No. L-1/103/CERC/2012
CENTRAL ELECTRICITY REGULATORY COMMISSION
NEW DELHI

Coram: Dr. Pramod Deo, Chairperson
Shri S. Jayaraman, Member
Shri V. S. Verma, Member
Shri M. Deena Dayalan, Member

Date of Hearing: 11.11.2010
Date of Order : 4.6.2012

In the matter of:
Benchmark Capital Cost (Hard cost) for Thermal Power Stations with Coal as Fuel

ORDER

A. BACKGROUND

In exercise of its power under Section 178 read with Section 61 of Act and after previous publication, the Commission has notified the Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations, 2009, (hereinafter referred to as "the 2009 Tariff Regulations"). Regulation 2 of 2009 Tariff Regulations provide that the regulations shall be applicable in cases where tariff for a generating station or unit thereof and transmission system is determined by the Commission under section 62 read with section 79 of the Act.

2. The Central Government in exercise of its power under section 3 of the Act, has notified the Tariff Policy vide Resolution No.23/2/2005-R&R (Vol.III) dated 6.1.2006. Para 5.3 of the Tariff Policy provides for the following among others:

"while allowing the total capital cost of the project, the Appropriate Commission would ensure that these are reasonable and to achieve this objective, requisite benchmarks on capital costs should be evolved by the Regulatory Commissions."

3. Keeping in view the above mandate of the Tariff Policy, first proviso to clause (2) of Regulation 7 of the 2009 Tariff Regulations provides as under:

> **"**Provided that in case of the thermal generating station and the transmission system, prudence check of capital cost may be carried out based on the benchmark norms to be specified by the Commission from time to time:"

4. The Commission initiated the process of determining benchmark cost of 400/765 kV transmission lines, associated substations with 400/765 kV Transmission system and Thermal power units of 500/600/660/800 MW in June 2008. A consortium of consultants {M/s Evonik Energy Services (India) Pvt. Ltd; M/s Power Research and Development Consultants (in short PRDC), and M/s Klynveld Peat Marwick Goerdeler (in short KPMG)} were engaged with the objective of developing benchmark norms for capital cost of thermal power units of 500/600/660/800 MW amongst others. The above objective was to be achieved by collecting reliable available data, analyzing the data, creating a data base, defining Disaggregated Packages of Hard Cost of a Project to be sufficient for benchmarking, recommending appropriate methodology through which a benchmark capital cost of a completed project would be arrived at for the purpose of prudence check and developing financial/pricing model with identified escalation factors assigning due weightage for various materials/factors etc. The financing cost, interest during construction, taxes and duties, right of way charges, cost of Rehabilitation & Resettlement etc. would be additional and were not to be

factored in benchmark cost being developed. The model so developed was to be validated based on the historical data from the database.

5. The Consortium developed a self validating pricing model with escalation formulas. The pricing model along with explanatory memorandum was placed on the website of the Commission, through public notice dated 21.10.2010 for public scrutiny and comments. A public hearing was held on 11.11.2010. The list of participants in the public hearing is enclosed as **Annexure – I**. Several stakeholders like BHEL, NTPC and one individual made power point presentation during the public hearing. Based on the suggestions and feedback received from stakeholder(s) through their written comments and oral submissions, major issues pertaining to the benchmarking of the capital cost have been analyzed and the Commission's decisions thereon have been discussed in the succeeding paragraphs.

(B) Issues and Commission's decisions

Issue No.1

6. Resultant cost can at best be applied only as a prudence check rather than be used to determine the tariff. Model should not replace the price discovery model based on ICB tendering process.

Clarification and decision

6.1 It is pertinent to mention that the model or the benchmark numbers so derived from the model are intended to be used for the purpose of prudence check as provided in 2009 Tariff Regulations. The model is not intended to replace the price discovery based on International Competitive Bidding (ICB) tendering process. Model is broad based for defined boundaries through the variables sheet and does not intend to

replicate the micro detailing which normally is the prerogative of project proponent/ manufacturer.

6.2 While carrying out prudence check, the model will be used to identify outliers (considering the deviations in boundaries in actual case and the model) as possible cases for carrying out further/detailed prudence check and assessing the reasonableness of the capital cost. Based on the principle of 'Management by Exception', this process will lead to saving of resource and time spent on conducting prudence check while admitting the capital cost. Model has been kept dynamic so that changes based on fresh inputs/additions can be made as per needs to reflect market trends.

