAP. The percentage of the said expenses which include non-EPC costs, legal fees, owners engineer fees, development expenses, pre-operative expenses, contingencies etc., was found to be approximately 5% (average). In view of the above, a conservative estimate of approximately Rs. 900 crore (4.5% of the Project cost) was included in the Project cost. The land cost for the Project has been sourced from the DPR.

Duties & Taxes

Duties and taxes (except works contract tax) have not been considered for estimating the total Project cost since customs duty is Nil (on equipment for plant operations) for mega power projects and excise duty and sales tax would be a function of the procurement strategy. Further, all taxes and duties, (except works contract tax), have also been excluded for calculating the tariff as per two part norms for other comparable projects.

In any case, if the above said duties and taxes are actually made applicable for the Project, the tariff as per the GoI guidelines would only increase. Thus presently, the tariff without taxes and duties provide a lower benchmark tariff for comparison with the actual tariff offer of SEAP. Further, SEAP in their tariff offer have also not considered the above taxes and duties.

Financing Costs & IDC

The financing plan developed by SBICAP based on its experience in raising resources for large-scale projects, takes into account the loan tenor / security enhancement requirements of the Project, the financing market conditions and the maximum possible funding from the various sources.

The financing assumptions regarding interest rates, upfront fees, management fees, commitment charges, arrangers' fees etc. are based on the prevailing market rates and expectations in the future for the Project. The details of the financing assumptions are presented in Annexure 2.

V.2 Comparison of SEAP's Tariff Offer with other Projects

The Project is a large coal based project, and as such, in the absence of cost details, the same has been compared to similar projects with suitable correction for unit size, unit number, MGR, FGD, Mega Power Policy benefits, tariff front loading levels etc.

Projects Selected & Rationale

The projects that have been considered for the purpose of comparison of the tariff offer of SEAP for the Project are -

- Mangalore Power Project (4*250=1000 MW)
- Vishakhapatnam Thermal Power Station (2*520=1040 MW)
- Bhadravati Thermal Power Station (2*531=1072 MW)
- Korba East Thermal Power Station (2*520=1040 MW)
- Cuddalore Thermal Power Project (2*660=1320 MW)
- North Madras Thermal Power Project – II (2*525=1050 MW)
- Simhadiri Thermal Power Station (2*500=1000 MW)

The above mentioned projects have been selected based on the following considerations -

- Type of Fuel: Domestic Coal based projects in India (except for Mangalore and North Madras which are imported coal based projects)
- Size of Project: 1000^{+} MW Projects
- Unit Size: 500^{+} MW (except for Mangalore)
- Information availability: TECs and Power Purchase Agreements (PPA) made available to SBICAP. For projects where PPA were not provided, suitable assumptions based on GoI guidelines and the usual clauses in other PPAs have been made regarding deemed generation provisions.

Comparative Analysis

Considering, electricity as a product, for the purpose of the comparative analysis, the actual expected tariff (fixed cost of generation) of the projects under comparison has estimated based on GoI norms for two part tariff. Further, as the projects are not comparable in terms of size and units, their tariff has also been estimated after applying suitable corrections using the B&V Curve. The various scenarios analysed are -

- Actual tariff at constant prices at 68.5% & 85% PLF based on TEC costs
- Actual tariff at current prices at 68.5% & 85% PLF based on TEC costs
- Actual tariff at constant prices at 68.5% & 85% PLF based on TEC costs with adjustment for Mega Power Policy benefits
- Actual tariff at current prices at 68.5% & 85% PLF based on TEC costs with adjustment for Mega Power Policy benefits
- Actual tariff at constant prices at 68.5% & 85% PLF based on TEC costs with adjustment for Mega Power Policy benefits & 0% income tax
- Actual tariff at current prices at 68.5% & 85% PLF based on TEC costs with adjustment for Mega Power Policy benefits & 0% income tax.
- Two part tariff at constant prices at 68.5%, 75%, 80% & 85% PLF based on CEA approved EPC costs, correction for unit size and number, costs of MGR & FGD and Mega Power Policy benefits.
- Two part tariff at constant prices at 68.5%, 75%, 80% & 85% PLF based on CEA approved EPC costs, correction for unit size, number, costs of MGR & FGD, Mega Power Policy benefits and sensitivity of the Project's two part tariff at –5% & -10% levels of the estimated Project cost.

- Two part tariff at current prices at 68.5%, 75%, 80% & 85% PLF based on based on on CEA approved EPC costs, correction for unit size and number, costs of MGR & FGD, Mega Power Policy benefits and sensitivity of the Project's two part tariff at –5% & -10% levels of the estimated Project cost.

Estimation of Actual Fixed Charges of Tariff

The actual fixed charges of tariff for the projects under comparison were estimated using the project cost details as available in the TECs. Further, the GoI norms for two part tariff were applied to derive other components of fixed charges such as interest on working capital.

