GUIDELINES
FOR THE PREPARATION OF
FEASIBILITY REPORTS FOR

POWER PROJECTS

PROJECT APPRAISAL DIVISION
PLANNING COMMISSION
GOVERNMENT OF INDIA

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PREFACE

The quality of appraisal, investment decision and success of the projects depend largely on the quality and content of the Feasibility Report (FR). It is in this context that the Planning Commission had earlier issued guidelines for the prepration of FR in 1966 and later in January, 1975. The 1975 version of the guidelines relates to the industrial projects but the same has been in use for other sectors as well to the extent possible.

Despite the emphasis on proper feasibility study, a number of cases of time and cost over-run have been encountered in the projects almost in all sectors of the economy. The issue was also considered by the Committee on Public Undertakings (COPU) 1981-82 (Seventh Lok Sabha). In the light of the shortcomings observed in the quality of FR submitted by the project authorities, the Committee desired that on the basis of the experience gained and feed-back on implementation obtained, revised guidelines for preparation of FRs should be issued to ensure reliable project formulation. Following the above recommendations, Working Groups for formulation of revised sector-specific guidelines were set up by the Planning Commission for seven sectors/subsectors, namely, Coal, Power, Cement, Paper, Engineering, Metallurgical and Process Industries.

Based on the drafts developed by these Working Groups, comments received from concerned Ministries/Organisations and discussions held with them, these Guidelines have been prepared. In these Guidelines, the term Detailed Feasibility Report (DFR) has been used in place of FR, mainly to emphasise the need for detailed information to enable proper appraisal of the investment proposal. The Guidelines mainly outline the information required for proper formulation and appraisal of projects. Any procedures and criteria/parameters as may be specified by the Government from time to time have also to be taken into consideration while formulating and appraising projects.

While efforts have been made to incorporate various improvements in the guidelines, these cannot be taken as the final word on the subject as project formulation is a dynamic process and depends on the state of knowledge which gets enriched with time. Any suggestions to improve these guidelines are, therefore, welcome.

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CHAPTER 1

INTRODUCTION

1.1 Every Five Year Plan lays down certain basic objectives and targets for growth, development, consumption, investment and resources to be mobilised. The macro or national targets are broken into sectoral investments and growth. The plans for each sector consist of programmes/projects and schemes. A complete system of project management must ensure the following aspects:

a) formulation/selection of the most sound and viable projects;

b) proper implementation of the projects selected; and

c) proper management of the completed projects.

1.2 The main stages of the project cycle can be considered in following phases:

a) Preliminary establishment of the need proposed to be achieved through the implementation of a project

b) Project identification and formulation which involves examination of various alternatives or options to meet the desired needs / goals; and selection of one or more options for preparation of the Detailed Feasibility Report.

c) Preparation of a Detailed Feasibility Report (DFR) : DFR is a document which contains detailed information on the technical, market , organisational, managerial and environmental aspects and on financial and economic viabilities;

d) Appraisal of Detailed Feasibility Report(DFR) from the following aspects:

i) Technical Analysis to determine whether the specifications of technical parameters chosen are realistic and optimal;

ii) Demand analysis to determine the demand availability gap of power for a particular region/state and arrangements for evacuation of power thus generated.

iii) Organisational aspects to determine whether the organisation has the managerial capability to implement and operate the project.

iv) Environmental aspects to ensure that the environment related aspects like rehabilitation, resettlement etc. as may be required as per environmental guidelines have been fully covered in the project cost;

v) Financial Analysis to determine whether financial costs are properly estimated and whether the project funding is ensured and whether the project is financially viable;

vi) Economic Analysis to determine the cost of generation/transmission and whether the project is worthwhile from the point of view of economy as a whole; and

e) Investment decision to be taken keeping in view the competing claims of other projects and in the context of the provisions available in the Five Year Plan and Annual Plans.

f) Implementation which involves implementation planning, preparation of a Detailed Project Report (DPR), detailed designs and drawings, specifications, tendering/contracting,getting various clearances, execution of various activities leading to commissioning of the project and monitoring throughout.

g) Operation (when the project starts generating/transmitting power) and ex-post Evaluation to find out whether the objectives intended were realised and wether the project was properly designed and effectively carried out.

1.3 Detailed Feasibility Report (DFR) is the basic document which provides information needed for the purpose of appraisal of the project irrespective of whether it is a proposal for setting up of a new plant/facility or expansion and / modernisation of an existing plant/facility. The quality of appraisal / investment decision largely depends upon the quality of DFR. The purpose of these Guidelines is to specify the information that is required on all the important aspects / parameters of the projects and the way in which the data should be presented for appraisal and investment decision.

Investment Approval Procedure :

1.4 All Central public sector projects above a specified cost level require approval by the PIB prior to consideration by the Cabinet. Projects in all sectors (except Railways, Atomic Energy , Space, Non Conventional Energy, Science and Technology and Electronics) have to be considered by the Public Investment Board (PIB). (In the case of Sceintific Departments such as Electronics, Science and Technology, the PIB is headed by the respective Secretaries).

1.5 The steps required to be undertaken for investment approval are as follows:

i) Techno-Economic approval by the Central Electricity Authority and in case of large hydroelectric projects, Advance Action approval by Department of Power/Committee of PIB and for thermal and other projects, by the Boards of respective companies within the delegated power. In case of power projects, a number of inputs/clearances from various agencies/Govt. Deptts., as listed at Annexure I, are required to be obtained prior CEA's clearance.

ii) Preparation and circulation of DFR and draft PIB Memo.

iii) Inter-ministerial Group (IMG) or pre-PIB meetings convened by the Financial Adviser in the Administrative Ministry/Department.

iv) Obtaining clearances from Ministry of Environment and Forests, etc.

v) Circulation of final PIB memo by the Administrative Ministry/Department.

vi) Preparation of appraisal note by the Project Appraisal Division (PAD).

vii) Consideration by PIB and its recomendations to Cabinet (CCEA).

viii) Preparation and circulation of Note for Cabinet (CCEA).

ix) Consideration and investment approval by Cabinet

x) Issue of sanction letter by the Ministry/Department.

1.6 The power projects are distinguished as thermal power projects (coal/gas based) hydroelectric projects, nuclear power projects and transmission projects. For each mode of generation, different procedures for preparation of feasibility/project report and investment decision are at present adopted. In respect of thermal power projects and transmission projects a feasibility/project report (termed as Detailed Feasibility Report in these guidelines) is prepared for technoeconomic clearance and investment decision. This is to be followed by a Detailed Project Report subsequent to detailed engineering, placing of orders for main plant and equipment and firming up of cost estimates. In case of hydroelectric projects, preconstruction (advance action) activities may be sanctioned to provide infrastructure, conduct surveys and investigations, firm up project design parameters and prepare Detailed Project Report for techno economic clearance by Central Water Commission and Central Electricity Authority. The DPR comprises of technical details running into several volumes. After CEA's clearance, a brief project report is presently prepared (often in the shape of a draft PIB memo) for the purpose of investment decision by the Government. These Guidelines relate to this

document which is termed here as Feasibility or Detailed Feasibility Report. It is not intended to replace DPR with DFR. These guidelines only present information requirements for the DFR for the purpose of appraisal and investment decision by the Government. The nuclear power projects are outside perview of PIB and, hence, these guidelines.

1.7 The guidelines for power projects have been divided into three parts: A. Thermal Power Projects; B. Hydroelectric Projects and C. Transmission Projects. Chapter-2 of each part describes the information required for the Advance Action proposal. The Studies and Investigations required to be carried out in respect of various aspects for preparation of Detailed Feasibility Report (DFR) for investment clearance are given in Chapter-3. Chapter-4 deals with the presentation of DFR while Chapter-5 describes the information required for submission of the Revised Cost Estimates (RCE).

ANNEXURE - I

1. Compliance of Section 29 of ES Act, 1948 in regard to notification of the scheme in State Gazette and local Newspapers.

2. Confirmation from State Authorities for acquisition of proposed land.

3. Rehabilitation and Resettlement Plan.

4. Confirmation of the State Authorities and CWC/Min. of Water resources on the availability of required quantity of water for cooling and consumptive use.

5. Clearance from State Pollution Control Board.

6. Clearance from National Airports Authority for tall structures.

7. Confirmation by Railway Authorities regarding railway siding facilities and for transportation of coal from Mines to Power Station site.

8. Environment clearance from Min. of Environment and Forests.

9. Confirmation on the availability of fuel from Deptt. of Coal/Ministry of Petroleum & Natural Gas.

10. CWC clearance for Hydro-power projects.

PART - A : THERMAL POWER PROJECTS

CHAPTER 2

ADVANCE ACTION PROPOSAL

Where the organisations like NTPC etc. have been delegated powers to incur expenditure for taking advance action without seeking approval from government as specified in the memorandum of understanding (MOU), these organisations may take up advance action in respect of projects to be undertaken within the monetary limits as indicated in the MOUs.

CHAPTER 3

STUDIES AND INVESTIGATIONS

3.1.1 The adequacy of a Detailed Feasibility Report (DFR) as a basis for investment decision is largely determined by the thoroughness of studies and investigations that have gone into the preparation of the Detailed Feasibility Report. In view of peculiar nature of the power projects owing to their inter- connectedness within the power sector and their integration with the energy sector and overall development, the studies and investigations have to be undertaken with the object of selecting least cost option' among the various alternatives so as to achieve desired benefits in the form of power generation and transmission.

3.1.2 In case of the power projects, the studies and investigations are concerned with the establishment of the need of the project for a particular region/state, choice of technology, design, size, location etc., type of fuel required and its availability, water availablity, infrastructure available and required to be created,transportation of fuel, geophysical conditions, river flow data, power evacuation arrangements, route survey for transmission lines, environment impact and other project specific studies and investigations etc.

3.1.3 Based on the above studies and investigations, a Detailed Feasiblity report is prepared. After the project is approved, the orders for main plant and equipment placed, funding arrangements tied, and detailed engineering conducted, a Detailed Project Report indicating the firmed up cost estimates and project implementation schedule is prepared. Between DFR and DPR stage, there may be some further studies required to improve information about site conditions and other project parameters.

3.2.0 The Studies and Investigations required to be under taken for Thermal Power Project (coal/gas based)are listed below:

a) Demand Analysis;

b)Availability of coal and required rail linkages/gas requirement and supply ;

c) Availability of cooling water;

d) Adequacy of transmission facilities;

e) Site

f) Basic engineering;

g) Environmental Impact Assessment.

h) Fly ash disposal (for coal based plant only)

i) Combined or open cycle (for gas-based plants only)

3.3.0 DEMAND ANALYSIS :

3.3.1 The demand analysis is concerned with the estimation of medium and long term demand availability of power so as to establish need for investment in new projects. Demand forecasting for power is an elaborate and continuous exercise undertaken by the Planning Commission (PC) and the Central Electricity Authority (CEA). The projections of both normal and peak demand and energy demand and availability are made available by the Annual Power Surveys at the national, regional and state levels. These forecasts generally cover the peak and energy demand for a period upto 20 years. If the time span for which forecasts are required for the project extends beyond the period for which the CEA/PC forecasts are available, the growth rate implicit in the CEA/PC forecasts should be used for the extrapolation.

3.3.2 The Detailed Feasibility Report (DFR) should be based on whatever is the currently agreed demand forecast used by the CEA and the Planning commission. The demand and availability gap for power and energy in a particular region/state need be analysed 'with project' and 'without project' situations considerng the availablity from existing, ongoing and sanctioned schemes from hydro, thermal and other sources.

3.4.0 COAL AND COAL TRANSPORTATION :

(for coal based thermal power projects only)

3.4.1 The coal linkage for the proposed thermal station has to be estabilished and the studies and investigations must establish the following :

i) Total potential of linked coal fields, proved reserves, yearwise production programme, expected calorific value and availability for proposed project;

ii) Yearwise requirements of the project;

iii) Parameters of coal from the particular block linked to the project covering moisture content, volatile matter, calorific value, ash content and other chemical and physical properties;

iv) Adequacy of coal-handling facilities at pit-head,whether washing/beneficiation will be required and if so, the parameters for this. The economics of coal-washing/ beneficiation will have to be studied and

v) Status of formulation and approval of specific mines linked to the project and their year-wise production programme.

3.4.2 The transportation arrangements for moving the coal will also have to be studied to establish the following:

i) Appropriate mode of movement for pit-head/load centred power stations;

ii) Road or the railway system;

iii) Available and planned capacity on the route and need for additional investments;

iv) Specific line capacity,works required to meet transportation requirements of the project and present status of formulation/approval of these works and

v) Route surveys for sidings, specification of handling arrangements at power plant.

3.5.0 GAS REQUIREMENT AND AVAILABILITY :

(for gas based projects only)

The gas linkages for the proposed gas based power plant has to be established and studies and investigations must establish the following:

i) Total requirement and availability of gas anticipated for the proposed project including linkage available,

ii) Arrangements required to make the gas available at site

iii) Yearwise gas requirement of the project both for peak and base load operations

iv) Quality parameters of gas: natural/associated, lean/rich, calorific value, other relevant physical and chemical properties, etc

3.6.0 COOLING WATER :

3.6.1 The water requirements of a large coal-based thermal plant may be nearly as large as the water delivered in a medium irrigation system. Hence, a close analysis of water availability is very necessary. The main sources of water supply for a thermal power project can be canals, reservoirs, rivers, natural lakes and oceans for coastal plants. Cooling water systems can be open cycle system or closed cycle system or a mixed one i.e., Hybrid system. Normal

requirements of circulating water as a thumb rule is of the order of 1.5 cusecs per MW for an open cycle CW system, the actúal consumptive requirement being 0.1 cusec per MW. For a closed cycle system, minimum make up water requirement for thermal power station will vary according to the chemical characteristics of the water.