6.3 Ultimate comparable cost for prudence check will be the overall cost and not package wise cost. Optional packages will be accounted separately.

Issue No.2

7. Emphasis now is being laid on tariff based competitive bidding; as such this benchmark study may serve limited purpose.

Clarification and decision

7.1 No doubt, emphasis now is on tariff based competitive bidding. Even the Commission in its statutory advice to the Central Government had recommended that the deadline of January 2011 for completing the transition to procurement of power through tariff based competitive bidding even from state /central government owned entities should not be extended any further except in case of certain specified projects.

7.2 In spite of the above fact, there may be several projects during the transitory phase

for which PPA's would have been entered into by the project developer prior to deadline date set for transition to competitive bidding. Such cases would have to be dealt with on cost plus basis for which the above model would be useful to carry out the prudence check.

Issue No 3:

8. Technological transfer price impact: Impact of advisory issued by CEA in February 2010 regarding incorporation of the condition of setting up of phased indigenous manufacturing facilities in the bids while sourcing supercritical units would require accounting for increase in cost on such issues.

Clarification and decision

8.1 Advisory on indigenous manufacturing for the sector is a welcome step from long term perspective. However, looking into the number of committed players already entered/entering in this field, competition thereof amongst participating players and looking into MW capacity addition being envisaged through this technology during coming few years, increase in costs in per MW terms on these count, due to the MW spread expected, should not be substantial. Small deviations on these counts may be expected from station to station. Even then during prudence check of the capital cost of the projects in which such conditions were incorporated during tendering stage issues arising on these count, will be addressed based on details of each case.

Issue No 4

9. Sample Size for 600, 660 & 800 MW /Limited data availability for 600/660/800 MW/Extrapolation done to derive costs.

Clarification and decision

9.1 The model has been prepared using reliable available data of 500 MW units and few units of 600/660/800 MW capacity. Co-relation between the two as far as material aspect is concerned is available in explanatory memorandum as well as CEA reports. The main test for benchmarking of cost lies in ultimate tariff at which power will be generated through these units for sale. For construction of Super Critical power plants, it is necessary to reduce investment cost and to bring about an economic optimum between investment cost and efficiency gains. The increase in per unit cost on account of increase in fixed charges due to higher capital cost should be at best equal to savings in per unit variable cost due to increase in efficiency to keep the overall cost of electricity per unit for sale at par with subcritical plant with all other input cost parameters (fuel, environmental compliance etc.) remaining the same. The incremental capital cost associated with a super critical plant as compared to a conventional sub critical plant is not significant (small to negligible) based on findings reported in International Energy Agency -Coal industry advisory board (CIAB) paper titled Industry Perspectives of Increasing the efficiency of Coal Fired Power Generation. Also as per numerous reports it is seen that in countries where supercritical technology is being used since number of years the situation is more or less similar. This is because the capital cost increase specific to the Super Critical Pulverized Fuel plant associated with superior materials and other features should get counter-balanced by cost savings due to the fact that the steam generator and Balance of Plant and ancillary equipments tend to be smaller (for same set of assumptions) as a result of the increased efficiency. The extrapolation done takes into account the reality of the condition that at introductory stage in India there can be certain premium for the technology and has

been factored through trend analysis of available data.

9.2 During the period from the date of public hearing and release of this order, number of orders have been placed by utilities for 660/800 MW based plants. Tenders based on bulk bidding have been opened in recent past by Central Generating Utility. Some data sourced through interaction with some funding agencies by the consultants, has been used internally by them for model testing. Based on variance results obtained it is felt that since the model is for prudence check any further intervention/correction in the model at this stage is not called for.

9.3 Notified Values of Benchmark are median values for Base case as described through Variables Sheet. A small deviation may be expected from station to station for the reasons such as within a particular technology (here supercritical technology) due to change in plant layout or design change (Spiral wound tubing vs vertical tubing) or import content during the period till considerable indigenization is achieved etc.