Estimation of Fixed Charges for Comparison

The EPC turnkey costs have been sourced from the TECs for the respective projects, and the following adjustments have been made to the EPC turnkey costs to bring the projects under comparison on an even platform with the Project -

- The Orissa Pollution Control Board has stipulated installation of an FGD unit for the Project, the estimated cost of which has been adjusted in the cost of other projects.
- The fixed charges for fuel transportation are normally included in the cost of fuel (variable charges) for power projects. The cost of the MGR system for fuel transportation in the Hirma Project is, however, a part of the fixed costs. Hence suitable adjustment has been made for the same in the costs of the other projects.
- The adjustments for unit size, number of units and economies of scale have been carried out based on the curve developed by B&V (Refer Annexure 1).

- A feasible funding plan has been developed by SBICAP for a project of such size and nature keeping in view the constraints of various lenders including the quantum of funds available with each class of lenders and this has been uniformly applied to all projects under comparison (including the Hirma Project) since it would not be appropriate to extrapolate the financing mix of the projects under comparison as the same may not hold good for a power station of the size of the Project. The funding plan and set of financing assumptions, as used for the Project, have thus been used for all the projects under comparison.
- The assumptions for operating norms are based on the GoI guidelines.
- The incentive structure and deemed generation provisions as per the respective Power Purchase Agreements have been considered since PPAs for the other projects include provisions for payment of incentives based on availability/PLF, including the extent of backing down, while in case of the Project, incentives are proposed to be paid only if actual dispatch occurs beyond 68.5% PLF. Further, as per the GoI guidelines for tariff determination, "for generation of above 6000 hrs/KW/yr., the additional incentive payable shall not exceed 0.7% of paid up and subscribed capital for each 1% increase in PLF above the normative level of 6000 hrs/KW/yr. While computing the level of generation, the extent of backing down, as ordered by the REBs or SLDCs, as the case may be, shall be reckoned as generation achieved".

Based on the above, the levelised tariff of the projects under comparison have been calculated at various PLFs.

V.3 Resolution of other tariff related issues

Based on discussions with both parties, an independent assessment was carried out with the help of B&V on other areas of disagreement, as detailed in Chapter IV.

CHAPTER VI: ANALYSIS OF AREAS OF DISAGREEMENT

VI.1 Boiler Technology

Based on economic and environmental considerations, B&V has recommended the use of Super-Critical Boilers. The advantages associated with a supercritical cycle include a lower heat rate, lower fuel burn rate, lower emission rate (on mass Basis) and improved load response rate.

Further, B&V has opined that the implementation schedule of a super-critical station is the same as a sub critical station. SEAP has contended that this technology is new in India and also there is lack of trained personnel within the country for sophisticated welding requirements, the implementation schedule for the Hirma project is expected to be higher by 3 months for the 1st unit of the project, and by 1 month for each subsequent unit.

The availability of the Super-critical boiler would be the same as Sub-critical boiler as per B&V. The capital cost is expected to be higher than a sub-critical station by around US$ 31 million plus associated financing costs.

Subsequent to detailed discussions, SEAP has agreed to implement the Project with Super critical boiler. However, as SEAP requires an additional time of 3 months to implement the first unit, SEAP has agreed to bear any increase in financing charges due to the delay in implementation schedule beyond 36 months (as originally envisaged for the Project with sub-critical boilers).

As per SBICAP's analysis, the use of the Super critical boiler would lead to a marginal increase in levelised fixed charges and reduction in the levelised variable charges (excluding secondary fuel charges). The indicative levels of levelised tariff at various PLF scenarios using the two part cost plus formula are presented in Annexure 3. It is seen that the increase in fixed tariff is 0.74% at current prices. For PLF below 80%, the levelised tariff for Super critical boiler is slightly higher than that for sub-critical one. The use of supercritical boiler is thus economically justified at PLFs of around 80% and above.

VI.2 Fixed Charge Component of Tariff

Estimation of fixed charge component of Tariff

The project cost has been estimated to be Rs. 20,477 crore. The assumptions behind these estimates are detailed in Annexure 2. It has been agreed by both the parties that installation of the FGD unit is necessary due to the stipulation laid down by OPCB. Therefore, the cost estimate includes outlay towards the FGD unit.