3.6.2 Assessment of water availability for thermal plant requires preparation of working table round the year, taking into consideration the following factors:

i) Source of water i.e. River, Canal or Ocean;

ii) Its nature, perennial or not;

iii) Yearwise flow data for the last ten years, catchment area, run off co-efficient etc., rainfall intensity and inflow into the river due to surface run off. (The study should give proof of availability of required quantity of water for 100% reliability);

iv) Design flood, flood routing studies, requirements for low flow augmentation, etc. ;

v) The study of shape of river at the point of water drawal and for few kms. upstream and downsteam of the plant to cover any non-uniform nature of the river. River profile and cross section, low flow discharges and depth data, navigation details, problems of bank erosion, aggradation, degradation and meandering of river, river training works etc;

vi) Any existing structure, water spread for the nearby agricultural land and its crop pattern if any, in case of irrigation canal already existing/proposed in the vicinity of proved site, details regarding flow data irrigation pattern and location of c/s regulator etc., are required;

vii) Ground geology of the area specially alongwith the river bank, structures up-stream and down-stream site of the power plant;

viii) Any commitment for other industries, power plant, or irrigation and quantum of their requirement, future projections etc., are also to be studied;

ix) Commitments from concerned authority in connection with the drawal of water as well as for consumption for the present as well as future stages of the power plant;

x) Where thermal power project is located on the bank of reservoir, the surface area of water spread for different water levels of reservoir round the year would also be required for establishing the possibilities of pond cooling at heat sink;

xi) Clearance from CWC/Ministry of Water Resource for availability ofwater and interstate aspects need be obtained.

xii) For thermic calculations of pond cooling, an area versus capacity curve of the reservoir/pond is required and other data like ambient temperature, reservoir water temperature and velocity, wind velocity, dry and wet bulb temperature, inflow and outflow from reservoir requires to be collected;

xiii) In case the source of water is an ocean, the maximum and minimum tide level has to be established and geological studies are also required to be carried out to assess problems of littoral drift deposit;

xiv) If ground water source is utilised, quantum has to be assessed alongwith its reliability as well as availability and filtration characteristics of the soils in the recharge area and

xv) Water quantity analysis indicating both chemical and biological quantities, temperature and other quality parameters.

3.6.3 In case of gas based thermal power plants with combined cycle mode of operation, the requirement of cooling water for steam generation part has to be dealt with in similar fashion as is the case with coal based thermal plants.

3.7.0 TRANSMISSION FACILITIES :

A thermal power project will need transmission capabilities for evacuating power. In order to provide a basis for planning such facilities the studies and investigations required for associated transmission system and the agency responsible should be indicated.

3.8.0 SITE :

3.8.1 Site-selection: While selecting a site for the project, guidelines issued by the M/o Environment and Forests should be taken into account. It is advisable to interact with that Ministry from the very initial stage of site studies and selections.

3.8.2 Site Conditions: The preliminary investigations that are required are as follows:

i) Topographical survey should be carried out over a broader area and should include transfer of Bench mark dividing the entire area in regular grid of 200 m x 200 m, fixing the RCC grid pillars on grid points with trenches such as grid number, reduced level etc., plotting the contours at 0.5 M interval and all permanent features are to be indicated such as roads, railways, nallahs, rivers, ponds, wells and houses etc.

ii) To firm up intake point for the CW system, three cross sections for river should be taken a) Tentatively reconnoitered point, b) One upstream of it and c) One downstream of it. River cross section should be taken at the highest flood level. The spacing of spot levels should be kept as 25 M for the portion normally above water level, 10 M for portion getting submerged during rising stream and 5 M in the water borne river bed. On these basis exact point for CW system intake should be decided, and

iii) After fixing plant layout, intake and discharge point corridor survey should be carried out as follows:

a) Route alignment survey and

b) Cross section at every 50 M intervals along with centre line of the alignment and in general should extend 75 M on either side of the centre line. Spot levels should be taken at 10 M interval.

3.8.3 Soil Investigations: The proposed plant area should be made into grids of approximately 200 M x 200 M and the soil investigation should be planned so that the stratification of entire plant area alongwith major soil parameters required for assessment of the choice of the function and all important structures are obtained. This comprises the following:

i) Bore holes should be drilled upto 20 M depth or refusal whichever occurs earlier and standard cone penetration test should be performed at 2.0 M intervals. From the bore holes soil should be collected for performing laboratory tests. Minimum 15 nos. of bore holes should be drilled;

ii) 15 Nos. of dynamic cone penetration tests should be performed;

iii) 10 Nos. of static cone penetration tests shoud be performed;

iv) 5 Nos. of plate load tests should be carried out;

v) Field permeability tests should consist of

a) 5 Nos. variable head tests and

b) 5 Nos. constant head tests and 20 Nos. packer tests;

vi) Ground water table fluctuations should be recorded by

a) 5 No. stand pipes and

b) installing 5 No. piezometers;

vii) 10 Nos. excavating trial pits should be dug;

viii) Drilling upto 75 metres should be done in rocky strata and boring with core recovery should be carried out and content. optimum moisture content, maximum dry density, bulk density of soil, shear strength parameters and consolidation characteristics, chemical, analysis of soil and water for assesment of harmful constituents.

3.8.4 Sub-soil exploration should also be taken up to find out the water table in the area. This will help in determining the extent of excavation required or if any pile foundations are required depending upon the sub-soil water, type of soil, etc.

3.8.5 Investigations relating to seisemicity in the area and studies relating to earthquake considerations should also be carried out and data for the same should be included in the feasibility report.

3.9.0 BASIC ENGINEERING :

A certain amount of basic engineering is necessary to firm up project parameters without which reliable cost estimation is not possible. The basic engineering should cover the following elements:

i) Estimates of land requirement for plant area, township area and ash disposal area;

ii) Quantum of earthwork and other land development activities;

iii) Type of foundations required and special civil engineering requirements due to nature of the site;

iv) Plant layout;

v) Sizing of major items of equipment;

vi) Basic parameters for boiler design taking account of expected coal quality;

vii) Broad specification for other items of equipment;

viii) Cooling water system, whether it is open or closed cycle, pond cooling or tower cooling, etc.

ix) Location and design of headworks or diversion works for water intake, if relevant and

x) Sub-station and transmission system configuration.

3.10.0 ENVIRONMENT IMPACT ASSESSMENT:

For projects of capacity exceeding 500 MW, a datailed Environmental Impact Assessment (EIA) is required by the Ministry of Environment and forests as per their guidelines. A minimum of one year baseline data is necessary for detailed EIAs. In order to obtain environmental clearances, baseline data is necessary within an area of 10 kms. radius of the proposed site in the areas of land use, water use, demography, soils, hydrology and water quality, meteorology and air quality, terrestrial and aquatic ecology and noise.

3.11.0 FLY ASH DISPOSAL :

(for coal based plants only)

For coal based thermal power generation proposal, specific proposals regarding maximum utilisation of fly ash generated by the TPS alongwith their costs should be included in the DFRs as per the guidelines of the Department of Power.

3.12.0 OPEN OR COMBINED CYCLE :

(for gas-based plants only)

For gas-based plants,depending upon the characteristics of the load and gas supply it is necessary to study whether open or combined cycle plants will be more suitable.

CHAPTER 4

DETAILED FEASIBILITY REPORT

4.1.0 The studies and investigations suggested in Chapter-4 often generate several investment options which are worth considering. On the basis of the preliminary analysis of these options, a feasible option is selected. The selected option is developed into a project and Detailed Feasibility Report (DFR) is prepared for further processing and seeking Government's approval. In this report a detailed description of the project parameters based on the studies and investigations, is to be given to enable the appraising agencies to evaluate the technical feasibility and financial & economic viability of the proposed project. The information about the project to be provided in DFR should be adequate and reliable. The details of information required to be furnished for a Thermal Power Plant have been discussed in the following paragraphs.

4.2.0 The information required to be presented in the DFR for a thermal power plant is listed below :

i) Need for the Project

ii) Project Description (Technical Aspects)

- a) Location, Site and Land
- b) Choice of Power Plant Capacity and Unit size
- c) Fuel Requirement and Availability
- d) Equipment and Construction Requirements
- e) Manpower Requirements
- f) Arrangements for Evacuation of Power
- g) Cooling System
- h) Ash Disposal
- i) Linked Projects

iii) Organisational and Management Aspects

- a) Implementation Plan
- b) State of Preparedness
- c) Infrastructural Backup

iv) Environment Aspects

v) Project Costs

- a) Capital Cost Requirements
- b) Operational Cost Requirements
- c) System Costs

vi) Cost Effectiveness Analysis

vii) Sensitivity Analysis

4.3.0 The details under each of the above items have to be furnished and the salient features of the project are to be given in format DFR-1.1.

4.4.0 NEED FOR THE PROJECT :

4.4.1 Demand Analysis:

The need for creation of additional generation capacity is to be established on the basis of demand analysis of power and energy (para 3.3.1 & 3.3.2) for the concerned region/state. In the detailed feasibility report (DFR), it is expected to provide wider perspective of the power sector and explain how the project fits into the overall framework of power development plans of the country and concerned region/state. Relevant information is to be provided as per formats DFR-1.2 and 1.3.

4.4.2 Alternatives Analysed:

In view of the existence of strong interdependence among power projects, it has to be ensured that the proposed project represents the most optimal solution for meeting the deficit. The alternatives available in terms of projects which may have been either formulated or identified but not formulated for meeting the deficit as projected by the demand analysis, may be listed and the choice of the proposed project in relation to available alternatives has to be justified. The above justification would have to be based on the relative merits and demerits (qualitative and quantitative analysis) of different modes of generating power viz. nuclear, hydro, thermal etc. and establish the case for the chosen mode of generation. Further, within the selected mode of generation, the analysis of alternative in terms of their location, the analysis of design, fuel availability and transport, infrastructure, impact on environment, capital and operating costs, system costs, funding arrangements, possibility of external assistance etc. has to be presented so as to indicate that the selected project is the best among available alternatives. Details are to be furnished as per formats DFR-1.4 - 1.6 for each alternative.

4.5.0 PROJECT DESCRIPTION (Technical Aspects) :

4.5.1 Location, Site, and Land:

Location of the plant, accessibility of site by rail, road etc., distance from major towns/cities should be indicated. Necessary maps should be provided. A break-up of total land requirement for different facilities such as generation, switchyard, township, ash disposal, provision for furture expansion should be furnished. The availability of land, its present usage, any financial or organisational implications in terms of resettlement or on employment should be brought out. The status of land (whether Government etc.)should also be given. The status of acquisition and commitment of State Government towards making land available for the project should be mentioned. The surface features of land, relative level, contour maps should be enclosed. Alternatives considered in regard to location and site and comparative analysis underlying the choice of location should be furnished. Particular emphasis should be placed on describing suitability of site from seismic and environmental angle. A schematic diagram of facilities and plant layout should be given. The DFR should contain a map of the area and major infrastructural facilities like, rail, road, port etc. This should be indicated on a suitable scale. Studies and investigations completed relating to these items should be indicated together with conclusions drawn from these.

4.5.2 Choice of Power Plant Capacity and Unit Size:

Having established a case for additional generation capacity, the rationale for project scale (total plant capaicty) should be provided. If the present proposal forms one phase of an ultimately envisaged development, it may be explained as to how the ultimate project capacity has been conceived and why this should be implemented in a phased manner. The proposed timing of different phases of project should also be explained. Further, the precise choice of unit size as well as mix of units must be explained in the light of economies of scale, indigeneous manufacturing capacity, etc. Thereafter, the technical specifi cations (temperature , pressure, flow, firing, heat rates etc) of different components such as turbo-generators etc., should be

indicated. Specific advantages of these specifications in the light of the latest available technology should be mentioned. Any studies and investigations which may have been carried out in the context of this sub-system should be furnished.

4.5.3 Fuel Requirement & Availability:

a) For a coal (or lignite) based thermal power plant, source of coal, quantitative and qualitative requirements and availability, the status of mining project and its timing, the arrangement for coal loading, transport, coal receipt, unloading, storage, grinding etc. should be described and details of speci fication, capacities and number of each main equipment including those to be used as standby should be provided. The possibility of raising the plant load factor by improving the quality of fuel should be explored and reported in the DFR. Similar details for fuel oil or other fuel required may also be furnished. Alternatives formulated and analysed in respect of each component should be discussed and the choice justified. For instance, coal transport by ropeways or conveyor or slurry pipeline or railway may be possible. The comparative economic analysis should be presented.

b) In case of Gas Turbines using gas or liquid fuel, the qualitative characteristics of desired fuel and the close alternative alongwith the estimated quantity needed for peak/base load operations should be specified. The agreement for supply of required quantity of gas/liquid fuel with the concerned agency need be clearly stated. Besides, the arrangements for transport of fuel to the site, viz, pipelines, storage facilities to be created etc. should be listed. As in case of coal, the alternatives need be analysed and choice be justified economically.

4.5.4 Equipment and Construction Requirement:

a) The DFR should contain a complete list of capital equipment (by type and size) of the main units of the proposed plant, requirements of buildings and structures by type and size and a broad plant layout. It should give justification for the choice of size and specifications proposed for important items of equipment and plant structure.

b) The DFR should also indicate the possible source of supply of capital equipment, construction services, engineering services etc. This is particularly important in the case of imported items. For imported items which are of high value or are critical to operation of plant, alternative sources of supplies should be indicated in order of performance.

c) The level of township statisfaction which has been assumed in the project cost may be indicated together with the details of the various types of houses which are proposed to be constructed as laid down by the Bureau of Public Enterprises (BPE). The precise location of the project and township and the distance between them may also be indicated. If the project authorities are planning to seek a separate sanction for the township at a later date, the years in which they may come up for such a sanction together with the likely requirement of funds in those years may have to be foreseen at the investment decision making stage itself as per the instructions in vogue.

d) Choice of equipment: The DFR should also deal with the analysis underlying the choice of equipment and specifications of the construction requirements. The DFR should outline the construction methodology and technology to be used, including capital v/s labour intensive options considered, construction equipment to be used, use of new materials planned, innovations in methodology, quality assurance, improvements planned over present construction methodologies/technologies and their likely benefit on project construction time and cost.