Issue No. 5: Civil Works

10. One of the issues raised is that the cost of civil works of Thermal Power Project cannot be appropriate cost to benchmark as it depends upon site specific details like:

- *Safe grade elevation considering the HFL & topography and the quantum of cutting & filling involved in leveling work.*
- *The seismicity & wind forces specific to site.*
- *Geotechnical data leading to selection of open or pile foundation (dia & length of pile), excavation in rock or soil.*
- *Measures of ground improvement in poor ground conditions (like soft marine condition) or measures to prevent liquefaction.*

- *Diversion existing roads & drains as necessary.*
- *Provision of reservoir which depends on the source of make-up water & its storage capacity and closure period of canal / availability of water in river.*
- *Intake well location in the water body and the depth of sinking of well as per geotechnical data, water depth and height of well above water level.*
- *Availability & lead for borrowed soil for site filling / ash dyke/ reservoir construction.*
- *Provision of liner in ash dyke / reservoir works as per technical requirement & MOEF stipulations (for dyke works).*
- *Length of approach roads / railway siding works / makeup water pipe lines / ash disposal & recirculation pipe line civil works which will depend upon the relative location w.r.t. main plant and varies from project to project.*
- *Corrosion protection measures which may be required depending upon the prevailing soil & ground water conditions and location in coastal areas.*

Clarification and decision

10.1 As already stated above, broad based modeling has been done in this regard encompassing usual scenarios. Deviation on account of specific issue like pile length etc may be dealt on case to case basis at the time of prudence check.

Issue No.6

11. Indices used for calculation of Escalation do not match with indices used by largest manufacturer (BHEL) and utility (NTPC).

11.1 Indices and their weightages used for calculation of price escalation in the thermal model do not match with those adopted in the Letter Of Awards of NTPC. For example, in case of Steam Generator, escalation formula agreed with BHEL and incorporated in the LOA provides for 15% fixed component, 25% for labour and 60% for base metals & alloys and in case of TG, escalation formula agreed with BHEL provides for 15% fixed

component, 35% for labour and 50% for base metals & alloys. However, the thermal model provides for different set of indices and weightages.

11.2 It may also be mentioned that once awarded, fixed component of 15% is not escalated during the tenure of the specific LOA. However, to calculate the likely cost of similar package for another project, the fixed component needs to be linked to escalation in WPI for the intervening period, which may be provided in the report.

11.3 The weightage given to various indices in Price Variation Clause formula are not commensurate with the prevailing formulas being used by utilities in general which are more rational. The materials used for the Price Variation Clause formula are not commensurate with the actual composition of the equipment. For example the indices used for Turbine generator formula includes non ferrous (18%) which is not true. This needs to be rationalized by taking the opinion of the manufacturers for the various packages.

Clarification and decision

11.4 As already stated in explanatory memorandum that indices used are based on discussions with various stakeholders to arrive at input material and their weightage which drives the cost of package due to absence of any standard PV formulae for mechanical packages. However based on suggestion of BHEL and interaction with them subsequently indices used for turbine generator has been corrected in the final model. It is clarified that deviations on account of indices used and as per model will be factored during detailed prudence check as required.

Issue No.7

12. Scaling down factors in case of Greenfield vs. Brownfield projects/Additional units

at one location.

12.1 In case of expansion projects, where earlier phase was completed long back, resources mobilized for earlier phase were de-mobilized. These resources include developed quarries, already deployed skilled/unskilled manpower, stores, deployed tools and tackles, other miscellaneous enabling works etc which are not available to the contractor(mainly in civil packages) as they were de-mobilized, thereby, making it effectively as costly as a green field work.

12.2 There has been difference in the Boiler Turbine Generator cost for the green field and brown field projects to the tune of 5% which is unreasonable as Boiler Turbine Generator scope remains the same for green field and brown field projects.

Clarification and decision

12.3 The difference, as worked out, between the two costs is on account of:

(i) Greenfield project requires totally newly established facilities such as office, canteen, workshop, guest house etc. which is not so in the case of brown field project.

(ii) Greenfield project also requires establishment of construction resources such as water, power, fuel, genset etc. while in the case of brown field project, the existing construction resources are utilized.

(iii) In brown field project, the existing turbine building is extended while in Greenfield project, a new turbine building has to be set.

(iv) In brown field project, the available engineering experience at existing location is utilized thereby reducing the cost while in Greenfield project, these needs to be established anew.