Using this project cost, the fixed charge component of tariff for the Project has been determined by applying GoI guidelines. The following results have been obtained -

PLF	Estimated tariff at Constant Prices using two part formula	SEAP's Offer	Estimated tariff at Current Prices using two part formula	SEAP's Offer
68.49%	1.8845	1.4633	3.2128	2.4705
75%	1.7224	1.3652	2.9374	2.2851
80%	1.6157	1.3008	2.7562	2.1631
85%	1.5215	1.2438	2.5964	2.0555

***** *SEAP's offer dated 27th October 1999 with guaranteed availability of 68.49%*

Comparison with other projects

Method 1: Results of comparison of the levelised tariff at constant and current prices of SEAPs tariff offer (at original as well as at levels of front loading comparable with a two part tariff structure) with the estimated tariff of other projects with suitable correction for size, MGR, FGD and Mega Power Project benefits are presented below -

Rs./Kwh

LEVELISED TARIFF COMPARISONS AT CONSTANT PRICES										
Project / PLF	Korba	Vizag	Bhadravati	Simhadri	Mangalore	Videocon	Cuddalore	SEAP's Offer *	SEAP's Offer #	SEAP's Offer @
68.49%	1.7747	1.8297	1.9435	1.4576	1.4403	1.6399	1.7131	1.4633	1.6442	1.5615
75.00%	1.6221	1.6723	1.7762	1.3325	1.3167	1.4990	1.5658	1.3652	1.5343	1.4570
80.00%	1.5217	1.5687	1.6662	1.2501	1.2353	1.4062	1.4689	1.3008	1.4619	1.3883
85.00%	1.4331	1.4774	1.5691	1.1775	1.1636	1.3244	1.3834	1.2438	1.3981	1.3276

***** *SEAP's offer dated 27th October 1999 with guaranteed availability of 68.49%*

 # SEAP's offer at 74% Front Loading at Current Prices

@ *SEAP's offer at 84% Front Loading at Constant Prices*

Rs./kwh

LEVELISED TARIFF COMPARISONS AT CONSTANT PRICES										
Project / PLF	Korba	Vizag	Bhadravati	Simhadri	Mangalore	Videocon	Cuddalore	SEAP's Offer *	SEAP's Offer #	SEAP's Offer @
68.49%	3.0621	3.2011	3.3331	2.3599	2.4364	2.7365	2.9580	2.4705	2.8349	2.4975
75.00%	2.7998	2.9267	3.0472	2.1585	2.2283	2.5025	2.7047	2.2851	2.6216	2.3118
80.00%	2.6272	2.7462	2.8592	2.0260	2.0915	2.3485	2.5381	2.1631	2.4813	2.1896
85.00%	2.4750	2.5869	2.6933	1.9091	1.9707	2.2126	2.3910	2.0555	2.3575	2.0818

***** *SEAP's offer dated 27th October 1999 with guaranteed availability of 68.49%*

 # SEAP's offer at 74% Front Loading at Current Prices

@ *SEAP's offer at 84% Front Loading at Constant Prices*

Method 2: The results of comparison of SEAPs offer with the estimated actual tariff of the other projects (with and without Mega Power Project benefits) at constant and current prices are presented hereunder -

Rs./Kwh

ACTUAL TARIFF AT CONSTANT PRICES								
Project / PLF	Korba	Vizag	Bhadravati	Simhadri	Mangalore	Videocon	Cuddalore	SEAP's Offer*
68.49%	2.042	1.962	2.033	1.677	2.115	1.858	1.909	1.4633
85%	1.648	1.584	1.642	1.354	1.708	1.501	1.541	1.2438

***** *SEAP's offer dated 27th October 1999 with guaranteed availability of 68.49%*

Rs/Kwh

TARIFF WITH MEGA PROJECT BENEFITS AT CONSTANT PRICES#							
Project / PLF	Korba	Vizag	Simhadri	Mangalore	Videocon	Cuddalore	SEAP's Offer*
68.49%	1.870	1.793	1.555	1.976	1.683	1.705	1.4633
85%	1.510	1.448	1.256	1.596	1.360	1.376	1.2438

[#] *Bhadravati has not been included as break-up of taxes was not available*

***** *SEAP's offer dated 27th October 1999 with guaranteed availability of 68.49%*

Rs/Kwh

ACTUAL TARIFF AT CURRENT PRICES								
Project / PLF	Korba	Vizag	Bhadravati	Simhadri	Mangalore	Videocon	Cuddalore	SEAP's Offer*
68.49%	3.607	3.552	3.666	2.543	3.722	2.943	3.339	2.4705
85%	2.911	2.868	2.959	2.054	3.008	2.380	2.695	2.0555

** SEAP's offer dated 27th October 1999 with guaranteed availability of 68.49%*

Rs/Kwh

TARIFF WITH MEGA PROJECT BENEFITS AT CURRENT PRICES#							
Project / PLF	Korba	Vizag	Simhadri	Mangalore	Videocon	Cuddalore	SEAP's Offer*
68.49%	3.422	3.369	2.411	3.573	2.754	3.118	2.4705
85%	2.762	2.720	1.948	2.888	2.228	2.517	2.0555

[#] *Bhadravati has not been included as break-up of taxes was not available*

***** *SEAP's offer dated 27th October 1999 with guaranteed availability of 68.49%*

As may be observed from the above, SEAP's tariff offer (at original as well as at levels of front loading comparable with a two part tariff structure) compares well against the tariffs of Korba, Vizag, Bhadravati, Videocon and Cuddalore at all PLFs.