4.5.5 Manpower Requirement:

The DFR should indicate the unitwise and category-wise requirement of personnel for the project and plan for induction of different categories of personnel. It should also indicate

the arrangement proposed for training in-plant and outside. If the project involves redundancies, it should indicate plans for redeployment of the staff rendered surplus. The DFR should indicate the steps envisaged for avoiding retrenchment or redeployment of construction staff after completion of construction, wherever necessary. The DFR should also indicate the organisational structure envisaged for the project after it is in production, and the time scdedule for filling up of key posts, particularly that of the Chief Executive. It should also indicate the arrangements contemplated for ensuring continuity in top management.

4.5.6 Arrangements for Evacuation of Power:

The arrangements to be made to evacuate power from the generating station to the regional grid/consumer need be specified in terms of voltage of transmission, transmission lines required for inter regional and intra regional power transfers, strengthening of transmission and distribution system of the beneficiary states, expected T & D losses, right of way, agreements with beneficiary states/ consumers concerning sale of power etc.

4.5.7 Cooling System:

The rationale for choice of cooling system, whether closed circuit or once through, cooling towers v/s cooling ponds or a combination etc.,requirement and availability of water (after meeting other commitments on the source of water etc.) for consumptive use and non-consumptive use should be provided. The critical period for the sources of water should be taken as the basis. (For instance in the case of irrigation seasons). The ownership details and commitment of owners to supply required quantity of water, should be provided. Once again any studies or investigations which may have been completed and which form the basis of some of the decisions in regard to this sub-system should be indicated.

4.5.8 Ash Disposal:

Estimated annual generation of ash, location of ash disposal sites, adequacy of area for a reasonable period, arrangements for collection, mixing and transport of ash, facilities for disposal of ash, etc. should be disuccsed to a fair degree of detail. Specific plans for maximum utilisation of ash should be outlined.

4.5.9 Linked Projects:

Public Investment Proposals are by their very nature such that they involve strong backward and forward linkages which are critical to the successful implementation and operation of the plant. Ideally, all these inter-linkages (or externalities) should be internalised. However, this may not always be possible as these linkages may or may not be with other projects within the jurisdiction of the agency which is sponsoring the power project. For instance a thermal power project requires coal as an input and this coal is sometimes located farway from power plant location so that transportation of this coal by railway or other modes of transport is necessary. Similarly the plant may rely for availability of water for cooling purposes on another project which would require to be undertaken by some State Government agency. While the situation may or may not be more complex depending on each case it is expected that the nature of linkages and critical dependence of the project on these linked projects is understood. The system cost of linked projects is covered in para 4.8.13.

4.6.0 ORGANISATIONAL & MANAGEMENT ASPECTS :

4.6.1 Implementation Plan

a) The feasibility report should indicate the activity- wise phasing of construction preferably in the form of a bar chart or a master control network (PERT/CPM) diagram. Quantitative information on the phasing of material and labour requirements during construction should be specified. The report should also indicate the timing of deliveries of imported and indigeneous equipment. The physical specification of phasing given in this chart should be consistent with the phasing of expenditure given in the section on capital costs. To the

extent possible the report should indicate the targetted levels for pouring of concrete and erection of equipment structures per month.

b) In many cases, synchronisation of the generation units and the commercial operation is dependent on certain allied items the completion of which is handled by other agencies. While indicating the phasing of construction activities of the project the phasing of inter-related facilities should also be clearly indicated so as to present an integrated view of all the connected items. Steps which could be taken to reduce the period of construction should also be indicated.

c) The DFR should also deal with the types of problems that may affect the phasing of construction. For example, possible difficulties in the movement of oversized components, special requirements of skills for onsite fabrication, etc. It should indicate the arrangements envisaged for housing workers during construction and for ensuring the supply of utilities during construction.

d) The report should also deal with the proposed capacity build-up for generation. The report should try to identify the types of problems that could arise during the capacity build-up stage particularly with respect to possible equipment failures, non availabilities of coal/gas in required quantity/quality, etc. In this connection the report should set out the experience of other plants of the implementation agency and analyse this in the context of its own anticipations.

e) The DFR should provide organisational structure intended for implementation of the project.

4.6.2 State of Preparedness

The following information may have to be furnished by the project authorities to illustrate their preparedness for the implementation of the project under consideration.

a) Studies & Investigations:

How far the required studies and investigations have been completed leading to, in general, a better prepared project?

b) Mode of implementation:

i) Whether the project will be implemented departmentally or through a turnkey contractor/various contractors or both. If so, whether the turnkey packages have been chosen as homogeneous parts for facilitating easy supervision, monitoring, fixing responsibility for non-attainment of performance, targets and even carrying out a disaggregated cost benefit analysis wherever possible/required.

ii) If the project is to be implemented by the departmental personnel, whether adequate number of key personnel of required experience and calibre are available? If fresh recruitment is to be resorted to, whether it will be possible to get such requisite manpower within the stipulated time? Whether the present recruitment rules and procedures would permit the same.

iii) If the project is to be implemented by hiring the services of a turn-key contractor, the standing of the contractor, his track record in the implementation of similar projects, major works on hand, capability to mobilise the requisite resources at a required time so that the project does not slip, may be explained.

iv) What is the progress in the acquisition of basic engineering and performing the detailed engineering work in connection with the project?

v) How far the material resources have been estimated and the tender documents made ready so that the notice inviting tenders could be released as soon as the investment decision is taken.

vi) Whether detailed schedules have been made for the various activities forming part of the PERT Chart used for the estimation of the gestation period. A copy of the Chart may be furnished. How will the project be monitored particularly for the activities on the critical path?

c) Infrastructural Back-up

Whether the following infrastructural facilities have been acquired/tied-up:

i) Allotment of land and problems associated therewith;

ii) Whether the project site is well conncected by a road/highway of the required standard. If not, what steps are being taken to acquire/augment this facility?

iii) Whether there is a need for a railway siding during the construction stage, for easy movement of plant and equipment upto the site by rail? If so, what steps have been taken to ensure that the siding will be available in time;

iv) In case the project is heavily dependent on a port for the import of capital goods, coastal movement of coal etc., what steps have been taken to augment them?

v) Will the requirments of water during construction and cooling water be available? Does it involve any laying of pipe-line to bring the required quantity of water from a nearby river/stream etc.? Will it be adequate to run the plant/meet the requirement of township after the plant is commissioned?

vi) Arrangements for making construction power available for the project specifying need for laying of transmission line, if any.

vi) Whether any temporary housing/warehousing have been provided wherever circumstances warrant the same?

vii) If the project will displace any member of a tribal community, its implications may have to be very clearly gone into. In such cases special approvals may be necessary from the State Government and the Ministry of Home Affairs.

4.7.0 ENVIRONMENTAL ASPECTS :

4.7.1 The project will have to be cleared from the ecological and environmental point of view by the Ministry of Environment and Forests of the Government of India as well as the Environmental Control Boards of the respective State Governments. In view of this, the individual requirements of these organisations will have to be foreseen and complied with. The environmental impact of the project and the measures envisaged to prevent environmental deterioration and hazards should be fully discussed in the DFR together with the cost implications. The environmental clearance should be obtained before the project is submitted for Government approval and relevant costs of environment related aspects separately mentioned in the cost estimates.Information on the following items are required for this purpose:

a) Site plan indicating location of different units, coal handling plant/gas storages, township, green belt etc.

b) Safeguards provided for improving emitted air quality, necessity of desulphurisation plant, ash utilization, heating effect on water resources, afforestation programme.

c) Rehabilitation plan.

d) Pollution Control systems proposed and their efficiency.

e) Permission from the State and Central Pollution Control Boards and State Department of Environment.

4.8.0 PROJECT COST :

a) Capital Cost Requirements:

4.8.1 In case of a power plant, the Capital Costs are essentially those costs which are incurred for creation of fixed assets such as Power Plant and associated facilities. A Power Project may be implemented in more than one stages and involve expenditure in foreign exchange. Summary of capital cost for major items of works appertaining power plant and associated facilities under each stage, both in terms of Indian Rupee and foreign exchange, is to be furnsihed in the format DFR-2.0.

4.8.2 The capital cost should include all items of expenditure required to be incurred before the commencement of commercial operation of the plant. Apart from expenditure on fixed assets, the cost estimates must also include township, engineering and administration costs as well as interest during construction (IDC), working capital margin etc, costs of training, expenditure on testing and stablization, staff, etc. After commencemnt of production, capital costs will be incurred when some items of equipment are replaced. Basically the intention is to analyse the profitability of projects over a single life time and the cost-estimates presented should not allow for a large scale rehabilitation of the plant. However, there will be some items of equipment e.g. vehicles etc., which may require replacement during the economic life of the project as a whole. These costs should be estimated and be shown in the respective year of their occurance. It is necessary that replacement expenditure should be distinguished clearly from repair and maintenance expenditure. The distinction will not always be easy to make but for practical purposes the distinction can be considered capital expenditure under tax laws. Estimates of repair and maintenance expenditure should be presented under operating costs. The enterprise should also develop a uniform way of coding items of expenditure under all heads.

4.8.3 The project authorities should adhere to the norms approved by PIB regarding admissible level of contingencies. Further, as per PIB procedures, no built in provision for forward escalation in the Capital Cost estimates is allowed. Hence the cost estimates, should correspond to a fairly recent date perferably not more than six month's old.

4.8.4 The major assumptions forming the basis of the capital cost estimates should also be listed in the text alongwith presentation in the relevant format DFR-2.0. The major itemwise details of cost estimate is to be covered in formats DFR-2.1 to 2.6. It is desirable that following information should also be presented in the text:

i) The reference price level of estimates;

ii) Currencies and exchange rates and their reference period

iii) Level of contingencies

iv) The level of inventories of coal/gas, fuel oil, materials, spares etc.

v) Scaling factors used for scaling up/down cost of any major equipment/item;

vi) The status of engineering and design on the basis of which the estimates have been framed and

vii) Rates and quantities of items on the basis of value analysis.

viii) Debt Equity Ratio, interest rates.

ix) Customs duty, Excise duty , Sales tax etc.

4.8.5 The cost on account of environmental safeguards including pollution abatement, rehabilitation, afforestation etc. would need to be estimated with the help of concerned authorities and the cost involved may be shown in the capital cost estimates as a separate item. **(DFR-2.7)**

4.8.6 Format DFR-2.8 has been designed with a view to collect information about the working capital requirements. Based on this, the margin money for the working capital required for the project and forming a part of the capital cost estimates will have to be determined for the purpose of sanction for the investment. However, for the purpose of viability analysis the interest on borrowed portion of the working capital should also be reflected in the separate column.

4.8.7 The information on the capitalised interest (on loan portion only) during construction should be furnished in detail (DFR-2.9) with the necessary back up calculations.

4.8.8 The DFR should also deal with the capital cost phasing of the project taking into account the various critical activities, requirements of resources, terms and conditions at which these resources could be mobilised, budget for the funds and arrive at an yearly requirements of funds for execution of the proejct.

b) Operating Costs Requirements

4.8.9 For the purpose of project appraisal, operating costs are essentially those costs which are incurred after the commencement of commercial production, excluding costs incurred for repairing and maintenance of capital equipment. The formats DFR-3.1 to 3.2 have been designed to collect information about operating costs in the form required for social profitability and financial appraisal.

4.8.10 It will be necessary to give details of the present operating cost by major components.

4.8.11 The operating costs comprising variable and fixed costs, are to be presented in the format DFR-3.1. The quantitative requirements of various inputs based on established norms and unit rates, wherever possible, are to be furnished alongwith their estimated costs. The cost data is to be furnished both in financial and economic terms for full capacity generation for a full year based on the prices prevailing in the reference year.

4.8.12 DFR-3.2 has been designed to collect data on labour requirements and labour costs. The coding of labour by category suggested here could be modified to suit the requirements of the enterprise. However, as far as possible the modifications should take the form of an addition of such categories rather then a complete change in the classifications suggested here.

c) Total System Costs

4.8.13 The system costs are incurred in the creation of the required complementary facilities by the other organisations which are not owned by the enterprise. But, nevertheless, these are required for the smooth construction/operation of the project. The purpose of this section is to obtain information on identity of these linked projects, the agencies responsible for these, the total cost of these projects, the corresponding provisions in the plans, the cost sharing arrangements, if any etc. Information is to be given in format DFR-2.10.

4.9.0 COST EFFECTIVENESS ANALYSIS :

4.9.1 Cost Effectiveness Analysis is undertaken to determine whether proposed investment in the proposed project is consistent with overall national and sectoral objectives and represents the best means of achieving the intended benefits.

4.9.2 The benefits of power projects are determined in terms of additional availablity of electricity and net additional energy flow through the system comparing the "with" and "without" project situations. Considering interconnected nature of power projects,system analysis of project's impact would be the appropriate way of estimating benefits accruing to the power utilities and consumers. However, in view of considerable difficulties in getting data for system analysis, the benefits of a power project are treated as non quantifiable and Cost Effectiveness Analysis is carried out in terms of unit cost of generation.

4.9.3 Financial Cost of Generation:

For the purpose of appraisal, the capital cost and the operating costs are worked out at market prices. The formats DFR 4.1 - 4.3 have been designed to assess financial position of the enterprise. Cashflow is prepared for the projected cost and the generation/flow of energy in each year of their occurance covering entire economic life of the project. The costs and the units generated are discounted at a rate of discount specified by the Government to workout unit cost of generation (DFR-4.4). It may be added that cost of generation by conventional method would continue to be calculated alongwith calculation of cost of generation by DCF method, as per requirement of the CEA for techo economic clearance purposes.