12.4 As such it is felt that there is no need to make any amendment in the model on this issue at present. Based on actual case/s warranting intervention the same will be viewed at the time of prudence check.

Issue No.9

13. Redundancies and margins have not been considered.

Clarification and decision

13.1 The standard redundancies are considered in the model (for example Mills, Boiler Feed Pump, Condensate Extraction Pump, Circulating Water pump, Raw Water pump etc). These standard redundancies of the system are described in the technical diary. Technical diary is prepared as per CEA's specification.

13.2 The margins as applicable such as capacity, flow, weight, volume of the equipment considered are based on normal industry practice and CEA specification for 500MW and above. These margins have been built in to incorporate factor of safety and to safeguard against equipment / system operating outside range of design parameters designed for. These margins built in only to achieve 100% MCR to cater to such eventualities.

Other Issues

Issue No.10

14. It is not clear whether the project specific Mega/non mega status have been factored in the analysis of price. Electro Static Precipitator package considered is a part of Steam Generator package or is excluded. Cost of transportation, insurance, statutory fees paid towards Indian Boiler Regulations, IR etc is included or otherwise.

Benchmark data for Turbine Generator and Boiler are based on Turbine Inlet parameter as 247 bar, 537/565 deg centigrade. However if any developer goes in for higher parameter e.g. 565/593 deg centigrade suitable factor to be applied over benchmark cost

Clarification and decision

14.1 Model has been prepared for hard cost of units of sizes 500/660/800 MW. Financing cost, interest during construction, taxes and duties, right of way charges, cost of R&R etc. would be additional and are not factored in benchmark costs.

14.2 ESP package is considered as a part of SG package

14.3 Cost of transportation, insurance, statutory fees paid to IBR, IR etc is included

14.4 Parametric effects have been captured through Boiler efficiency and turbine heat rate. Observations referred above regarding temperature and pressure indirectly affects the boiler efficiency and turbine heat rate.

Issue No.11

15. Benchmark study should also consider units below 500 MW capacities. Since the study is on Thermal Stations Gas based projects should have also been considered in the study. Financing cost, interest during construction, taxes and duties may impact total project cost especially in case of COD delay.

Clarification and decision

15.1 Major percentage of likely additions either Greenfield or extension units will be of capacity rating of 500 MW and above as such study was focused on the same. For Gas

based units Handbooks are available for reference. Interest during construction, financing charges, taxes and duties etc are considered during tariff determination including the impact of COD delay on the project cost through these elements. These costs are utility and project specific.

Issue No.12

16. Cost towards erection, testing and commissioning should get indicated separately.

Clarification and decision

16.1 These costs constitute minor percentage of total cost and have been factored in.

Issue No.13

17 Providing options for dry fly ash disposal (100%), High Concentration Slurry System (100%). Suitable weightage for distance beyond 5 km, lower slabs of Calorific value, price ceiling impact may be considered, Categorization of seismic zone, Type of chimney-single flue/multi flue, consideration of auxiliary boiler etc.

Clarification and decision

17.1 As stated above Model is broad based and detailing as desired is prerogative of project proponent, variations on all these counts will have to be factored during prudence checks.

Issue No.14

18. Model may not cover all commercial factors affecting cost.

Clarification and decision

18.1 Most common commercial variables have been used based on discussions and interactions with manufacturers, suppliers, developers, experts, industry and power

utilities. Due to data limitations, it may not be feasible to capture the impact of all the variables in the model. However, the variables used in the model are considered adequate to provide a reasonable cost figure for “prudence check”.

Issue No.15

19. Coal Handling Plant / Ash Handling Plant Cost

19.1 These costs largely depend on plant layout, varying coal quantity due to import/indigenous type of coal, storage requirement etc. Benchmarked cost is based on either track hopper or wagon tippler scheme, whereas, depending upon the requirement, at times both the schemes are in use which needs to be considered. Further, in case of Ash Handling Plant Cost, the Commission has considered only 5 km of length, whereas in reality the overall length varies significantly depending on the layout.

