

**Central Electricity Regulatory Commission**  
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Tele No. 2436 1145 Extn. 210 / Fax No. 2436 0010

No. 2/7(6)/2008-Policy/CERC

Dated: July, 2008

**Sir/Madam,**

**Sub : ASSIGNMENT FOR DEVELOPING BENCH MARKS OF CAPITAL COST FOR THERMAL POWER STATIONS AND TRANSMISSION SYSTEM ELEMENTS**

Central Electricity Regulatory Commission (CERC) proposes to commission an assignment on the above subject. The Terms of Reference (TOR) of the proposed assignment are at **Annexure-I.**

2. It may kindly be noted that the proposals would be evaluated by a Committee. Selection of the Consultant will be based on two-stage-evaluation process. In the first stage, “**Technical**” evaluation will be done by the Committee based on the parameters as mentioned in the TOR and the decision of the Committee shall be final. The “**Financial**” bids of only those bidders who qualify in “**Technical**” evaluation will be opened for final evaluation.

3. It is requested that proposals (**in sealed cover – separate each for “Technical” and “Financial”**), as per the above requirement may kindly be sent to this office **latest by 21<sup>st</sup> August, 2008 by 1500 hrs.**

Yours faithfully,

Encl: as stated.

**Alok Kumar**  
**Secretary**

## TERMS OF REFERENCE ( TOR )

### ASSIGNMENT FOR DEVELOPING BENCH MARKS OF CAPITAL COST FOR THERMAL POWER STATIONS AND TRANSMISSION SYSTEM ELEMENTS

#### **1.0 Introduction:**

Wherever capital cost is the basis of cost plus tariff, it is most important to carry out a prudence check of the capital expenditure of the tariff claiming entity. The Commission so far has been relying on in-house analysis and audited accounts for this purpose. The data available with the Commission indicates that there is wide variation in the capital cost of a thermal or transmission project due to different site conditions, design parameters, terrain and year of placing of orders, cost escalation, etc. By having benchmarks, it would be possible to prudently arrive at completed cost of the project. From the experience gained so far, it is inferred that it would be desirable to develop disaggregated benchmarks of capital cost of individual packages. The summation of relevant packages/elements of a project should add to total hard cost of the project. The actual hard cost of the project shall be compared with the bench mark cost. In case of a large variation is found between the two, the Commission may undertake detailed examination to ascertain the reason and justification for the variation.

#### **2.0 Objectives:**

This assignment seeks to achieve the following objectives:

- (i) Developing benchmarks of capital cost for Thermal Power Stations and Transmission System elements by analysing all India and global data for this purpose.
- (ii) The data available with the Commission indicates that there is wide variation in the capital cost of a thermal or transmission project due to different site conditions, design parameters, terrain and year of placing of orders, cost escalation, etc. Considering the variables, recommending appropriate methodology through which a bench mark cost of a completed project would be arrived at for the purpose of prudence check.
- (iii) Developing disaggregated benchmarks of capital cost of individual packages. The summation of relevant packages/elements of a project should add to total hard cost of the project. The financing cost, interest during construction, taxes and duties, right of way

charges, cost of R&R etc. would be additional and there is no need to develop bench marks for these additional items.

- (iv) Developing a model for benchmarking which should be self-validating i.e. as data of new projects gets added to the data base, the benchmark should get revised automatically.

### **3.0 Scope of assignment:**

In order to achieve these objectives, the consulting agency shall undertake the following:

- a) Step1: The starting point of assignment would be to create a database of capital cost of projects (separately for generation and transmission), it shall be prepared of national and international projects for which data is reliably available.
- b) Step2: After having project database, analyse it and define disaggregated packages of hard cost of a project, such that sufficient data/information is available for benchmarking.
- c) Step3: Identify escalation factors and develop financial / pricing models to assign weightages to various escalation factors and test accuracy with historical data from the developed project database. From the above, develop cost escalation formula for each disaggregated bench mark giving due weightage to various materials/factors.

The above concept is illustrated below:

### **3.2 Hard cost for Thermal Power Plant:**

As an illustration, the following packages could be considered.

- a) Steam Generator Island including coal mills excluding civil works
- b) Turbo generator island including control and instrumentation, excluding civil works
- c) Civil package for main plant
- d) Electrical package including switchyard and transformer yard
- e) Balance of plant including civil works (coal handling plant, ash handling plant, CW system, fuel oil system, water treatment plant, cooling towers, workshop, railway siding, Emergency DG supply, water clarification plant, potable water supply system, station air compressors, fire fighting system, cable facilities etc).
- f) Other works such as roads, bridges, tree plantation, residential facilities, hospital, school and miscellaneous infrastructure facilities.
- g) Cost of flue gas desulphurization plant, if any, for different percentage of sulphur in coal.