4.9.4 Economic Cost of Generation :

The objective of the economic analysis of power project is to determine the cost of generation and transmission at their true resources cost to the economy as the financial cost of generation/transmission may not reflect the true cost of power to the economy on account of distortions inherent in the market prices. While working out the economic cost of generation/transmission, both the costs and power generated have to be valued at their true resources cost. This process involves removal of taxes and dutics from thc costs as thcy arc not thc costs to the society. Similarly, the subsidies are also not allowed as they are only transfer payments. The foreign exchange being scarce , there is certain amount of premium on it. All the imported items such as plant and machinery have to be valued at CIF prices. The coal, fuel oil or other liquid fuel oils have to be valued at their resources cost which may be the economic cost of production plus transportation cost and international prices in case of gas or petroleum fuels. Apart from adjustment in the costs, the economic analysis also covers the impact of the proposed project on the power system. As a result of the proposed project coming into the stream, there may be some existing power plants which may be backed down in the interest of optimal operation of the power system resulting in resources cost saving and additional energy availability from the system besides improving the quality of supply in the system. Efforts should be made to bring out the possible reduction in operating costs for the rest of the system on account of addition of the proposed project.

4.9.5 Likewise the financial analysis, cash flow for the economic analysis will also be prepared on the similar lines covering the capital cost and operating cost in the economic terms and the proposed units generated/energy flow in the system for each year during the life of the project. These cash flow will be discounted at a rate specified by the Government to arrive at the economic cost of generation.

4.10.0 SENSITIVITY ANALYSIS :

It is assumed that the DFR is prepared on the basis of, as far as possible, realistic assumption of demand supply gap, capital cost estimates, gestation period, operating cost estimates, production build-up, turnover, economic life, etc. But, the project is in the nature of a venture which means exposure to chance and some of the assumptions/estimates may go wrong. Experience shows that in several areas assumptions have often gone wrong. It is, therefore, necessary to carry out sensitivity analysis to indicate the project's financial viability when there are changes in the estimates of key parameters such as capital costs particularly the foreign exhchange component, cost of fuel etc. The extent of changes in the key parameters should be based on the past experience relating to the sector.

THERMAL POWER PROJECTS

DFR - 1.1

SALIENT FEATURES OF THE PROJECT

A. Indentification Characteristics

1. Name of the project:
2. Location (District/State)
3. Implementation Agency
4. Department/Ministry sponsoring the project
5. Sector
6. Objectives/nature of project (Grassroot/ expansion/ replacement/ rehabilitation/modernisation).

B. Physical Characteristics

1. Project Capacity Stage-I Stage-II Stage-III

i) Generation (MW)

No. of Units /size

ii) Transmission Required (may form part of linked projects)

- Voltage level
- SC/DC
- Line length (CKT,Km)
- Substation (MVA)

2. Fuel Requirement

a) Coal/Lignite based projects

- Source of fuel *
- Annual requirement of coal/Lignite
- Calorific value

* Specify linkage as well as the status of the linked project (whether existing mine, new mine already sanctioned, new mine yet to be sanctioned etc.)

b) Gas based projects (base load/peak load)

- Total linked quantity of gas
- Annual requirement of gas
- Calorific value of gas
- gas quality : lean/natural/associated.

(contd.)

SALIENT FEATURES OF THE PROJECT

3. Coal Transportation System

- Rope way
- Conveyor
- Rail *
- Pipeline

* Specify whether MGR, etc.

4. Gas, Supply System

- Length of pipeline required to be laid upto the point where main gas pipeline is to be connected (Kms.)
- Gas storage capacity (M3)
- Area earmarked

5. Cooling Water System

- Quantity required
- Type of cooling
- Source of water *
- Arrangements

* Specify the ownership and whether the owner has made any commitment to supply of water to the project.

6. Ash Disposal (for coal based plants only)

- Distance
- Area earmarked
- Storage capacity (No. of years)
- Possibility of utilisation in some industry (specify if any)

(contd.)

SALIENT FEATURES OF THE PROJECT

7. Land

- Total requirement

(Include requirement for township, ash ponds, etc.)

- Availability

(Specify, whether Government land or privately owned (areawise), status of acquisition)

- No. of families affected/requiring rehabilitation
- Whether agriculture or non-agriculture

(Present use may be specified)

8. Additional Employment Generation (Nos.)

C. Financial and Economic Characteristics

1. Total Capital cost (Rs. Crores)
2. Foreign exchange component (Rs. Crores)
3. Exchange Rate:
4. Interest during construction (Rs. crores)
5. Working Capital Margin (Rs. Crores)
6. Funding arrangement for Indigenous Cost (IC) and FE
7. Total system cost (Rs. crores)
8. Base date of capital cost (month/year)
9. Annual operation and maintenance cost (at_____% cap. ut.)

(Rs. crores)

10. Selling Price (Rs./Kwh)

(contd.)

SALIENT FEATURES OF THE PROJECT

D. Evaluation Indicies

	Cost of Generation (Rs./kwh)
1	2
(i) Financial	
(ii) Economic **	

* This has to be worked out at a discount rate specified by the Government.

** With premium on foreign exchange and other shadow prices as specified by the Government.

E. Commissioning Schedule

a) Generating units

1. From the date of sanction to synchronisation of units _____ years _____ months.

2. From the date of sanction to commercial operation _____ years _____ months.

b) Transmission Lines

1. From date of sanction to commissioning _____years _____ months.

THERMAL POWER PROJECTS

DFR - 1.2

*

ANALYSIS OF DEMAND & AVAILABILITY OF POWER FOR THE _____REGION IN THE YEARS _____.

Item	Year @		Year @		Year @	
	Without project	With project	Without project	With project	Without project	With project
1	2	3	4	5	6	7
1. Installed Capacity (MW)						
2. Peak Demand (MW)						
3. Peak Availability (MW)						
4. Peak Deficit (MW)						
5. Energy Requirement(M.Kwh)						
6. Energy Availability (M.Kwh)						
7. Energy Surplus/Deficit (M.Kwh)						

* Basis of demand and availability (existing projects in operation and sanctioned projects) to be indicated.

@ Year: end of the current and next Five Year Plans and year of full benefits.

THERMAL POWER PROJECTS

DFR - 1.3

DETAILS OF POWER AVAILABILITY IN THE REGION

Region	First year of full benefits			
	Installed Capacity (MW)	Likely Benefits		Basis
		Peak Load (MW)	Energy (Mkwh)	
1	2	3	4	5
A. Existing Plants Total				
(in operation)				
Hydro				
Thermal				
Nuclear				
Total A :				
B. Sanctioned Projects				
.				
I.1 Hydro				
.				
.				
Sub Total I.1				
I.2 Thermal				
.				
.				
Sub Total I.2				
I.3 Nuclear				
.				
.				
Sub Total I.3				
Total B :				

(Contd)

THERMAL POWER PROJECTS

DFR - 1.3 (Contd.)

PLANTWISE DETAILS OF POWER AVAILABILITY

Region	First year of full benefits			
	Installed Capacity (MW)	Likely Benefits		Basis
		Peak Load (MW)	Energy (Mkwh)	
1	2	3	4	5
C. Cleared by CEA or DAE etc. but awaiting Govrnment Approval *				
I.1 Hydro				
.				
.				
Sub Total I.1				
I.2 Thermal				
.				
.				
Sub Total I.2				
I.3 Nuclear				
.				
.				
Sub Total I.3				
Total C :				
Grand Total : (A+B+C)				

* Assumptions on likely date of approval and gestation period may be stated.

THERMAL POWER PROJECTS

DFR - I.4

ALTERNATIVE PROJECTS IDENTIFIED FOR MEETING PROJECTED POWER DEFICIT IN THE REGION

Name of Project & Owner/ Region	Type of Project *	Present Status @	Capacity Envisaged MW	Estimated Cost Rs. crores	Likely date of Commissioning	Yearwise Likely Benefits # Yr1.. Yr2...
1	2	3	4	5	6	7 8
1.						
2.						
3.						
.						
.						
.						
.						
.						

* Whether Hydro, Thermal, Nuclear, etc.

@ Whether identified, formulated, under CEA's consideration.

\# Peak load availability and Energy availability.

THERMAL POWER PROJECTS

DFR - 1.5

ITEMWISE BREAKUP OF CAPITAL COST AND OPERATION & MAINTENANCE COST AND VALUE OF OUTPUT

(Separately for each Alternative)

Unit of measurement:

Base date (month & Year):

Exchange rate * :

Item	Unit	Qty.	Market Price	Financial Cost			# Economic Cost	
				IC	FC	Taxes & Duties in IC	IC	FC
1	2	3	4	5	6	7	8	9
A. Capital Cost								
1. Studies & Investigations								
2. Land & Civil Works								
3. Know-how & Engineering								
4. Plant & Equipment								
5. Project Management								
6. Commissioning Expenditure								
7. Environment Related Cost								
8. Margin Money for Working Capital								
9. Capitalised Interest During Construction								
Total (1-9) :								
Cost / Kwh _____								

(contd.)

THERMAL POWER PROJECTS

DFR - 1.5(contd.)

Item	Unit	Qty.	Market Price	Financial Cost			# Economic Cost	
				IC	FC	Taxes & Duties in IC	IC	FC
1	2	3	4	5	6	7	8	9
B. Operation & Maintenance at full capacity operation								
1. Fuels & Energy								
01								
02								
.								
2. Utilities								
01								
02								
.								
3. Labour cost								
01								
02								
.								
4. Repair & Maintenance								
5. Other expenses								
Total (1-5) :								
Cost / kwh : _____								

* In case a number of Foreign Currencies are involved the amount and the exchange rate assumed may be specified separately.

\# For all traded and tradable item, the economic cost would be fob / cif prices and internal transportation cost. For non-traded /tradable item, this will be social opportunity cost/economic cost of production/market price excluding taxes, duties and subsidies and any other transfer payments.

Note: IC indicates the indigenous component and

FC the Foreign component.

THERMAL POWER PROJECTS

DFR - 1.6

CASHFLOW STATEMENT FOR CALCULATION OF COST OF GENERATION

(Separate statements for financial and economic unit costs for different alternatives)

Alternative ..... Base date (month & Year) :

Exchange rate :

(Rs. crores)

YEAR	CASH OUT FLOW									Unit Generated (M.Kwh)
	Capital Cost			O & M cost			Total			
	IC	FC	Taxes and duties in IC	IC	FC	Taxes and duties in IC	IC	FC	Taxes and duties in IC	
1	2	3	4	5	6	7	8	9	10	11
1.										
2.										
3.										
.										
.										
N										
Total										

IC : Indigeneous Component FC: Foreign Component

Unit cost of generation: Financial _____, Economic_____

Note:

i)Interest during construction (IDC) will be exlcuded from cols.2 & 3. Depreciation will be excluded from col.5. Interest on Working Capital will, however, be included in col. 5.

ii)Recovery of salvage value is to be shown in N+1 th year. Replacementcost of capital nature,if any, not included in the annual O&M cost should be shown in the capital cost column against the appropriate years.

iii)For economic analysis the capital and operation and maintenance cost should be taken at their economic values (as given in DFR-1.6) and after using premium/ shadow prices for foreign exchange, labour, etc. as may bespecifiedbyPIB from time to time.

THERMAL POWER PROJECTS

DFR - 2.0

SUMMARY OF CAPITAL COST

Base date (month & year):

Exchange rate* :

(Rs. crores)

Statement No.	Item	Capital Cost			@ Basis of estimates	Degree of reliability within (+/-)....%
		IC	FC	Total		
1	2	3	4	5	6	7
2.1	Studies & Investigations & Preliminary Works					
2.2	Cost of Civil Works (including land)					
2.3	Know-how Engineering and Consultancy					
2.4	Plant & Equipment					
	2.4.1 Mechanical Equipment					
	2.4.2 Electrial Equipment					
	2.4.3 Control Instrumentation and DAS					
	2.4.4 Coal Transportation					
	2.4.5 Misc. tools & Plants					
2.5	Project Management (Administration)					
2.6	Commissioning Expenditure					
2.7	Environment Related cost					
2.8	Working Capital Margin					
2.9	Interest During Construction					
A.	Total Project Cost (2.1 to 2.9)					

(contd.)

(Rs. crores)

Statement No.	Item	Capital Cost			@ Basis of estimates	Degree of reliability within (+/-)....%
		IC	FC	Total		
1	2	3	4	5	6	7
2.10	Cost of linked projects					
2.11	Cost of unskilled labour (included in A.Total)					
2.12	Any other cost (specify)					
	Total System Cost:					

* In case the number of foreign currencies involved are more than one, the amount and exchange rate for each of the currencies may be indicated in the footnote.

@ TQ - Tender Quotation BQ - Budgetary Quotation

IH - In-House Cost Data CD - Consultants Data

IC : Indigeneous Component FC: Foreign Component

THERMAL POWER PROJECTS

DFR - 2.1

DETAILS OF THE COST OF THE STUDIES AND INVESTIGATIONS AND PRELIMINARY WORKS

Base date (month & year):

Exchange Rate:

(Rs. Crores)

Sl. No.	Studies and Investigations and Preliminary works	Cost of the Study/ Investigation			Agency responsible for carrying out the study/ investigation *
		IC	FC	Total	
1	2	3	4	5	6
1.	Demand Analysis				
2.	Coal/Lignite Availability & Transportation or Gas Availability and arrangements to make the gas available at site.				
3.	Cooling water Availability				
4.	Site selection, site conditions and investigations				
5.	Preliminary works				
6.	Basic Engineering				
7.	Fly Ash disposal				
8.	Open or combined cycle (for Gas Turbines only)				
9.	Environmental Impact				
10.	Others				

IC : Indigeneous Component FC: Foreign Component

* Indicate whether inhouse or outside agency.