Issue No.16

20. Change in evacuation voltage level from 400KV to 765KV results in significant increase in switchyard cost i.e. per bay cost almost trebles. While factoring evacuation voltage, Commission report is silent on the following. As per Central Electricity Authority, the power evacuation voltage level has been typically considered as 400KV for 2x500MW, 765KV for 2x660/800MW. However, Power evacuation voltage levels are finalized by CTU/CEA based on present capacity of plant, future capacity addition provisions, location of plant and beneficiaries of projects. Accordingly voltage levels are decided as 765 KV, 400KV or both 765KV and 400KV levels. Accordingly number of lines both at 400KV & 765KV along with associated 765/400KV Inter Connecting Transformers shall have to be considered. Provision of these requirements should be

considered as per project requirement. The base switchyard type taken for thermal project in the CERC report appears to be only of AIS for 400 kV/765 kV. Factors for GIS type switchyard should also be considered as these are being planned based on land availability and environmental conditions. It appears Commission has only considered tie lines (dedicated lines) up to pooling substation as twin conductor for 400KV. Provision of lines with high capacity configurations i.e. quad conductor for 400KV & other variants based on line configurations should also be considered.

Clarification and decision(Issue 15&16)

20.1 For the present, no correction is envisaged in the model. Deviations on this count will be considered at the time of prudence based on facts of the case.

Issue No.17

21. Packages not Considered in the Report: (a) Certain mandatory packages like Site Leveling, Station Piping, Generator Bus duct, Startup Power cost, Construction Power cost have not been considered in the CERC report.

(b) Few other optional packages like Extra High Voltage cables package (400/220/132KV as per requirement), Gypsum Handling package, Lime Handling package, over head lines/sub-stations for power supply to remote loads outside the plant like makeup water needs to be considered.

(c) Factors like diversions of existing overhead lines from project site to clear the land should also be considered.

(d) Off-late water availability has been a major concern for NTPC projects. Because of

this at times we are required to create a storage capacity for one to three months, which again requires construction of Reservoir / Weir / Annicut / Barrage and these needs to be considered by CERC.

Clarification and decision

21.2 Mandatory packages have been factored. Optional packages and specific issues like diversion of lines, impact due to water availability will be dealt based on facts of case and deviations caused.

Issue No.18 : Corrections in the Model

22. Turbine Heat Rate Sensitivity: As per the thermal model in the report, change in Turbine Heat Rate does not impact TG cost, whereas, at clause no-6.3.5 of the report it is mentioned that better TG heat rate reduces TG cost. For improved (reduced) turbine heat rate, escalation is to be provided rather than reduction as machine with improved turbine heat rate i.e. less heat rate are likely to be costlier because of improved design, material and workmanship.

Clarification and decision

22.2 Model has been rectified to incorporate the above.

Issue No.19

23. Indices used for Turbine Generator Formula.

Clarification and decision

23.1 Formula has been modified based on specific observation of BHEL after discussion.

Issue No.20

With less Cooling Water temperature, condenser size becomes lower hence less costly. Necessary corrections have been carried out.

Conclusion

24. In view of the forgoing, we approve the benchmark norms as on December 2011 as per **Annexure II** to this order for capital cost for Thermal Power Station/Unit size(s) 500/600/660/800 MW which shall be taken into consideration while determining the capital cost in accordance with clause (2) of Regulation 7 of 2009 Tariff Regulations. The benchmark cost may be reviewed and updated on 6 monthly basis or at such interval as may be decided by the Commission. We further direct that the generating companies whose tariff is determined by the Commission under Section 62 of the Act shall be required to submit information on the forms attached as **Annexure III** to this order in addition to the formats being submitted in accordance with 2009 Tariff Regulations.

Sd/-	sd/-	sd/-	sd/-
(M. DEENA DAYALAN)	**(V.S.VERMA)**	**(S.JAYARAMAN)**	**(DR. PRAMOD DEO)**
MEMBER	**MEMBER**	**MEMBER**	**CHAIRPERSON**

ANNEXURE- I

List of participants in public hearing on **"Benchmarking of Capital cost, of Thermal Power Station" held on 11.11.2010**