SEAP's offer however is higher than the tariff offer etimated for Mangalore and Simhadri based on Method 1. The comparison with Mangalore may be viewed against B&Vs opinion that there may be a higher margin of error while applying the economies of scale adjustments for a unit size of 250 MW to make it comparable to a unit size of 660 MW. It may be observed that as per Method 2, the tariff obtained for Mangalore is higher than the tariff of other projects.

Further, Simhadri is an NTPC project which would be set up using a package wise contract approach for project implementation. The liquidated damage provisions are much lower in such projects and there is no single point responsibility for timely implementation of the project. Although such an approach results in lower hard costs, the IDC would be higher since the implementation schedule as per the TEC for the project is 56 and 65 months for units 1 and 2 respectively. In our analysis, however, since the implementation schedule has been assumed at 36 – 51 months for the 6 units for all projects for the sake of uniformity, the lower fixed charges for the

project would need to be viewed against the fact that the capital cost of the project may be significantly higher if the EPC approach with stringent LD provisions and a shorter implementation schedule of 36 – 51 months were actually to be followed.

VII.3 Indexation of Operation & Maintenance Charges

SBICAP is of the view that the O&M charges should not be linked to the capacity charges. SBICAP has worked out the O&M charges as on the COD date under the various alternatives suggested by both the parties which is given hereunder.

OPTIONS FOR O&M CHARGES					
	Base Case	SEAP-Option 1	SEAP-Option 2	SEAP-Option 3	SEAP-Option 4
Actual Completed project cost -Rs mm	NA	NA	NA	204774	204774
% of project cost	NA	NA	NA	2.0%	2.5%
Exchange rate - forex portion	Date of 96 offer	Nov 99	Unit 1 COD	NA	NA
Exchange rate- rupee portion	Date of 96 offer	NA	NA	NA	NA
Escalation date- Forex	N.A	Nov 99	COD +1 year	NA	NA
Escalation date -Rupee	Date of 96 offer	NA	NA	COD+ 1 year	COD+ 1 year
Escalation date- Forex	N.A	27-Oct-99	1-Oct-07	NA	NA
Escalation date -Rupee	17-Oct-96	NA	NA	1-Oct-07	1-Oct-07
Exchange rate -Rs-$-forex portion	-	42.50	57.27	NA	NA

Exchange rate -Rupee portion	35.00	-	-	NA	NA
68.50%					
US $ - forex portion	-	0.0021	0.0021	NA	NA
US $ - rupee portion	0.0021	-	-	NA	NA
Total - Rs / kwh	0.0735	0.0893	0.1203	0.1724	0.2155
75.00%					
US $ - forex portion	-	0.0021	0.0021	NA	NA
Rs / kwh- rupee portion	0.0021	-	-	NA	NA
Total - Rs / kwh	0.0735	0.0893	0.1203	0.1574	0.1968
80.00%					
US $ - forex portion	-	0.0021	0.0021	NA	NA
Rs / kwh- rupee portion	0.0021	-	-	NA	NA
Total - Rs / kwh	0.0735	0.0893	0.1203	0.1476	0.1845
85.00%					
US $ - forex portion	-	0.0021	0.0021	NA	NA
Rs / kwh- rupee portion	0.0021	-	-	NA	NA
Total - Rs / kwh	0.0735	0.0893	0.1203	0.1389	0.1736
Rs. Per KWh on COD	**0.1369**	**0.1376**	**0.1203**	**0.1724**	**0.1203**

In addition to the above, B&V has independently arrived at the reasonable O&M charges for the project for the purpose of benchmarking the above offers. These are estimated to be around 0.321 cents per kwh at 68.5% PLF and 0.296 cents at 85% PLF which work out to be more than SEAP's offer at current prices.

The Option 2 suggested by SEAP appears to be the most favourable one from the SEBs point of view.

VII.4 Indexation of SEAP's Offer if Financial Closure Not Achieved by 31.12.2000

SEAP's initial tariff offer was made in 1996, and since then the conversion rate for rupee component of capacity charge has been frozen at Rs. 35 = 1 US$. In view of the considerable time span having lapsed since the initial tariff offer of SEAP, it would be appropriate to provide SEAP with indexation on the rupee component of capacity charge.

On discussions with both PTC and SEAP the following structure has been evolved by SBICAP for indexation -

- Agreements to be signed by the "Milestone Date"
  - Power Purchase Agreements (PPAs) between SEAP and PTC and between PTC and the 5 SEBs
  - Fuel Supply Agreement
  - Implementation Agreement (State Support Agreement)
  - Security Package
- Milestone Date would be 30th June 2001 for Option 1 and 31st March 2001 for Option 2 (in respect of the 2 options proposed by SBICAP for the levelised fixed charge component of tariff).
- The rate of Rs. 35 per US$ being used for arriving at the rupee component of SEAP's tariff (the "Frozen Exchange Rate") would be indexed based on depreciation of the rupee vs the US$, if any, from the "Base Exchange Rate" as per the formula given below.