THERMAL POWER PROJECTS

DFR - 2.2

DETAILS OF COST CIVIL WORKS

Base date (month & year):

Exchange Rate :

Sl.No.	Item	Unit	Qty.	Rate (Rs)	Amount (Rs. Crs.) IC	FC	Remarks
1	2	3	4	5	6	7	8
1.	Design, Engineering & Consultancy						
2.	Land & Land Developments						
	a) Land acquisition:-						
	i) Plant						
	ii) Other purposes (to be specified)						
	b) Preliminary survey, soil investigations etc.						
	c) Land Development						
	i) Excavation						
	ii) Levelling						
	iii) Internal roads and paths						
3.	Main Foundations						
	a) Main Building Foundations						
	b) Equipment foundation-concreting						
	i) Pile Foundation						
	ii) Raft Foundation						
	iii) Equipment Foundation						
4.	Cooling Water System						
	a) Inlet/Outlet Water Channel,duct						
	i) Excavation						
	ii) Concreting						

(contd.)

DETAILS OF COST CIVIL WORKS

Base date (month & year):

Exchange Rate :

Sl.No.	Item	Unit	Qty.	Rate (Rs)	Amount (Rs. Crs.) IC	FC	Remarks
1	2	3	4	5	6	7	8
	b) Pump House & Forebay						
	i) Excavation						
	ii) Concreting						
	iii) Building etc.						
	c) Makeup Water Pump house						
	d) CW Piping						
	i) Fabrication						
	ii) Erection						
5.	Main Building Structural steel						
	a) Fabrication						
	b) Erection						
6.	Main Building Super structure						
	a) Total concreting for Interflooring						
	b) Masonary for side walls						
	c) Roofing & clading						
7.	Chimney (ht)						
	i) Foundation						
	ii) Shell						
8.	Cooling towers						
	a) Excavation						
	b) Foundation						
	c) Shell						
	d) Fill						

(contd.)

DETAILS OF COST CIVIL WORKS

Base date (month & year):

Exchange Rate :

Sl.No.	Item	Unit	Qty.	Rate (Rs)	Amount (Rs. Crs.) IC	FC	Remarks
1	2	3	4	5	6	7	8
9.	Auxiliary Buildings						
	a) Foundation						
	b) Super structure						
	c) Clading						
10.	Coal Handling Plant						
	a) Excavation						
	b) Concreting						
	c) Structural Works						
11.	Ash Handling Plant						
	a) Excavation						
	b) Concreting						
	c) Structural Works						
12.	Water Treatment Plant						
	a) Excavation						
	b) Concreting						
	c) Structural works						
	d) Super structure						
13.	Fire Water Pump House						
14.	Switch Yard Civil works						
15.	Offsite						
	a) Fuel Oil handling						
	b) Compressed Air						
	c) Administrative Building						
16.	Township						

(contd.)

DETAILS OF COST CIVIL WORKS

Base date (month & year):

Exchange Rate :

Sl.No.	Item	Unit	Qty.	Rate (Rs)	Amount (Rs. Crs.) IC	FC	Remarks
1	2	3	4	5	6	7	8
17.	Miscellaneous						
	a) Roads & Bridges						
	b) Railway Sidings						
	c) Construction works for Water & Power						
	d) Other Works						
	e) Establishment audit and accounts						
	f) Training						
	g) T & P (including special)						
	h) Contingencies						
	i) Consultancy						
	j) Suspense Account						
18.	Total						

IC : Indigeneous Component FC: Foreign Component

(List of items may be suitably modified for gas based projects)

THERMAL POWER PROJECTS

DFR - 2.3

DETAILS OF KNOWHOW, ENGINEERING AND CONSULTANCY

Base date (month & year):

Exchange Rate:

Item	Rs. Crores
1. Indian Consultancy -IC	
2. Foreign Consultancy -IC	
FC	

IC - Indigeneous Component

FC - Foreign Component

BREAK UP OF PLANT AND EQUIPMENT COST

Base date (month & year)

Exchange Rate :

(Rs.Crores)

Sl. No.	Item	Cost of Equipment/ supplies				Inland Transport & Insurance	Erection charges		Others (to be specified)		Total	
		cif	Custom Duties & Other Taxes	Indigenous cost	Tax element in IC							
		FC	IC	IC		IC	IC	FC	IC	FC	IC	FC
1	2	3	4	5	6	7	8	9	10	11	12	13
A. MECHANICAL EQUIPMENT												
1. Boiler Package												
2. T.G. Package												
3. Coal Handling Plant												
4. C.W. Pumps												
a) Makeup Water Pumps.												
b) Auxiliary CW Pumps												
5. Water Treatment plant												
a) Pre Treatment Plant												
b) DM Plant												

(contd.)

BREAK UP OF PLANT AND EQUIPMENT COST

DFR 2.4(contd.)

Base date (month & year)

Exchange Rate :

(Rs.Crores)

Sl. No.	Item	Cost of Equipment/ supplies				Inland Trans-port & Insura-nce	Erection charges		Oth-ers (to be speci fied)		Total	
		cif	Custom Duties & Other Taxes	Indigen-ous cost	Tax ele-ment in IC							
		FC	IC	IC	IC	IC	IC	FC	IC	FC	IC	FC
1	2	3	4	5	6	7	8	9	10	11	12	13
6. Coal Transportation												
a) Track material												
b) Wagons												
c) Locomotives												
d) Signalling & Telecommunication												
e) MGR workshop												
f) Others												
7. EOT Crane												
8. Ash Handling Plant												
9. Fuel Oil & Lube System												
10. Compressed Air System												
11. Air conditioning												
12. Fire Fighting Equipment												
13. L.P.Piping & Valves												
14. Cooling Tower												
15. Spares (Mechanical)												
16. Misc. Tools & Plants												
17. Erection & Commissioning												
18. Sub Total (A)												

(contd.)

BREAK UP OF PLANT AND EQUIPMENT COST

DFR 2.4(contd.)

Base date (month & year)

Exchange Rate :

(Rs.Crores)

Sl. No.	Item	Cost of Equipment/ supplies				Inland Transport & Insurance	Erection charges		Others (to be specified)		Total	
		cif	Custom Duties & Other Taxes	Indigenous cost	Tax element in IC							
		FC	IC	IC		IC	IC	FC	IC	FC	IC	FC
1	2	3	4	5	6	7	8	9	10	11	12	13
B. ELECTRICAL EQUIPMENT												
1. Transformers												
a) Generator transformers												
b) Station transformers												
c) Unit auxilary transformers												
d) Distribution transformers												
2. Switchgear												
a) 400 KV SWGR												
b) 220 KV SWGR												
c) 6.6 KV SWGR												
d) LT SWGR												
3. Bus Ducts												
a) 6.6 KV DUCTS												
b) 11 KV DUCTS												
c) 21 KV DUCTS												

(contd.)

BREAK UP OF PLANT AND EQUIPMENT COST

DFR 2.4(contd.)

Base date (month & year)

Exchange Rate :

(Rs.Crores)

Sl. No.	Item	Cost of Equipment/ supplies				Inland Transport & Insurance	Erection charges		Others (to be specified)		Total	
		cif	Custom Duties & Other Taxes	Indigenous cost								
					Tax element in IC							
		FC	IC	IC	in IC	IC	IC	FC	IC	FC	IC	FC
1	2	3	4	5	6	7	8	9	10	11	12	13
4.	Cables											
	a) Power cables											
	b) Control cables											
5.	DC System, stepup station (Switch yard) Equipment											
6.	Control & Instrumentation/ Data Acquisition System											
7.	Station lighting											
8.	Misc. tools & plants											
9.	Spares (Electrical)											
10.	Others											
11.	Sub total (B)											
C.	Contigency											
D.	Grand Total(A+B+C)											

IC : Indigeneous Component FC : Foreign Component

(List of items may be suitably modified forgas-based projects)

THERMAL POWER PROJECTS

DFR - 2.5

A. PROJECT MANAGEMENT EXPENSES

Base date (month & year):

Exchange Rate :

(Rs.Crores)

Sl. No.	Item	Project Managment Expenses *			
		IC	FC	Total	Basis
1	2	3	4	5	6
1.	Site Establishments				
2.	HQ Establishment				
3.	Audit & Accounts				
4.	Training and O & M staff				
5.	Losses on stocks				

IC : Indigeneous Component FC : Foreign Component

* Excluding expenditure covered under `Knowhow and Engineering payments'.

Note: This format may be completed based on the experience of the project authorities and their consultants as a percentage of plant costs including plant and equipment.

(Contd.)

DFR - 2.5 (Contd..)

B. CATEGORYWISE MANPOWER DURING CONSTRUCTION

Year	Managerial/ Administrative		Technical		Skilled		Semi-skilled		Un-skilled		Total	
	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost
1	2	3	4	5	6	7	8	9	10	11	12	13
1.												
2.												
3.												
.												
.												
Till commissioning												

THERMAL POWER PROJECTS

DFR - 2.6

DETAILS OF COMMISSIONING EXPENDITURE

Base date (month & year):

Exchange Rate :

(Rs. crores)

Items	Amount		
	IC	FC	Total
1	2	3	4
A. Expenditure on Commissioning			
1.			
2.			
Total (A):			
B. Credit for Generation during commissioning period			
C. Net commissioning expenditure : (A - B)			

IC : Indigeneous Component FC : Foreign Component

1. Duration of trial runs alongwith the cost incurred for carrying out trial production after adjusting the receipts from such trial runs.
2. The pre-operative training includes the cost of training required to be given to the various categories of work force alongwith the duration of training and Institutes where they are to be imparted, may be indicated. If required, a separate annexure may be used for presenting additional details.

THERMAL POWER PROJECTS

DFR - 2.7

ENVIRONMENT RELATED COSTS

Base Date (month & year) :

Exchange Rate :

(Rs. crores)

Sl. No.	Item	Amount			Basis
		IC	FC	Total	
1	2	3	4	5	6
1.	Rehabilitation of displaced persons *				
2.	Pollution abatement cost				
3.	Effluent treatment				
4	Compensatory afforestation				
5.	Pollution monitoring facilities				
	Total				

IC : Indigeneous Component FC : Foreign Component

* Number of families/persons affected, compensation basis and other details to be given in the footnotes.

THERMAL POWER PROJECTS

DFR - 2.8

ASSESSMENT OF WORKING CAPITAL

Base date (month & year):
Exchange Rate:
(Rs. crores)

Sl. No.	Item	Norms of inventory	Unit rate	Total Value	Remarks
1	2	3	4	5	6
1. Fuel					
a) Coal/Lignite/Gas					
b) Fuel oil					
c) Cooling water					
d) others					
2. Stores and spares					
3. Annual Generation of Energy (M.Kwh)					
4. Debtors					
5. Cash and Bank balance					
A. Total current assets (1-5)					
6. Creditors					
7. Advances from customers (if any)					
B. Total current liabilities (6-7)					
8. Working Capital gap (A - B)					
9. Margin Money (as per norms)					
10. Gap for bank finance					
11. Annual interest on bank financed amount (excl. margin money)					

Note:- 1. This is required to be furnished yearwise till one year after stable level of production is achieved;

2. Incremental working capital requirements on annual basis may be shown in a footnote.

THERMAL POWER PROJECTS

DFR - 2.9

CAPITALISED INTEREST DURING CONSTRUCTION (IDC)

(Contents flexible depending upon specific requirements of the project)

Base date (month & year) :

Exchange Rate :

(Rs. crores)

Year	Source	Loan		Rate of Interset	Period	Total Amount
		Currency	Amount			
1	2	3	4	5	6	7
Total						

THERMAL POWER PROJECTS

DFR - 2.10

COST OF LINKED PROJECTS INCURRED BY OTHER AGENCIES

(Normally for facilities which will not be owned by the enterprise)

Base date (month & year) :

Exchange Rate :

(Rs. crores)

Sl. No.	Project	Total cost	Implementing Agency	Completion date (month/year)
1	2	3	4	5.

THERMAL POWER PROJECTS

DFR - 3.1

ESTIMATION OF OPERATING REQUIREMENT AND COSTS

Base date (month & year):

Exchange Rate:

(Rs. crores)

Item/Details	Consumption Norms	Total requirement (Qty.)	Unit rate	Financial			
				IC	FC	T&DC	Total
1	2	3	4	5	6	7	8
A. Variable Cost							
1. Fuels							
a) Coal/Lignite/Gas							
b) Fuel oil							
2. Utilities							
a) Water							
b) Others							
3. Other variable cost							
Total variable cost (A) :							
B. Fixed Cost							
1. Labour & Supervision							
2. Fixed Overheads							
3. Repairs & Maintenance							
4. Depreciation							
5. Interest on Long Term Loans							
6. Interest on Working Capital Loans							
7. Others to be specified							
Total Fixed Cost (B) :							
Total Operating Cost (A+B) :							

(Contd.)

THERMAL POWER PROJECTS

ESTIMATION OF OPERATING REQUIREMENT AND COSTS

Base date (month & year):
Exchange Rate:
(Rs. crores)

Item/Details	Consumption Norms	Total requirement (Qty.)	Unit rate	Economic			
				IC*	FC@	Inland Trans-port	Total
1	2	3	4	9	10	11	12
A. Variable Cost							
1. Fuels							
a) Coal/Lignite/Gas							
b) Fuel oil							
2. Utilities							
a) Water							
b) Others							
3. Other variable cost							
Total variable cost (A) :							
B. Fixed Costs							
1. Labour & Supervision							
2. Fixed Overheads							
3. Repairs & Maintenance							
4. Depreciation							
5. Interest on Long Term Loans							
6. Interest on Working Capital Loans							
7. Others to specified							
Total Fixed Cost (B) :							
Total Operating Cost (A+B)							

(Contd.)

IC : Indian Component FC : Foreign Component

T & DC : Taxes & Duties Component

* For non-traded goods.

@ For traded & tradable goods at cif value.