Sl. No.	NAME	DESIGNATION	NAME OF COMPANY
1	DEEPAK SHRIVASTAVA	DY. GENERAL MANAGER	M.P. TRADECO
2	R. SURESH	GM/COMMERCIAL	NLC
3	SANDEEP SAHAY	DGM	AES
4	G. P. SINGH	SE	UPRVUNL
5	ANUJ GUPTA	SR. ENGG.	BHEL
6	REVTI RAMAN	AGM	NTPC
7	C.A MANISH GARG	PARTNER	MADHU GUPTA & CO.
8	A. DHAR	VP	L & T POWER
9	P.K. GARG	Sr. GM	L & T POWER
10	MANESH GUPTA	AGM	L & T
11	ANKIT AGRWAL	ASST. MANAGER	TATA POWER
12	SANJIV K. GOEL	CHIEF MANAGER	JAYPEE
13	TANUSHREE BHATTACHARYA	RESEARCH ASSOCIATE	TERI
14	ABHASH MOHANTY	MANAGER COMMERCIAL	NTPC
15	SHIYA A	SR.ENGINEER COMML	NTPC
16	RAJIV BHARDWAJ	MD	JAYEE POWERGRID
17	S.SEN	DIRECTOR	SANGAM POWER
18	U K TYAGI	GM	POWER GRID
19	B. VAMSI	CM	POWERGRID
20	RK CHAWHAN	GM	POWERGRID
21	BHARAT SHARMA	AM	NDPL
22	ANAND JAIN	CM	ABC CONSULTING
23	N L RAJAH	ADVISORY COMMITTEE	CHENNAI CAG

ANNEXURE –II

BENCHMARK HARD COST IN Rs. Crore Per MW With December 2011 Indices as Base																								
Unit size in MW	500	500	500	500	500	500	600	600	600	600	600	600	660	660	660	660	660	660	800	800	800	800	800	800
Number Of Units	1	2	3	4	1	2	1	2	3	4	1	2	1	2	3	4	1	2	1	2	3	4	1	2
Type	GF	GF	GF	GF	Ext	Ext	GF	GF	GF	GF	Ext	Ext	GF	GF	GF	GF	Ext	Ext	GF	GF	GF	GF	Ext	Ext
TOTAL HARD COST * **	**5.08**	**4.71**	**4.48**	**4.34**	**4.92**	**4.53**	**4.87**	**4.54**	**4.32**	**4.01**	**4.47**	**4.19**	**5.37**	**5.01**	**4.67**	**4.37**	**4.95**	**4.67**	**4.96**	**4.79**	**4.59**	**4.44**	**4.63**	**4.44**

*** **Total Hard cost with December 2011 as base for indices includes Steam Generator/Boiler Island, Turbine Generator island, Associated auxiliaries, Transformers, Switchgears, cables, cable facilities, Grounding & Lighting packages, Control & Instrumentation, Initial Spares for BTG, Balance of Plant including cooling tower, water system, coal handling plant, ash handling plant, Fuel oil unloading & storage, Mechanical miscellaneous package, switchyard, Chimney, Emergency DG Set. This does not include MGR, Railway siding, unloading equipment at jetty, and Rolling stock, locomotive, Transmission line till tie point.**

G F - Green Field **Ext - Extension**

ANNEXURE –III

PART-I
FORM-5
ABSTRACT OF ADMITTED CAPITAL COST FOR THE EXISTING PROJECTS

Name of the Company: _____

Name of the Power Station: _____

Capital Cost as admitted by CERC	
Capital cost admitted as on_____	
(Give reference of the relevant CERC Order with Petition No. & Date)	
Foreign Component, if any (In Million US $ or the relevant Currency)	
Domestic Component (Rs. Cr.)	
Foreign Exchange rate considered for the admitted Capital cost	
Hedging cost, if any, considered for the admitted Capital cost	
Total Capital cost admitted (Rs. Cr)	

PETITIONER

PART-I

FORM-5A

ABSTRACT OF CAPITAL COST ESTIMATES AND SCHEDULE OF COMMISSIONING FOR THE NEW PROJECTS

Name of the Company: _____

Name of the Power Station: _____

New Projects

Capital Cost Estimates

Board of Director/ Agency approving the Capital cost estimates:		
Date of approval of the Capital cost estimates:		
	Present Day Cost	**Completed Cost**
Price level of approved estimates	As of End of _____Qtr. Of the year ___	As on Scheduled COD of the Station
Foreign Exchange rate considered for the Capital cost estimates		
Capital Cost excluding IDC & FC		
Foreign Component, if any (In Million US $ or the relevant Currency)		
Domestic Component (Rs. Cr.)		
Capital cost excluding IDC, FC, FERV & Hedging Cost (Rs. Cr)		
IDC, FC, FERV & Hedging Cost		
Foreign Component, if any (In Million US $ or the relevant Currency)		