- Base Exchange Rate would be the simple average of the SBI TT Buying Rates for the period from 2 working days before and 2 working days after the Milestone date.
- The formula for calculating the "Indexation Amount" would be as follows :
  (Depreciated Exchange Rate – Base Exchange Rate)/Base Exchange Rate

The Depreciated Exchange Rate would be SBI's TT Buying Rate for the period 2 working days before and 2 working days after the New Indexation Date (both days inclusive). The New Indexation Date would be the earlier of the date of Financial Closure and the date falling 12 months after the Milestone Date or the actual date of signing the last of the agreements among those listed above if such date is later than the Milestone Date.

The exchange rate to be applied for arriving at the rupee component of the fixed component of tariff ("Revised Frozen Exchange Rate") would be calculated as follows -

Frozen Exchange Rate * (1 + Indexation Amount in %age)

It may be clarified that in case the Indexation Amount is negative, no adjustment would be made to the Frozen Exchange Rate.

VII.5 Availability Vs Plant Load Factor

The current tariff offer of SEAP is based on a guaranteed availability of 68.5%. SEAP contends that they would require a higher reimbursement for guaranteeing availability above 68.49% due to increased O&M expenditure while PTC desires some discount in tariff for guaranteeing PLF of 85%.

SBICAP is of the view that a modern plant of this nature and size should be used at optimal capacity. Further, there is a consensus amongst both PTC and SEAP that the demand for power exists and that in all probability the despatch would be at 80%-85%. Therefore, it would be appropriate to have both guaranteed offtake and availability at 85%.

Considering the above, the following options for setting the tariff in case availability and PLF were to be guaranteed at 85%may be considered -

Option 1

- Availability guaranteed at 85%.
- Guaranteed recovery of full fixed charges at 85% PLF including deemed generation.
- Capacity charges of US$ 0.0362 per KWh, 50% of which would be converted into rupees at the current exchange rate ($ component) and 50% would be converted @ Rs. 35 (Re component) for the first 12 years after COD. The ratio would become 25% and 75% respectively for years 13 to 30. The levelised tariff (fixed charges), assuming a current exchange rate of 42.5, works out to Rs. 1.2249 per KWh at 85%PLF.
- O&M charges of US$ 0.0017 per KWh, 100% of which would be converted into rupees at the exchange rate prevailing on COD of unit 1. O&M charges to be indexed as per GoI guidelines.
- No incentives to be paid separately.

Option 2

- Availability guaranteed at 85%.
- Guaranteed recovery of full fixed charges at 68.5% PLF including deemed generation.
- Capacity charges of US$ 0.0432 per KWh, 50% of which would be converted into rupees at the current exchange rate ($ component) and 50% would be converted @ Rs. 35 (Re component) for the first 12 years after COD. The ratio would become 25% and 75% respectively for years 13 to 30. The levelised tariff, assuming a current exchange rate of 42.5, works out to Rs. 1.2309 per KWh at 85%PLF.
- O&M charges of US$ 0.0021 per KWh, 100% of which would be converted into rupees at the exchange rate prevailing on COD of unit 1. No O&M charges to be paid beyond 68.5% PLF. O&M charges to be indexed as per GoI guidelines.
- Incentive @20% of fixed charges to be paid for PLF (including deemed generation) beyond 68.5%upto 85%.

In both the above options, the incentives for despatch above 85% PLF would be calculated as 1 paise per KWh for 1% increase in despatch above 85% PLF, 2 paise per KWh for 2% increase in despatch above 85% PLF and so on.

VII.6 Front Loading in Tariff

As per SEAP's offer, the extent of front loading at constant prices is 92% and at current prices is 88%. This level of front loading is considerably high compared to the front loading percentages of 84% at constant prices and 74% at current prices that exist in other power projects that get reimbursement as per two part tariff structure.

SEBs have voiced concern over the level of front loading which, even though results in a lower levelised tariff due to optimisation of the tax benefits, leads to higher payout in terms of tariff in the first 12 years. Since the SEBs are going through a phase of reforms, they are apprehensive about having to pay higher amounts in the initial years. Further, as per our analysis, higher levels of front loading would result in low differential IRRs over the 30 year period over the first 12 year period leading to only marginal incentives for the project company to operate beyond 12 years.