In case any cost item is at subsidised rate, the actual economic cost would be reported.

THERMAL POWER PROJECTS

DFR - 3.2

REQUIREMENTS OF LABOUR AND COSTS

(At Stable Level of Capacity Utilisation for a Full Year)

Base date (month & year):
Exchange Rate:

(Rs. crores)

Category of Labour	No. of workrs	Total wage cost	Costs of P.F. ESIS,,gratuity scheme etc.	Average Earnings per worker (Rs.)
1	2	3	4	5
1. Production Workers				
01 Unskilled				
02 Semi-skilled				
03 Skilled				
04 Technical				
05 Managerial				
2. Workers at Administration				
01 Unskilled				
02 Clerical				
03 Junior Managerial				
04 Senior Managerial				
Total:				

THERMAL POWER PROJECTS

DFR - 4.1

PROJECTED BALANCE SHEET

(Rs. Crores)

Item	Year 1	Year 2	Year 3 .....
1	2	3	4
I. Assests			
01 Gross block			
Less 02 Depreciation and amortisation			
03 Net block			
04 Capital work in progress			
05 Unallocated expenditure during construction			
06 Other items in the nature of assets			
07 Total net fixed assets (03 - 06)			
08 Investments			
09 Working Capital/Net Current assets			
10 Inventories			
101 Raw materials			
102 Spare parts			
103 Other stores			
11 Sundry debtors			
12 Loans and advances			
13 Cash and bank balance/ deposits			
14 Other assests			
15 Total current assests (10 - 14)			

(contd.)

THERMAL POWER PROJECTS

DFR - 4.1 (contd.)

PROJECTED BALANCE SHEET

(Rs. Crores)

Item	Year 1	Year 2	Year 3 .....
1	2	3	4
Less 16 Current liabilities and provision			
17 Net current assets/working capital			
18 Deferred revenue/preliminary expenditure			
19 Accumulated deficit			
Grand total :			
Authorised Share Capital			
II. Liabilities			
01 Paid up share capital			
011 From Central Government			
012 From others			
02 Loans			
021 Loans from Central Government			
022 Loans from foreign parties			
023 Working capital loans from Central Government			
024 Loans from others			
03 Cash credit/advances			
04 Reserves and surplus			
041 Development rebate/Investment allowance reserve			
042 General and other reserves			
043 Specific reserves			
05 Balance from profit/loss			
Grand Total :			

Note: The above data may be furnished till one year after project operation is stabilised.

THERMAL POWER PROJECTS

DFR - 4.2

PROJECTED PROFIT AND LOSS STATEMENT

(Rs. crores)

Item	Year1	Year 2	Year3 .....
1	2	3	4 .....
I. Income			
01 Gross sales/operating income			
Less 02 Commission, rebate and discount			
Less 03 Excise duty			
04 Net sales/operating income			
05 Other income/Misc. receipts			
Total (04 + 05) :			
II. Expenses			
06 Consumption of fuels, cooling water stores and spares			
07 Salaries, wages and welfare benefits			
08 Repairs & maintenance			
09 Misc. expenditure			
10 Prior period adjustment			
Total (06 - 10) :			

THERMAL POWER PROJECTS

DFR - 4.2 (contd.)

PROJECTED PROFIT AND LOSS STATEMENT

(Rs Crores)

Item	Year1	Year 2	Year3 .....
1	2	3	4 .....
III. Gross Margin (I - II)			
Less 11 Depreciation			
Less 12 Deferred revenue/ preliminary expenditure			
IV. Gross profit/loss (III - 11 - 12)			
13 Interest			
131 On Central Govt. loans			
132 On foreign loans			
133 On other loans			
134 On cash credit			
135 On supplier's credit			
136 On bonds & others (specify)			
Less 137 Interest capitalised			
14 Net chargeable interest			
V. Profit/loss before tax (IV-14)			
Less 15 Tax provision			
VI. Net profit/loss (V-15)			
Less 16 Dividend payment			
VII. Retained profit/loss (VI-16)			

Note: The above data may be furnished till one year after production is stabilised.

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THERMAL POWER PROJECTS

DFR - 4.3

SOURCES OF FINANCING OF THE PROJECT

(Rs. crores)

Item	Total	Yearly phasing during implementation		
		Year 1	Year 2	Year 3 .....
1	2	3	4	5 .....
1. Capital cost				
a) IC				
b) FC				
Domestic				
2. Internal resources				
3. Institutional loans				
4. Market borrowings				
5. Supplier's credit				
6. Public equity				
7. Budgetary support				
8. Collaborators contribution				
9. Other sources (specify)				
Total (2 - 9) :				
Foreign				
10. Multilateral loans (specify)				
11. Bilateral loans (specify)				
12. Direct commercial borrowings				
13. Supplier's credit				
14. Collaborator's contribution				
15. Others (specify)				
Total (10 - 15) :				

THERMAL POWER PROJECTS

DFR - 4.4

CASHFLOW STATEMENT FOR CALCULATION OF COST OF GENERATION

Base date (month & Year):

Exchange rate:

(Rs. crores)

Year	Cash Outflow									
	Capital Cost			O & M cost			Total			
	IC	FC	Taxes and duties in IC	IC	FC	Taxes and duties in IC	IC	FC	Taxes and duties in IC	No. of units available at busbar (M.Kwh)
1	2	3	4	5	6	7	8	9	10	11
1.										
2.										
3.										
.										
.										
.										
N										
Total										

IC : Indian Component FC : Foreign Component

NPV (financial):_____, NPV (economic):_____

Unit Cost of Generation : Financial_____, Economic_____

Note:

i) Interest during construction (IDC) will be excluded from cols. 2 & 3.Depreciation will be excluded from col. 5.Interest on Working Capital will, however, be included in col. 5.

ii) Recovery of salvage value is to be shown in N+1 th year. Replacement cost of capital nature, if any, not included in the annual O&M cost should be shown in the capital cost column aainst the appropriate years.

iii) For the alternative proposed, cashflow statementswould need to be prepared for "with" and "without project" situations, for working out cost generation/ transmission (Financial & Economic) on incremental basis.

THERMAL POWER PROJECTS

DFR - 4.5

SENSITIVITY ANALYSIS

S. No.	Case	Cost of Generation		
		Financial	Economic	
			With Premium	Without Premium
1	2	3	4	5
1.	Base case			
2.	Capital cost + 20%			
3.	Capital cost + 30%			
4.	Capital cost + 50%			
5.	Time overrun + 20%			
6.	Time overrun + 30%			
7.	Time overrun + 50%			

CHAPTER 5

REVISED COST ESTIMATES (RCE)

5.1.1 All projects, requiring Government approval, have to be reappraised and require Government approval again if the increase in Capital Cost exceeds a specified percentage. These revised cost estimates have to be submitted well before incurring the additional expenditure or making commitments. Necessary procedures and instructions required for RCE are laid down by the Government from time to time. This chapter outlines the information to be given in RCE proposals which have to be submitted for this purpose. In many cases, when the Detailed Project Report is prepared after the investment approval, the revised costs became known and often a proposal for revised approval, based on DPR, is submitted. This could also be treated as RCE.

5.1.2 The proposal of revised cost estimates (RCE) should be in the nature of a memorandum on 'exceptions'. The primary aim of subjecting RCE to techno-economic appraisal is to focus on the changes which have taken place since the original approval of the proposal and reasons thereof. As far as possible,repetitions of information on the need and justification, technology, location and other parameters should be avoided, if there is no change vis-a-vis the latest sanctioned project.

5.1.3 The information to be presented in DPR/RCE cases will compare the revised status with the sanctioned project. In case of first Revised Cost Estimate, the comparison is with the original project sanctioned. In case of second RCE, the comparison will be with the first RCE sanctioned and so on. The RCE formats have been designed on the same lines as DFR formats so as to enable a comparison of the RCE with the DFR estimates as per sanctioned project.

5.1.4 The comparative picture should cover all the important techno-economic parameters such as, the project cost, capacity, completion time, O&M expenditure, financial/economic benefits, financial and economic viabilities as given earlier vis-a-vis those now proposed. In case there are major variations in the parameters like technology, location, size of the plant, funding pattern or in the need and justification of the project from the latest sanctioned project, the project authorities should clearly indicate such change together with the reasons/justifications underlying the proposed changes.

5.1.5 Project Status: It is necessary to indicate the latest physical and financial progress achieved. The date upto which the progress is reported should be clearly indicated. Major milestones achieved should also be recorded in the form of a calender of events. While indicating the financial progress, the project authorities should not simply furnish the latest expenditure incurred on the project, it should also indicate the expenditure committed till the date of report. Apart from achivement of major milestones, the physical progress may give the achievement in percentage terms for each of the components/ contracts of the project separately. The details to be furnsihed are indicated in the Format RCE-4.1.

5.1.6 Cost Over-run: It is also necessary to indicate the basis on which the sanctioned estimates were framed and how the circumtances changed that basis. Similarly, project authorities should also give the basis underlying the revised estimates proposed. The degree of reliability of the revised estimates must also be indicated together with the reference level of prices.

5.1.7 The cost over-run should be subjected to the standardised variance analysis to segregate the effect of a) cost increases due to fiscal reasons within approved project schedule, (b) cost increases due to fiscal reasons beyond approved project schedule and (c) cost increases due

to other reasons. The itemwise cost variance analysis should be presented in the Format RCE-4.3. Detailed reasons/justifications for each variation in the cost proposed should be furnished. The variation in cost due to increase in quantitites and/or unit rates should be indicated separately in the formats RCE-4.3.

5.1.8 The variation in the annual operation and maintenance cost and the working capital requirement, if any, should also be indicated together with the justification/rcasons underlying the change.

5.1.9 Funding: The arrangements for funding of RCE as compared to sanctioned project, both for Indigenous cost (IC) and FE, should be outlined.

5.1.10 Time Over-run: In analysing the total time over-run the starting point should be taken as the change from the zero date (i.e. the date of sanction). Similarly, the project commissioning should be taken as the final event. If the time over-run is on account of elongation of activities on the critical path, then the list of all such critical activities and reasons for inability to assess accurately their time duration in the sanctioned proposal should be clearly explained. It is also important that the reasons for the inability to adhere to the sanctioned commissioning schedule are clearly brought out in the Format RCE-4.1 . The project authorities should also highlight the steps being envisaged to crash some of the critical activities so as to commission the project in the original time profile. A schedule of major milestones on a comparative basis should be provided. The cost over-run as a result of time over- run should be estimated and indicated separately.

5.1.11 Viability Analysis of the Revised Proposal: The project authorities should also furnish the financial and economic viabilities of the revised cost proposal together with the cashflow statements in support of the above calculations as per format RCE-4.4 .

THERMAL POWER PROJECTS

RCE - 1.1

SALIENT FEATURES OF THE PROJECT

1. Name of the project:
2. Department/Ministry sponsoring the project:
3. Date of sanction of original proposal:

	Latest Sanctioned	RCE	Variation
1	2	3	4
A. Physical Characteristics			
1. Project Capacity			
i) Installed capacity (MW)			
ii) Generation (MKwh) No. of Units			
2. Fuel Requirement(MTPA)(Coal/Gas)			
3. Additional Employment Generation (Nos.)			
B. Financial and Economic Characteristics			
1. Total Capital cost (Rs. Crores)			
2. Foreign exchange component (Rs. Crores)			
3. Exchange Rate:			
4. Interest during construction (Rs. crores)			
5. Funding arrangement for Indigenous Cost (IC) and FE			
6. Total system cost (Rs. crores)			
7. Base date of capital cost (month/year)			
8. Annual operation and maintenance cost (at_____% cap. ut.) (Rs. crores)			
9. Selling Price (Rs./Kwh)			
C. Evaluation Indicies			
Cost of Generation * (Rs./Kwh)			
i) Financial			
ii) Economic **			

(contd.)

SALIENT FEATURES OF THE PROJECT

D. Commissioning Schedule

1. From the date of sanction to synchronisation of units: _____ years _____ months.
2. From the date of sanction to commercial operation: _____ years _____ months.

---

* This has to be worked out at discount rate specified by the Government.

** With premium on foreign exchange and other shadow prices as specified by the Government.

THERMAL POWER PROJECTS

RCE - 1.2

ANALYSIS OF DEMAND & AVAILABILITY OF POWER

FOR THE REGION _____

(Separate statements for latest sanctioned and RCE)

Item	Year @		Year @		Year @	
	Without Project	With Project	Without Project	With Project	Without Project	With Project
1	2	3	4	5	6	7
1. Installed capacity (MW)						
2. Peak Demand (MW)						
3. Peak Availability (MW)						
4. Peak Deficit (MW)						
5. Energy Requirement(M.Kwh)						
6. Energy Availability (M.Kwh)						
7. Energy surplus/Deficit (M.Kwh)						

* Basis of demand and availability existing projects in operation and sanctioned projects) to be indicated.

@ Year : end of the current and next Five Year Year Plan and year of full benefits.

THERMAL POWER PROJECTS

RCE - 1.3

PLANTWISE DETAILS OF POWER AVAILABILITY

(Separate statements for latest sanction and RCE)

Region/ Plants	First year of full benefits			Basis
	Installed Capacity (MW)	Likely Benefits		
		Peak Load (MW)	Energy (Mkwh)	
1	2	3	4	5
A. Existing Plants in operation				
Hydro				
Thermal				
Nuclear				
Total A:				
B. Sanctioned Projects				
I.1 Hydro				
.				
Sub Total I.1				
I.2 Thermal				
.				
.				
Sub Total I.2				
I.3 Nuclear				
.				
.				
Sub Total I.3				
Total B :				

(Contd.)

THERMAL POWER PROJECTS

RCE - 1.3(contd.)