Domestic Component (Rs. Cr.)		
Total IDC, FC, FERV & Hedging Cost (Rs.Cr.)		
Rate of taxes & duties considered		
Capital cost Including IDC, FC, FERV & Hedging Cost		
Foreign Component, if any (In Million US $ or the relevant Currency)		
Domestic Component (Rs. Cr.)		
Capital cost Including IDC & FC (Rs. Cr)		
Original Schedule of Commissioning as per the approval of the Board of Directors / agency approving the capital cost estimates		
COD of Unit-I/Block-I		
COD of Unit-II/Block-II		

COD of last Unit/Block		

Note:

1. Copy of approval letter should be enclosed.
2. Details of Capital cost are to be furnished as per FORM-5B or 5C as applicable
3. Details of IDC & Financing Charges are to be furnished as per FORM-14

PETITIONER

PART-I

FORM-5B

BREAK-UP OF CAPITAL COST FOR COAL/LIGNITE BASED PROJECTS

Name of the Company: _____

Name of the Power Station: _____

S.N.	Break Down	As per original Estimates	Actual capital expenditure as on COD	Liabilities/ provisions	Variation (3-4-5)	Reasons for Variation
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1.0	**Cost of Land & Site Development**					
1.1	Land					
1.2	Rehabilitation & Resettlement (R&R)					
1.3	Preliminary Investigation & Site development					
	Total Land & Site Development					
2.0	**Plant & Equipment**					
	BTG					
2.1	**Steam Generator Island**					
2.1.1	ESP					
2.2	**Turbine Generator Island**					
2.2.1	HP/LP Piping					
	BOP Mechanical					
2.3	**Water System**					
2.3.1	External water supply system					
2.3.2	CW system					
2.3.3	DM water Plant					
2.3.4	Clarification plant					
2.3.5	Chlorination Plant					
2.3.6	Effluent Treatment Plant					
2.3.7	Sewage Treatment Plant					
2.3.8	Fire Fighting System					
2.3.9	Central Monitoring System					
2.3.10	Dust Suppression System					
2.3.11	Desalination Plant					
2.4	**Material Handling System**					
2.4.1	Fuel Oil Handling & Storage System					
2.4.2	Ash Handling System					
2.4.3	Coal Handling System					
2.5	**Mechanical-Miscellaneous Package**					
2.5.1	Air Compressor System					
2.5.2	AC Ventilation					

S.N.	Break Down	As per original Estimates	Actual capital expenditure as on COD	Liabilities/ provisions	Variation (3-4-5)	Reasons for Variation
(1)	(2)	(3)	(4)	(5)	(6)	(7)
2.5.3	Workshop, Laboratory Equipment and Monitoring System & Equipment					
2.6	Optional Packages - Mechanical					
2.6.1	MGR/ Railway Siding / Unloading Equipment at Jetty					
2.6.2	Rolling Stock/Locomotive					
2.6.3	FGD Plant					
	BOP Electrical					
2.7	Switchyard Package					
2.8	Transformers, Switchgear, Cables, Cable Facilities, Grounding & Lighting Packages					
2.9	Emergency DG Set					
2.10	Transmission Line Cost till Tie Point (If applicable)					
2.11	C & I Package					
	Civil Works					
2.12	Main Plant, Administration Building, Foundations, Water System, Material Handling System and Miscellaneous System					
2.13	Site Development, Temporary Construction & Enabling Works, Road & Drainage and Area Development for Ash Disposal					
2.14	Cooling Tower					
2.15	Chimney					
2.16	Optional Packages - Civil					
2.16.1	MGR/ Marshalling Yard / Jetty					
2.16.2	Township & Colony					
2.16.3	FGD Plant					
2.16.4	Desalination Plant					
	Initial Spares (Included in above Packages)					
	Total Plant & Equipment including Civil Works but excluding taxes & Duties					
2.18	Taxes and Duties					
2.18.1	Custom Duty					
2.18.2	Other Taxes & Duties					
	Total Taxes & Duties					