Considering the above, SEAP was asked to make tariff offers at lower levels of front loading for the original offer of October 1999 as well as the two fixed charge tariff options discussed above (under Availability vs. PLF). The following are SEAP's offers for various levels of front loading -

Current offer (at 68.49% availability)
Front Loading (current prices): 88%
Levelised Tariff (constant prices)
1-30 years : Rs. 1.4633 / kwh
1-12 years :Rs. 1.7470 / kwh
13-30 years : Rs. 0.5189 / kwh

Front loading (current prices)	**Option 1* Levelised tariffs (constant prices)**			**Option 2* Levelised tariffs (constant prices)**		
	Level-ised	1-12 years	13-30 years	Level-ised	1-12 years	13-30 years
74%	1.3766	1.4152	1.2478	1.3835	1.422	1.256
88%	1.2249	1.4628	0.4328	1.2310	1.469	0.437

** Guaranteed Availability of 85%*

VII.7 Mechanism for Tariff Adjustment on Account of Statutory Variations in Taxes & Duties

SBICAP, after a series of discussions with all the parties concerned and Ministry of Power, is of the view that Changes in Taxes, duties etc is a PPA issue. Both the parties have agreed that any change in duties and taxes, other than the customs duty during construction period, should be reflected in the tariff through an agreed mechanism spelt out in the PPA. Both the parties have also agreed that the scenario of any change in customs duties during the construction period would be suitably spelt out in the PPA.

However, in the event of the underlying assumptions for computation of exemptions in tax, duties etc. being incorrect due to mis-interpretation / misclassification of the items, the increased burden of taxes would have to be borne by the party who has erred in the judgement as this is a commercial issue.

VII.8 Means of Financing

The project is being implemented based on a Stand-alone Tariff Based Offer and hence the entire risks of financing are being borne by the developer. Therefore, any consequences of the change in the financing mix, whether favourable or adverse, should accrue to the developer. SBICAP is of the view, therefore, that denomination of the fixed charges into rupees and dollars should not be linked to the ultimate financing mix.

VII.9 Average Net Station Heat Rate (NSHR)

B&V has recommended a NSHR of 2460 kcal / kwh at 100% load (including degradation) for a sub-critical boiler and both the parties

have agreed to the same. The recommended NSHR for a Super Critical Boiler is 2411 kcal/kwh at 100% load (including degradation). These figures would be further subject to the load curve given by B&V in their report (Annexure 1).

Both the parties have agreed to abide by the NSHR arrived at by B&V as above.

VII.10 Cost of Coal

The parties have agreed that the coal cost would be at the loading point of the MGR system.

VII.11 Secondary Fuel Oil

B&V has arrived at the appropriate level of secondary fuel consumption, considering the levels of plant operation, start-up requirements etc. which are given in B&V report (Annexure 1). There is no requirement of secondary fuel for operations above 50% PLF, and the requirement for hot, warm and cold start-ups are given in B&V's report.

Both the parties have agreed to abide by the Secondary Fuel Consumption Norms arrived at by B&V.

CHAPTER VII: RECOMMENDATIONS

Based on the above analysis, SBICAP's recommendations on the various tariff related issues as per the terms of reference for the assignment are as under -

1. Super critical boiler units may be used by SEAP for the project. The Net Heat Rate may be kept as per the recommendation of the technical consultant for supercritical units, i.e. 2411 KCal/KWh at 100% load including degradation. With regard to the implementation schedule, the technical consultant has opined that the commissioning time for supercritical units would be the same as subcritical units. However, SEAP has contended that an additional 3 months would be required for commissioning of the first unit only to compensate for the lack of experience of setting up super critical boilers in India and lack of trained manpower. However, keeping in view the fact that the developer is a large multinational company with extensive experience of setting up large power plants including those with supercritical units, it is expected that they would conform to the best international practices and ensure commissioning of supercritical units within the same time frame. The increase in fixed charges may, therefore, be limited to cover the additional project cost on account of increase in equipment costs and related financing charges and increased O&M expenses, which is estimated at 0.74%. As per the technical consultant, the O&M costs for a supercritical unit are expected to be higher by around 2.5%. The overall increase in fixed charges of 0.74% would, therefore, include an increase of 2.5% in the O&M charges. However, keeping SEAP's reservations in view, an increase of 3 months in commissioning time of unit 1

from the current agreed level of 36 months may be permitted for the purpose of fixation of penalties for non-timely completion in the PPA. Any increase in financing charges on account of this delay would, however, have to be borne by SEAP.

2. With regard to the fixed component of tariff, the following Options (applicable for sub-critical units) may be considered by SEAP and PTC :

Option 1

- Availability guaranteed at 85%.
- Guaranteed recovery of full fixed charges at 85% PLF including deemed generation.
- Capacity charges of US$ 0.0362 per KWh, 50% of which would be converted into rupees at the current exchange rate ($ component) and 50% would be converted @ Rs. 35 (Re component) for the first 12 years after COD. The ratio would become 25% and 75% respectively for years 13 to 30. The levelised tariff (fixed charges), assuming a current exchange rate of 42.5, works out to Rs. 1.2249 per KWh at 85%PLF.
- O&M charges of US$ 0.0017 per KWh, 100% of which would be converted into rupees at the exchange rate prevailing on COD of unit 1. O&M charges to be indexed as per GoI guidelines.
- No incentives to be paid separately.