PLANTWISE DETAILS OF POWER AVAILABILITY

(Separate statements for latest sanction and RCE)

Region/ Plants	First year of full benefits			Basis
	Installed Capacity (MW)	Likely Benefits		
		Peak Load (MW)	Energy (Mkwh)	
1	2	3	4	5
C. Cleared by CEA or				
DAE etc. but				
awaiting				
Government Approval *				
I.1 Hydro				
.				
.				
Sub Total I.1				
I.2 Thermal				
.				
.				
Sub Total I.2				
I.3 Nuclear				
.				
.				
Sub Total I.3				
Total C :				
Grand Total : (A+B+C)				

* Assumptions on likely date of approval and gestation period may be stated.

Note: Similar information may be furnished for the subsequent years also.

THERMAL POWER PROJECTS

RCE - 2.0

SUMMARY OF CAPITAL COST

Base date (month & year):

Exchange rate* :

(Rs. crores)

Statement No.	Item	Capital Cost						Basis of estimates	@ Degree of Reliability within (+/-)....%
		LS			RCE				
		IC	FC	Total	IC	FC	Total		
1	2	3	4	5	6	7	8	9	10
	2. 1 Studies & Investigations & Preliminary Works								
	2.2 Cost of Civil Works (including land)								
	2.3 Know how Engineering and Consultancy								
	2.4 Plant & Equipment								
	2.4.1 Mechanical Equipment								
	2.4.2 Electrial Equipment								
	2.4.3 Control Instrumentation and DAS								
	2.4.4 Coal Transportation								
	2.4.5 Misc. tools & Plants								
	2.5 Project Management (Administration)								
	2.6 Commissioning Expenditure								
	2.7 Environment Related cost								
	2.8 Working Capital Margin								
	2.9 Interest During Construction								
	A. Total Project Cost (2.1 to 2.9)								

(contd.)

THERMAL POWER PROJECTS

RCE - 2.0

SUMMARY OF CAPITAL COST

Base date (month & year):

Exchange rate* :

(Rs. crores)

Statement No.	Item	Capital Cost						Basis of estimates	@ Degree of Reliability within (+/-)....%
		LS			RCE				
		IC	FC	Total	IC	FC	Total		
1	2	3	4	5	6	7	8	9	10
2.10 Cost of linked projects									
2.11 Cost of unskilled labour included in A(total)									
2.12 Any other Cost									
B. Total System Cost:									

IC : Indigenous Component FC : Foreign Component LS : Latest Sanction, RCE : Revised Cost Estimates

* In case the number of foreign currencies involved are more than one, the amount and exchange rate for each of the currencies may be indicated in the footnote.

@ TQ - Tender Quotation IH - In-House Cost Data

CD - Consultants Data BQ - Budgetary Quotation

THERMAL POWER PROJECTS

RCE - 2.1

DETAILS OF THE COST OF THE STUDIES AND INVESTIGATIONS AND PRELIMINARY WORKS

Base date (month & year):

Exchange Rate:

(Rs. Crores)

Sl. No.	Studies and Investigations and Preliminary works	Cost of the Study/ Investigation						Agency*responsible for carrying out the study/ investigation
		LS			RCE			
		IC	FC	Total	IC	FC	Total	
1	2	3	4	5	6	7	8	9
	1. Demand Analysis							
	2. Coal/Lignite Availability & Transportation or Gas Availability and arrangements to make the gas available at site.							
	3. Cooling water Availability							
	4. Site selection, site conditions and investigations							
	5. Preliminary works							
	6. Basic Engineering							
	7. Fly Ash disposal							
	8. Open or combined cycle (for Gas Turbines only)							
	9. Environmental Impact							
	10. Others							

IC : Indigenous Component FC : Foreign Component

* Indicate whether inhouse or outside agency.

THERMAL POWER PROJECTS

RCE - 2.2

DETAILS OF COST CIVIL WORKS

Base date (month & year):

Exchange Rate :

Sl.No.	Item	Unit	Qty.		Rate (Rs)		Amount (Rs.Crs.)				Remarks
			LS	RCE	LS	RCE	LS		RCE		
							IC	FC	IC	FC	
1	2	3	4	5	6	7	8	9	10	11	12

1. Design, Engineering & Consultancy
2. Land & Land Developments
   a) Land acquisition:-
      i) Plant
      ii) Other purposes(to be specified)
   b) Preliminary survey, soil investigations etc.
   c) Land Development
      i) Excavation
      ii) Levelling
      iii) Internal roads and paths
3. Main Foundations
   a) Main Building Foundations
   b) Equipment foundation-concreting
      i) Pile Foundation
      ii) Raft Foundation
      iii) Equipment Foundation
4. Cooling Water System
   a) Inlet/Outlet Water Channel,duct
      i) Excavation
      ii) Concreting

(contd.)

THERMAL POWER PROJECTS

RCE - 2.2(contd.)

DETAILS OF COST CIVIL WORKS

Base date (month & year):

Exchange Rate :

Sl.No.	Item	Unit	Qty.		Rate (Rs)		Amount (Rs.Crs.)				Remarks
			LS	RCE	LS	RCE	LS		RCE		
							IC	FC	IC	FC	
1	2	3	4	5	6	7	8	9	10	11	12
	b) Pump House & Forebay										
	i) Excavation										
	ii) Concreting										
	iii) Building etc.										
	c) Makeup Water Pump house										
	d) CW Piping										
	i) Fabrication										
	ii) Erection										
5.	Main Building Structural steel										
	a) Fabrication										
	b) Erection										
6.	Main Building Super structure										
	a) Total concreting for Interflooring										
	b) Masonary for side walls										
	c) Roofing & clading										
7.	Chimney (ht)										
	i) Foundation										
	ii) Shell										

(contd.)

(contd.)

THERMAL POWER PROJECTS

RCE - 2.2(contd.)

DETAILS OF COST CIVIL WORKS

Base date (month & year):

Exchange Rate :

Sl.No.	Item	Unit	Qty.		Rate (Rs)		Amount (Rs.Crs.)				Remarks
			LS	RCE	LS	RCE	LS		RCE		
							IC	FC	IC	FC	
1	2	3	4	5	6	7	8	9	10	11	12
8. Cooling towers											
a) Excavation											
b) Foundation											
c) Shell											
d) Fill											
9. Auxiliary Buildings											
a) Foundation											
b) Super structure											
c) Clading											
10. Coal Handling Plant											
a) Excavation											
b) Concreting											
c) Structural Works											
11. Ash Handling Plant											
a) Excavation											
b) Concreting											
c) Structural Works											
12. Water Treatment Plant											
a) Excavation											
b) Concreting											
c) Structural works											

THERMAL POWER PROJECTS

RCE - 2.2(contd.)

DETAILS OF COST CIVIL WORKS

Base date (month & year):

Exchange Rate :

Sl.No.	Item	Unit	Qty.		Rate (Rs)		Amount (Rs.Crs.)				Remarks
			LS	RCE	LS	RCE	LS		RCE		
							IC	FC	IC	FC	
1	2	3	4	5	6	7	8	9	10	11	12
13. Fire Water Pump House											
14. Switch Yard Civil works											
15. Offsite											
a) Fuel Oil handling											
b) Compressed Air											
c) Administrative Building											
16. Township											
17. Miscellaneous											
a) Roads & Bridges											
b) Railway Sidings											
c) Construction works for Water & Power											
d) Other Works											
e) Establishment audit and accounts											
f) Training											
g) T & P (including special)											
h) Contingencies											
i) Consultancy											
j) Suspense Account											
18. Total											

Note : (List of items may be suitably modified for gas based plants)

IC : Indigenous Component FC : Foreign Component

THERMAL POWER PROJECTS

RCE - 2.3

DETAILS OF KNOWHOW, ENGINEERING AND CONSULTANCY

(Separate Statement for Latest Sanctioned and RCE)

Base date (mon' & year):

Exchange Rate:

Item	Rs. Crores
Indian Consultancy (IC)	
Foreign Consultancy (FC)	
(IC)	

IC = Indigenous Component FC = Foreign Component

THERMAL POWER PROJECTS

RCE - 2.4

BREAK UP OF PLANT AND EQUIPMENT COST

(Separate Statement for Latest Sanctioned and RCE)

Base date (month & year)

Exchange Rate :

(Rs.Crores)

Sl. No.	Item	Cost of Equipment/ supplies				Inland Transport & Insurance		Erection charges	Others (to be specified)		Total	
		cif	Custom Duties & Other Taxes	Indigenous cost	Tax element in IC							
		FC	IC	IC	in IC	IC	IC	FC	IC	IF	IC	IF
1	2	3	4	5	6	7	8	9	10	11	12	13
A. MECHANICAL EQUIPMENT												
1. Boiler Package												
2. T.G. Package												
3. Coal Handling Plant												
4. C.W. Pumps												
a) Makeup Water Pumps												
b) Auxiliary CW Pumps												
5. Water Treatment plant												
a) Pre Treatment Plant												
b) DM Plant												
6. Coal Transportation												
a) Track material												
b) Wagons												
c) Locomotives												
d) Signalling & Telecommunication												
e) MGR workshop												
f) Others												

(contd.)

BREAK UP OF PLANT AND EQUIPMENT COST

1	2	3	4	5	6	7	8	9	10	11	12	13

7. EOT Crane
8. Ash Handling Plant
9. Fuel Oil & Lube System
10. Compressed Air System
11. Air conditioning
12. Fire Fighting Equipment
13. L.P.Piping & Valves
14. Cooling Tower
15. Spares (Mechanical)
16. Misc. Tools & Plants
17. Erection & Commissioning
18. Sub Total (A)

B. ELECTRICAL EQUIPMENT

1. Transformers
   a) Generator transformers
   b) Station transformers
   c) Unit auxilary transformers
   d) Distribution transformers
2. Switchgear
   a) 400 KV SWGR
   b) 220 KV SWGR
   c) 6.6 KV SWGR
   d) LT SWGR

(contd.)

THERMAL POWER PROJECTS

RCE - 2.4(contd.)

BREAK UP OF PLANT AND EQUIPMENT COST

1	2	3	4	5	6	7	8	9	10	11	12	13

3. Bus Ducts
   a) 6.6 KV DUCTS
   b) 11 KV DUCTS
   c) 21 KV DUCTS
4. Cables
   a) Power cables
   b) Control cables
5. DC System, stepup station
   (Switch yard) Equipment
6. Control & Instrumentation/
   Data Acquisition System
7. Station lighting
8. Misc. tools & plants
9. Spares (Electrical)
10. Others
11. Sub total (B)

C. Contigency

D. Grand Total(A+B+C)

IC : Indigenous Component FC : Foreign Component

(Listof items may be suitably modified forgas-based projects)

THERMAL POWER PROJECTS

RCE - 2.5

A. PROJECT MANAGEMENT EXPENSES

Base date (month & year):

Exchange Rate :

(Rs.Crores)

Sl. No.	Item	Project Managment Expenses *						
		LS			RCE			
		IC	FC	Total	IC	FC	Total	Basis of RCE
1	2	3	4	5	6	7	8	9
1.	Site Establishments							
2.	HQ Establishment							
3.	Audit & Accounts							
4.	Training and O & M staff							
5.	Losses on stocks							

IC : Indian Component FC : Foreign Component

* Excluding expenditure covered under `Knowhow and Engineering payments'.

Note: This format may be completed based on the experience of the project authorities and their consultants as a percentage of plant costs including plant and equipment.

B. CATEGORYWISE MANPOWER DURING CONSTRUCTION

(Seperate statement for Latest Sanction and RCE)

Year	Managerial/ Administrative		Technical		Skilled		Semi-skilled		Un-skilled		Total	
	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost
1	2	3	4	5	6	7	8	9	10	11	12	13
1.												
2.												
3.												
Till commissioning												

THERMAL POWER PROJECTS

RCE - 2.6

DETAILS OF COMMISSIONING EXPENDITURE

Base date (month & year):

Exchange Rate :

(Rs. crores)

Items	Amount					
	LS			RCE		
	IC	FC	Total	IC	FC	Total
1	2	3	4	5	6	7
A. Expenditure on Commissioning						
1.						
2.						
3.						
Total (A):						
B. Credit for Generation during commissioning period						
C. Net commissioning expenditure : (A - B)						

IC : Indigenous Component FC : Foreign Component

1. Duration of trial runs alongwith the cost incurred for carrying out trial production after adjusting the receipts from such trial runs.

2. The pre-operative training includes the cost of training required to be given to the various categories of work force alongwith the duration of training and Institutes where they are to be imparted, may be indicated. If required, a separate annexure may be used for presenting additional details.

THERMAL POWER PROJECTS

RCE - 2.7

ENVIRONMENT RELATED COSTS

Base Date (month & year) :

Exchange Rate :

(Rs. crores)

Sl. No.	Item	Amount						Basis of RCE
		LS			RCE			
		IC	FC	Total	IC	FC	Total	
1	2	3	4	5	6	7	8	9
1. Rehabilitation of * displaced persons								
2. Pollution abatement cost								
3. Effluent treatment								
4. Compensatory afforestation								
5. Pollution monitoring facilities								
.								
.								
.								
.								
Total								

IC : Indigenous Component FC : Foreign Component

* No. of families/persons affected, compensation basis and other details to be given in the footnotes.