- 3.2.1 It may be mentioned that cost of erection, testing and commissioning and other incidental expenses including site preparation, site supervision etc., shall be factored into the various disaggregated capital cost heads.
- 3.2.2 The Consultant would be required to give scaling down factors in case of station comprises more than one unit.
- 3.2.3 The bench marks are essentially required to be developed for stations comprising unit of 500 MW and 660 MW. These could be extension units or green field projects.

### 3.3 Hard Cost for transmission system:

- 3.3.1 The transmission system has two distinct elements viz., transmission lines and substations. The focus would be on developing bench marks for 400 kV and 800 kV lines and sub-stations, as these are most commonly deployed in inter-state transmission system regulated by the Commission. In case benchmark could be delivered for HVDC lines and converter stations, it would be still better.
- 3.3.2 In so far as transmission lines are concerned, the Consultant would be required to develop bench marks of capital cost in terms of rupees per circuit-km for various voltage levels and conductor sizes, e.g., 400 kV double circuit and single circuit lines using twin moose or triple moose or quad moose ACSR or AAC conductors. Similarly, bench mark capital cost would be required for frequently used 800 kV transmission line configuration.
- 3.3.3 Transmission lines pass through various types of terrains i.e., plain, hilly and high mountains and this would have to be factored while developing the bench marks. A suitable factor would have to be developed for taking into account the use of suspension towers and tension towers, use of special insulators for heavily polluted areas, use of tower extensions, use of large towers for river crossing, use of various types of tower foundations etc.
- 3.3.4 In so far as sub-station is concerned, the ISTS sub-stations are generally 400 kV/220 kV or 800 kV/400 kV/220 kV. Briefly the typical configuration of an inter-state sub-station deploys 1½ breaker scheme for 800 kV and three bus scheme for 220 kV. 315 MVA, 400 kV/220 kV interconnecting autotransformers are typically deployed at the sub-stations. The bus and line reactors are of 50 MVAR rating and the line reactors are of generally switchable. Sometimes, fixed series compensation devices are also installed on the lines at the sub-station end. The Consultant would be required to develop suitable disaggregated bench marks in terms of number of switch gear bays, ICTs, reactors etc., for arriving at total hard cost of a sub-station. The cost of substation like grounding, civil works,

control and instrumentation, air-conditioning, fire fighting, carrier communication, DC batteries, emergency DG set, residential facilities, roads, fencing etc., shall be suitably spread in the disaggregated bench marks. The cost of erection, testing and commissioning and other incidental expenses including site preparation, site supervision etc., shall be factored into the various disaggregated capital cost heads.

3.3.5 Consultant would examine actual deployment of supervisory personnel on sample projects to work out benchmarks of site supervision charges and other incidental expenditure during construction (IEDC).

3.3.6 The cost of land, financing charges, interest during construction and Right of Way charges etc., shall be additional, which need not be considered.

#### **4.0 Deliverables and Duration of Assignments:**

##### **4.1 Stage-I:**

- (i) The Consultant shall submit Concept Papers on disaggregated bench marks for capital cost for
  - (a) thermal power stations of unit sizes 500 and 660 MW
  - (b) 400 kV AC and 800 kV AC transmission lines of different conductor sizes passing through different terrains
  - (c) 400 kV and 800 kV substations
- (ii) The concept papers should give clear picture of how the benchmarks would be developed and how much data shall be collected and collated and what would be the degree of reliability and accuracy of the benchmarks.

##### **First Presentation:**

- (iii) The Consultant shall be required to make a detailed first presentation on the above concept papers and shall explain the escalation formulas proposed to be developed for updating the bench marks. The Consultant shall provide satisfactory answers to the queries during discussion.

##### **Delivery Period for First Presentation:**

- (iv) The time for the first presentation shall be 45 days from placement of order.

Second Presentation:

- (v) The Commission may require the Consultant to revise the Concept Papers in the light of the discussions and submit revised papers and make fresh presentations after a time of about two weeks.
- (vi) Develop / revise draft formats for project costs in view of the proposed disaggregated benchmarks, in which future capital costs of projects are to be submitted by project proponents.

Delivery Period for Second Presentation:

- (vii) The time for the second presentation shall be 15 days after first presentation.

4.2 Stage-II

Deliverables:

- (i) Data base of capital cost of various elements, component etc., which formed the basis of developing benchmarks. A model / proposal for refreshing the database shall be included.
- (ii) Disaggregated bench marks of capital cost for thermal power stations with various factors for scaling down, location, type of coal, technology etc.
- (iii) Disaggregated bench marks of capital cost for 800 kV/400 KV/220 kV sub-stations typically used for inter-state transmission.
- (iv) Bench mark of capital cost in rupee per circuit-km for 400KV and 800 kV AC transmission lines passing through different terrains and having different conductor sizes.
- (v) Escalation formula to be applied on each bench mark from the reference for the purpose of updating the bench mark on annual basis for next 5 years i.e. for 2009-14.
- (vi) A model for benchmarking which should be self-validating i.e. as data of new projects gets added to the data base, the benchmark should get revised automatically. The Consultant shall impart training to Officers of the Commission on working of Model and give code of software of Model so that any modification in future can be done. The Consultant shall also provide working warranty of the Model for 5 years.