Option 2

- Availability guaranteed at 85%.
- Guaranteed recovery of full fixed charges at 68.5% PLF including deemed generation.
- Capacity charges of US$ 0.0432 per KWh, 50% of which would be converted into rupees at the current exchange rate ($ component)

and 50% would be converted @ Rs. 35 (Re component) for the first 12 years after COD. The ratio would become 25% and 75% respectively for years 13 to 30. The levelised tariff, assuming a current exchange rate of 42.5, works out to Rs. 1.2309 per KWh at 85%PLF.

- O&M charges of US$ 0.0021 per KWh, 100% of which would be converted into rupees at the exchange rate prevailing on COD of unit 1. No O&M charges to be paid beyond 68.5% PLF. O&M charges to be indexed as per GoI guidelines.
- Incentive @20% of fixed charges to be paid for PLF (including deemed generation) beyond 68.5%upto 85%.

In both the above options, the incentives for despatch above 85% PLF would be calculated as 1 paise per KWh for 1% increase in despatch above 85% PLF, 2 paise per KWh for 2% increase in despatch above 85% PLF and so on.

SEAP is agreeable to either of the options. SBICAP is confident that PTC would select one of the options as we consider that in the prevailing circumstances, either of the options, depending on the risk profile PTC is comfortable with, is reasonable.

3. The level of front loading may be kept at the level offered by SEAP since any reduction would increase the levelised tariff. However, if the SEBs so desire, any other level of front loading as per the analysis presented in the previous section and the tariff profiles provided by SEAP (Exhibit 2) may be agreed upon.

4. Indexation of the exchange rate for the rupee component of tariff (currently frozen at Rs 35) may be allowed as per the methodology suggested in the previous Chapter

5. The denomination of fixed charges in US$ and rupees may not be linked to the financing mix ultimately achieved by SEAP.

6. The adjustment for taxes and duties (except for customs duty) may be carried out through tariff only. The mechanism may be mutually agreed upon by the parties during PPA finalisation. Adjustment for any change in customs duty may be decided upon by the parties at the time of PPA finalisation in consultation with the MoP.

7. The Net Station Heat Rate may be fixed at 2460 KCal/KWh at 100% load (including degradation) for sub critical and 2411 KCal/KWh at 100% load (including degradation) for super critical, subject to the load curve as given by the technical consultant.

8. Secondary fuel consumption may be fixed at the levels suggested by the technical consultant in their report which is annexed.

9. The cost of coal may be calculated at the loading point of the MGR system.

Annexure I: Technology Characterisation Report by B&V

Please refer to Word file name "Petition No 24_2000 Tech Cons Report . doc".

Annexure II: Assumptions Underlying SBICAP Analysis

A detailed financial modeling exercise was carried out for analysing the various tariff related issues referred to in the Terms of Reference. The various assumptions used for developing the model are given below -

TECHNICAL ASSUMPTIONS

Plant specifications

Parameter	Value
Net Capacity	3960 MW
Net Capacity Unit 1	660 MW
Net Capacity Unit 2	660 MW
Net Capacity Unit 3	660 MW
Net Capacity Unit 4	660 MW
Net Capacity Unit 5	660 MW
Net Capacity Unit 6	660 MW
Operation Period Heat Rate Net for Subcritical units (including degradation)	2460 kcal/kwh
Operation Period Heat Rate Net for Supercritical units (including degradation)	2411 kcal/kwh

Fuel Specifications

Fuel Parameters	Value
Calorific Value of Coal	3360 kcal / kg
Base Cost of Coal	450 Rs. Per MT
Base date for fuel prices	01-Jan-01

Time Schedule

Dates	Values
Financial Close Date	01-Jul-2002
Construction Period Unit 1	36 months
Construction Period Unit 2	39 months
Construction Period Unit 3	42 months
Construction Period Unit 4	45 months
Construction Period Unit 5	48 months
Construction Period Unit 6	51 months
Scheduled Unit 1 COD	01-Jul-05
Scheduled Unit 2 COD	01-Oct-05
Scheduled Unit 3 COD	01-Jan-06
Scheduled Unit 4 COD	01-Apr-06
Scheduled Unit 5 COD	01-Jul-06
Scheduled Unit 6 COD	01-Oct-06
Initial Tariff Period Begins	01-Oct-06
Initial Tariff Period Ends	01-Apr-07
Term of PPA from U6 COD	30 years
Expiry of PPA	30-Sep-36