S.N.	Break Down	As per original Estimates	Actual capital expenditure as on COD	Liabilities/ provisions	Variation (3-4-5)	Reasons for Variation
(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Total Plant & Equipment including Taxes & Duties					
3.0	**Construction & Pre- Commissioning Expenses**					
3.1	Erection Testing and commissioning					
3.2	Site supervision					
3.3	Operator's Training					
3.4	Construction Insurance					
3.5	Tools & Plant					
3.6	Start up fuel					
	Total Construction & Pre-Commissioning Expenses					
4.0	**Overheads**					
4.1	Establishment					
4.2	Design & Engineering					
4.3	Audit & Accounts					
4.4	Contingency					
	Total Overheads					
5.0	**Capital cost excluding IDC & FC**					
6.0	**IDC, FC, FERV & Hedging Cost**					
6.1	Interest During Construction (IDC)					
6.2	Financing Charges (FC)					
6.3	Foreign Exchange Rate Variation (FERV)					
6.4	Hedging Cost					
	Total of IDC, FC, FERV & Hedging Cost					
9.0	**Capital cost including IDC, FC, FERV & Hedging Cost**					

1. In case of time & Cost overrun, a detailed note giving reasons of such time and cost overrun should be submitted clearly bringing out the agency responsible and whether such time & cost overrun was beyond the control of the generating company.
2. Give breakup of Taxes and duties along with the details of basis of computations
3. Give detailed breakup and working of IDC and Financing charges.

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PART-I

FORM-5D

BREAK-UP OF CONSTRUCTION/SUPPLY/SERVICE PACKAGES

Name of the Company: _____

Name of the Power Station: _____

		1	2	3	4	5	6	----
1	Name/No. of Construction / Supply / Service Package							
2	Scope of works[1] (in line with head of cost break-ups as applicable)							
3	Whether awarded through ICB/DCB/ Departmentally/ Deposit Work							
4	No. of bids received							
5	Date of Award							
6	Date of Start of work							
7	Date of Completion of Work							
8	Value of Award[2] in (Rs. Cr.)							
9	Firm or With Escalation in prices							
10	Actual capital expenditure till the completion or up to COD whichever is earlier (Rs.Cr.)							
11	Taxes & Duties and IEDC							
12	IDC, FC, FERV & Hedging cost							
13	Sub -total (10+11+12)							

1. The scope of work in any package should be indicated in conformity of Capital cost break-up for the coal/lignite based plants in the FORM-5B to the extent possible. In case of Gas/Liquid fuel based projects, break down in the similar manner in the relevant heads as per FORM-5C.
2. If there is any package, which need to be shown in Indian Rupee and foreign currency(ies), the same should be shown separately along with the currency, the exchange rate and the date e.g. Rs.80 Cr+US$50m=Rs.320Cr at US$=Rs48 as on say 01.04.09.

3. In case of contract packages with escalation clause provide the escalation formula in each package as per the order placed.

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Unit Size	
Number of Units	
Greenfield/Extension	

S.No.	Variables	(Design Operating Range) Values
1	Coal Quality -Calorific Value	
2	Ash Content	
3	Moisture Content	
4	Boiler Efficiency	
5	Suspended Particulate Matter	
6	Ash Utilisation	
7	Boiler Configuration	
8	Turbine Heat Rate	
9	CW temperature	
10	Water Source	
11	Distance of Water Source	
12	Clarifier	
13	Mode of Unloading Oil	
14	Coal Unloading Mechanism	
15	Type of Fly Ash Disposal and Distance	
16	Type of Bottom Ash Disposal and Distance	
17	Type of Soil	
18	Foundation Type (Chimney)	
19	Water Table	
20	Seismic and Wind Zone	
21	Condensate Cooling Method	
22	Desalination/RO Plant	
23	Evacuation Voltage Level	
24	Type of Coal (Domestic/Imported)	

Parameter/Variables	Values
Completion Schedule	
Terms of Payment	
Performance Guarantee Liability	
Basis of Price (Firm/Escalation-Linked)	
Equipment Supplier (Country of Origin)	

Optional Packages	Yes/no
Desalination Plant/RO Plant	
MGR	
Railway Siding	
Unloading Equipment at Jetty	
Rolling Stock/Locomotive	
FGD Plant	
Length of Transmission Line till Tie Point (in km)	

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