### Delivery Period for Stage-II:

- (vi) The Consultant, covering above works, shall submit a Draft Report within 45 days from go ahead by the Commission to commence on this phase.
- (vii) The Consultant after taking into consideration the suggestions given by the Commission shall submit a Final Report within 15 days from go ahead by the Commission.

### **5.0 Eligibility Criteria:**

The institution/organization should have adequate experience in consultancy for project appraisal, and financing of Thermal Generating Stations and Transmission System elements. The agency should have in-depth knowledge of costing of thermal power stations and development of transmission systems. The agency in support of its claim should submit the details of projects handled and its national and international tie-ups.

### **6.0 Evaluation Criteria:**

- 6.1 The institution/organization is required to submit separate Technical and Financial bids, duly sealed in separate envelopes.
- 6.2 Technical component will carry 80% weightage and Financial component will carry 20% weightage.
- 6.3 In the first stage, “**Technical**” evaluation will be done by the Committee based on the parameters as mentioned below and the decision of the Committee shall be final. The “**Financial**” bids of only those bidders who qualify in “**Technical**” evaluation will be opened for final evaluation.
- 6.4 Within the Technical component, weights will be assigned in the following manner for different technical parameters:-

<b>Technical Parameters</b>	<b>Weights</b>
Qualification/Experience of key staff proposed (Evaluation would be done based on the commitment made in the proposal towards the man-days to be devoted by each of the key staff for the proposed study. This would also be monitored throughout the assignment)	20
Past relevant Experience of the Institution/Organization in India and outside India	10
Details of availability of relevant Indian and international database along with proposal for data collection and its sources	10
Broad approach / Methodology for the Assignment	15
Presentation on proposal and interaction with Bidders to assess their capability	25

- 6.5 Weight for Financial parameters: - Proposal with the lowest cost will be given a financial score of 20 and other proposals given financial scores that are inversely proportional to their prices.
- 6.6 The total score will be obtained by weighting the Technical and Financial scores and adding them.
- 6.7 The price quoted for Stage-I shall not be more than 20% of the total quoted price.
- 7.0 CERC would designate one of its officers as Nodal officer for this assignment and to interact with the consultant for providing data available with the Commission.

8.0 Payment Terms:

- (a) 50% of price quoted for Stage-I shall be given after the first presentation.
- (b) 50% of price quoted for Stage-I shall be given after the second presentation.

Note: In case the commission is not satisfied with the progress of work upto stage-I, the contract can be terminated without any claim after stage-I.

- (c) 50% of price quoted for Stage-II shall be given after submission of draft Report.
- (d) 50% of price quoted for Stage-II shall be given after submission of final Report.

**8.0 Format of Application:**

**At Annexure-A (Technical) and Annexure-B (Financial)**



**DETAILED PROPOSAL FOR ASSIGNMENT**

**(TECHNICAL)**

Four copies of the proposal along with project summary to be submitted to Secretary, CERC

**I. GENERAL INFORMATION:**

01. Title of the Assignment :
02. Name and address of the Organization/ :  
Institution
03. Name & Designation of the Key Persons:
04. Contact address of the Key Person :  
(e-mail / fax / telephone)
05. Net-worth/Turnover of the Organization/ :  
Institution

**II. TECHNICAL SPECIFICATIONS:**

06. Qualification/Experience of key staff proposed in the areas of Engineering and Modeling (Evaluation would be done based on the commitment made in the proposal towards the man-days to be devoted by each of the key staff for the proposed study. (This would also be monitored throughout the assignment)
07. Past relevant Experience of the Institution/Organization in India and outside India
08. Details of availability of relevant Indian and international database and proposal for data collection along with its sources
9. Broad approach / Methodology for the assignment

**DETAILED PROPOSAL FOR ASSIGNMENT**

**(FINANCIAL)**

**I. GENERAL INFORMATION:**

- 01. Title of the Assignment :
- 02. Name and address of the Organization/ :  
Institution
- 03. Name & Designation of the Key Person :
- 04. Contact address of the Key Person :  
(e-mail/fax/telephone)
- 05. Net-worth/Turnover of the Organization/ :  
Institution

**II. FINANCIAL SUPPORT:**

- 06. Amount quoted for:
  - (i) Stage-I
  - (ii) Stage-II

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**TOTAL**

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Note: The price quoted for Stage-I shall not be more than 20% of the total quoted price.

**(RUPEES**

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Please indicate the fees/charges and applicable taxes separately.

Signature of the Head of the Study Team/  
Authorized Signatory