Macroeconomic Assumptions

Macroeconomic Assumptions	Value (Scenario I) Constant Prices	Value (Scenario II) Current Prices
Rupee inflation - CPI	-	7.5%
Rupee inflation - WPI	-	6%
Dollar inflation - CPI	-	2%
Weightage for Rupee CPI	30%	30%
Weightage for Rupee WPI	70%	70%
Base exchange rate	Rs. 42.5 = 1USD	Rs. 46 = 1 USD
Base exchange date	27th October 1999	10th August 2000
Rupee Devaluation Rate	-	5.39%

Tax & Accounting Assumptions

Tax & Accounting Parameters	Value
Tax Rate	35.0%
Depreciation Limit (excluding land) %	90%
Depreciation Rate	7.84%

Benefits of Mega Power Policy have been assumed for the project

Hard Cost Assumptions

Contract Price	USD mm	Rs mm	Total-Rs. Mn
Turnkey incl works contract tax*	2456	53657	158045.65
Land	0	665	665.00
Non turnkey costs	50	1400	3525.00
Overheads	25	4000	5062.50
Other Expenses	0	463	462.63
Total	**2531**	**60185**	**167760.78**

The above assumptions on Turnkey costs have been made based on the inputs of B&V. The detailed breakup of the Turnkey cost is given in B&V's report. The other costs have been estimated based on the costs under the respective heads in other projects

Funding Assumptions

Funding	Value
Debt	70% of project cost
Equity	30% of project cost

Source	Tenor	Interest Rate			Financing Charges		
Debt Tranche Name	Years	Base Rate (% p.a.)	Spread (% p.a.)	Interest Rate (% p.a.)	Up-front fee / Closing Fee (%) *	Commitment Fee	Guarantee Premium (%)
RTL	13.5	12.75%	3.50%	16.25%	1.05%	0.50%	0.00%
ECA without DPG facility	15.0	7.33%	3.00%	10.33%	0.50%	0.50%	8.00%
ECA with DPG facility – 1	15.0	7.33%	0.50%	7.83%	0.50%	0.50%	8.00%
ECA with DPG facility – 2	15.0	7.33%	0.50%	7.83%	0.50%	0.50%	8.00%
Commercial Tranche	12.0	7.00%	3.50%	10.50%	2.00%	0.75%	0.00%
Quasi Equity	12.0	13.00%	0.00%	13.00%	0.00%	0.00%	0.00%

*Financial Advisors and Arrangers fee of 0.75% has been assumed in addition to the closing fees specified above

DPG Assumptions	Value
Upfront Fees	1.06%
DPG Commission	3.50%

Funding Rules
All the debt funds would be drawn an a pro-rata basis
Broadly following limits have been assumed for each of the debt funds
Maximum ECA funding would be limited to 85% of the Turnkey Contract Cost in foreign curreny
Maximum possible Exposure of domestic banks and institution (including fund and non fund based exposure) – Rs. 40000 mn.
Maximum possible funding of hard costs from commercial tranche – Rs. 400 mn USD
Maximum possible funding of hard costs from ECA with DPG would be limited by the extent of DPG guarantee available from domestic banks and institutions
Of the total equity contribution it is assumed that 50% of the equity would be denominated in foreign currency (USD)

Funding Pattern

Sources of Funds			**Conv. at Prevailing Rate (Rs. 42.5=1USD)**	**% of Total**
	USD (Mm)	**Rs. Mm**	**Rupee (Mm)**	
Equity				
Equity	723	30,716	61,432	30%
Debt				
Rupee Term Loan		30,876	30,876	15%
ECA without DPG facility	1,568		66,655	33%
ECA with DPG facility – 1	108		4,584	2%
ECA with DPG facility – 2	108		4,584	2%
Commercial Tranche	457		19,428	9%
Quasi Equity	405		17,216	8%
Total Sources of Funds	2,646	61,592	204,774	100%

Annexure III: Super Critical v/s Sub Critical Tariff Profile

Please refer to Excel File Name : "Petition No 24_2000 Consultants Report Attachments.xls" (Sheet Name : Attach 6)

Annexure IV: Tariff Calculations & Output Sheets

Levelised Tariff Comparisons at Constant Prices

Levelised Tariff Comparisons at Current Prices

Project Cost Data Used for Comparative Analysis

Hirma Levelised Tariff Proposals at Constant Prices

Hirma Levelised Tariff Proposals at Current Prices

Final Tariff Proposals at Current Prices

Detailed Calculation Sheets for SEAP's Tariff Offer at 68.5%

Detailed Calculation Sheets for Tariff Proposal (Option 1) at 85%

Detailed Calculation Sheets for Tariff Proposal (Option 2) at 85%

Please refer to Excel File Name : "Petition No 24_2000 Consultants Report Attachments.xls"

Exhibit I: Tax Assumptions Underlying SEAP's Tariff Offers

Exhibit II: SEAP's Tariff Profiles At Various Front Loading Levels