THERMAL POWER PROJECTS

RCE - 2.8

ASSESSMENT OF WORKING CAPITAL

(Separate statements for Latest Sanctioned and RCE)

Base date (month & year):

Exchange Rate:

(Rs. crores)

Sl. No.	Item	Norms of inventory	Unit rate	Total Value	Remarks
1	2	3	4	5	6
1.	Fuel				
	a) Coal/Lignite/Gas				
	b) Fuel oil				
2.	Stores and Spares				
3.	Annual Generation of Energy (M.Kwh)				
4.	Debtors				
5.	Cash and Bank balance				
6.	Total current assets (1-5)				
7.	Creditors				
8.	Advances from customers (if any)				
9.	Total current liabilities (7-8)				
10.	Working Capital gap (6-9)				
11.	Margin Money (as per norms)				
12.	Gap for bank finance				
13.	Annual interest on bank financed amount (excl. margin money)				

Note:-

1. This is required to be furnished yearwise till one year after stable level of production is achieved;

2. Incremental working capital requirements on annual basis may be shown in a footnote.

THERMAL POWER PROJECTS

RCE - 2.9

CAPITALISED INTEREST DURING CONSTRUCTION (IDC)

(Contents flexible depending upon specific requirements of the project)

Base date (month & year) :

Exchange Rate :

(Rs. crores)

Year	Source		Loan				Rate of Interset		Period		Total Amount	
			Currency		Amount							
	LS	RCE	LS	RCE	LS	RCE	LS	RCE	LS	RCE	LS	RCE
1	2	3	4	5	6	7	8	9	10	11	12	13
Total												

LS : Latest Sanctioned RCE : Revised Cost

THERMAL POWER PROJECTS

RCE - 2.10

COST OF LINKED PROJECTS INCURRED BY OTHER AGENCIES

(Normally for facilities which will not be owned by the enterprise)

Base date (month & year) :

Exchange Rate :

(Rs. crores)

Sl. No.	Project	Total cost		Implementing Agency	Completion date (month/year)	
		LS	RCE		LS	RCE
1	2	3	4	5	6	

THERMAL POWER PROJECTS

RCE - 3.1

ESTIMATION OF OPERATING REQUIREMENT AND COSTS

(Seperate Statement for Latest Sanction and RCE)

Base date (month & year):

Exchange Rate:

(Rs. crores)

Item/Details	Consumption Norms	Total requirement (Qty.)	Unit rate	Financial			
				IC	FC	T&DC	Total
1	2	3	4	5	6	7	8
A. Variable Cost							
1. Fuels							
a) Coal/Lignite/Gas							
b) Fuel oil							
2. Utilities							
a) Water							
b) Others							
3. Others (to be specified)							
Total Variable Cost							
B. Fixed Cost							
1. Labour & Supervision							
a)							
b)							
2. Fixed Overheads							
a)							
b)							
3. Repairs & Maintenance							
4. Depreciation							
5. Interest on Long Term Loans							
6. Interest on Working Capital Loans							

(contd.)

THERMAL POWER PROJECTS

RCE - 3.1 (Contd.)

ESTIMATION OF OPERATING REQUIREMENT AND COSTS

(Seperate Statement for Latest Sanction and RCE)

Base date (month & year):

Exchange Rate:

(Rs. crores)

Item/Details	Consumption Norms	Total require-ment (Qty.)	Unit rate	Financial			
				IC	FC	T&DC	Total
1	2	3	4	5	6	7	8
7. Others (to be specified)							
Total Fixed Cost:							
Total Operating Cost:							

(contd.)

THERMAL POWER PROJECTS

RCE - 3.1 (Contd.)

ESTIMATION OF OPERATING REQUIREMENT AND COSTS

(Seperate Statement for Latest Sanction and RCE)

Base date (month & year):

Exchange Rate:

(Rs. crores)

Item/ Details	Consumption Norms	Total require-ment (Qty.)	Unit rate	Economic			
				* IC	@ FC	Inland Trans-port	Total
1	2	3	4	9	10	11	12
A. Variable Cost							
1. Fuels							
a) Coal/Lignite/Gas							
b) Fuel oil							
2. Utilities							
a) Water							
b) Others							
3. Others (to be specified)							
Total Variable Cost							
B. Fixed Cost							
1. Labour & Supervision							
a)							
b)							
2. Fixed Overheads							
a)							
b)							

(contd.)

THERMAL POWER PROJECTS

RCE - 3.1 (Contd.)

ESTIMATION OF OPERATING REQUIREMENT AND COSTS

(Seperate Statement for Latest Sanction and RCE)

Base date (month & year):

Exchange Rate:

(Rs. crores)

Item/ Details	Consumption Norms	Total require-ment (Qty.)	Unit rate	Economic			
				* IC	@ FC	Inland Trans-port	Total
1	2	3	4	9	10	11	12
3. Repairs & Maintenance							
4. Depreciation							
5. Interest on Long Term Loans							
6. Interest on Working Capital Loans							
7. Others (to be specified)							
Total Fixed Cost:							
Total Operating Cost:							

IC : Indigenous Component FC : Foreign Component

T & DC : Taxes & Duties Component

* For non-traded goods.

@ For traded & tradable goods at cif value

In case any cost item is at subsidised rate, the actual economic cost would be reported.

THERMAL POWER PROJECTS

RCE - 3.2

REQUIREMENTS OF LABOUR AND COSTS

(At Stable Level of Capacity Utilisation for a Full Year)

(Seperate Statement for Latest Sanction and RCE)

Base date (month & year):

Exchange Rate:

(Rs. crores)

Category of Labour	No. of workers	Total wage cost	Costs of P.F. ESIS, gratuity scheme etc.	Average earnings per worker (Rs.)
1	2	3	4	5
1. Power Plant				
01 Unskilled				
02 Semi-skilled				
03 Skilled				
04 Technical				
05 Managerial				
2. Workers at				
Administration				
01 Unskilled				
02 Clerical				
03 Junior Managerial				
04 Senior Managerial				
Total:				

THERMAL POWER PROJECTS

RCE - 4.1

PRESENT STATUS OF THE PROJECT

(Progress upto .....month & year)

Sl. No.	Item of work/ activity	Date of award of contract	Target date of completion (month & Year)		Reasons for delay	Progress achieved			
			LS	RCE		Physical@	Financial *		
							IC	# FC	Total
1	2	3	4	5	6	7	8	9	10
1.									
2.									
3.									
.									
.									
.									
.									
.									

IC : Indigenous Component FC: Foreign Component

LS : Latest Sanctioned, RCE : Revised Cost Estimate

@ In terms of percentage.

* Actual expenditure incurred upto the month and year progress is reported in rupee crores.

Exchange rates assumed would need to be specified.

THERMAL POWER PROJECTS

RCE -4.2

DETAILS OF YEARWISE EXPENDITURE TILL.....(MONTH/YEAR)

Base date (month/year) :

Exchange rate :

(Rs. crores)

Item	Latest Sanctioned Cost		Year		Year		Year		Balance expend-iture
	IC	FC	IC	FC	IC	FC	IC	FC	
1	2	3	4	5	6	7	8	9	10
1. Studies & Investigations									
2. Cost of civil works									
3. Know-how & Engineering									
4. Plant & Equipment									
5. Project Management									
6. Commissioning Expenditure									
7. Environment RelatedCost									
8. Margin Money forWorking Capital									
9. Capitalised Interest During Construction									
A. Total Project Cost(1 to 9)									
10. Cost of Linked Projects									
11. Cost of Unskilled Labour included in item A (Total)									
B. Total System Cost									
12. Weighted average * Exchange Rate									

IC : Indigeneous Component FC : Foreign Component

* In case the number of foreign currencies involved are more than one, the amount and exchange rate for each of the currencies are to be indicated.

THERMAL POWER PROJECTS

RCE-4.3

ITEMWISE COST VARIANCE ANALYSIS

LS RCE

Base date (month/year) :

Exchange rate :

(Rs. crores)

Sl. No.	Items	LS	RCE	Variation in cost	Variation due to			Change in statutory duties due to exch. rate variation
					Escalation (based on Index) @	Exchange rate variation	Change in statutory duties *	
1	2	3	4	5	6	7	8	
A. Cost overrun for fiscal reasons within approved time schedule:								
1.								
2.								
3.								
.								
IDC								
Margin money								
Total (A)								
B. Cost overrun for fiscal reasons beyond approved time schedule								
1.								
2.								
3.								
IDC								
Margin money								
Total (B)								

(Contd.)

THERMAL POWER PROJECTS

RCE - 4.3 (Contd.)

ITEMWISE COST VARIANCE ANALYSIS

LS RCE

Base date (month/year) :

Exchange rate :

(Rs. crores)

C. Cost overrun due to other reasons

Sl. No.	Items	Latest sanctioned	RCE proposed	Variation in cost	Variation due to			
					Change in scope		Under/ over-estimation	Other reasons (specify)
					Approved items	Additional items		
1	2	3	4	5	10	11	12	13
1.								
2.								
3.								
.								
IDC								
Margin Money								
Total (C)								

LS : Latest Sanctioned, RCE : Revised Cost Estimate

@ Yearwise indices used for LS and RCE to be given in the footnote.

* Statutory duties	LS		RCE	
	Rate	Amount	Rate	Amount
-Excise duty				
-Customs duty				
-Sales tax				
-Others(specify)				

THERMAL POWER PROJECTS

RCE - 4.4

CASHFLOW STATEMENT FOR CALCULATION OF COST OF GENERATION

(Separate statements for financial cost of generation for the Latest Sanction and proposed RCE)

Base date (Month & Year):

Exchange rate:

(Rs. crores)

YEAR	CASH OUTFLOW										
	Capital Cost			O & M cost			Total				
	IC	FC	Taxes and duties in IC	IC	FC	Taxes and duties in IC	IC	FC	Taxes and duties in IC	No.of units available at at bus-bar M.Kwh	
1	2	3	4	5	6	7	8	9	10	11	
1.											
2.											
3.											
.											
.											
.											
N											
Total :											

NPV (Financial):_____, NPV (Economic):_____

Cost of Generation (Rs./Kwh):

Financial: _____

Economic : _____

Note: i) Interest during construction (IDC) will be exclu ded from cols. 2 and 3. Depreciation will be excluded from col.5. Intei est on Working Capital will, however, be included in col. 5.

ii) Recovery of salvage value is to be shown in N+1 year. Replacement cost of capital nature, if any, not included in the annual O & M cost should be shown in the capital cost column against the appropriate years.

THERMAL POWER PROJECTS

RCE - 4.5

SENSITIVITY ANALYSIS

(Separate statement for LS and RCE)

Sl. No.	Case	Cost of Generation		
		Financial	Economic	
			With Premium	Without Premium
1	2	3	4	5
1. Base case				
2. Capital cost	+ 20%			
3. Capital cost	+ 30%			
4. Capital cost	+ 50%			
5. Time Overrun	+ 20%			
6. Time Overrun	+ 30%			
7. Time Overrun	+ 50%			

PART - B : HYDROELECTRIC PROJECTS

CHAPTER 2

ADVANCE ACTION PROPOSAL

2.1 In view of the obvious advantages of hydel power, it is desirable that hydroelectric projects are given the impetus and priority that they deserve. One of the important steps for accelerating the development of hydroelectric power is the reduction in the gestation period of the project. This could be achieved by expediting clearances, in addition to the other steps, like introducing modern construction and management techniques. In view of locational and other site-specific conditions, it is desirable that land acquisition and pre- construction infrastructural works, such as roads and bridges for affording easy access to the site, office and residential buildings, workshop facilities, communications and some of compensatory afforestation plans are taken up well in advance before the actual construction work on the main project commences.

2.2 The development of infrastructural facilities, which may, in many cases, take as much as 2 to 3 years to complete and implementation of the main project constitute continuous but independent, phases of the execution of a project. With a view to cut short delays in the implementation of hydel project, hydroelectric projects need to be implemented in two distinct phases. Development of infrastructure would constitute the first phase, while implementation of the main project would be in the second phase. While infrastructure development is taking place, detailed designing of the project could be done and details regarding items affecting forest and environment could be worked out, in consultation with the Ministry of Environment & Forests. Similarly, parallel action could be taken for obtaining various other clearances, tying up external funding (if involved), and processing the case for an investment decision in regard to the main project, all of which is time consuming.

2.3 The activities to be included in the scope of pre- construction works in the form of advance action would be as specified by the Government. At present following activities are included as per Department of Power circular No. 16(101)/89- DO (NHPC) dated February 23, 1992 and May 25, 1992.

i) Essential temporary (camp type) residential/office accommodation required for infrastructure development work;

ii) Such roads and bridges as may be required to approach the work site as well as the temporary residential/ office accommodation.

iii) Acquisition of land for the main project works such as dam, power house and power channel other than land coming under submergence as a result of the project, temporary residential/ office complex as well as roads/bridges, referred to in (i) and (ii) above.

iv) Power supply for project construction.

v) Preparation of environmental management plans.

As and when the scope of advance action activities is modified, the same will become applicable for the purpose of this analysis.

2.4 Taking up of the pre-construction works as outlined above pending investment decision would, however, be subject to the fulfilment of the following requirements:

a) Consent of the state government concerned is available to the project being executed in the central sector or in the joint sector, on the approved sharing formula.

b) The project is techno-economically cleared by Central Electricity Authority.

c) Some resource allocation for the project exists in the Five Year Plan and Annual Plan.

d) Clearance from all concerned agencies like Ministry of Environment & Forests, Water Resources, Defence etc. wherever applicable, have been obtained for implementing the project. For this purpose, the Ministry of Environment & Forests would issue an "in principle" first stage clearance, pending preparation of detailed Environment Assessment Study, after a rapid 2/3 months' Environment Assessment Study.

2.5 The Department of Power has been delegated powers to sanction the first phase cost estimates for pre-construction works and development of infrastracture facilities upto Rs. 10 crores for each hydroelectric project, specifically identified for such action. The first phase estimates involving expenditure above Rs. 10 crores and upto Rs. 20 crores would be considered and approved by a committee of PIB after broadly going into justification for the project and satisfying itself about the conditions referred to in para 2.4 above. The proposals involving expenditure above Rs. 20 crores would be considered by PIB and submitted for approval to the CCEA with the recommendation of the PIB. The main project proposal of the hydroelectric project, when processed for investment approval, would include the cost earlier approved for the pre- construction/infrastructural works in phase-I (advance action).

CHAPTER 3

STUDIES AND INVESTIGATIONS

3.1.1 As mentioned in Chapter-2, in case of hydro-electric projects, advance action may have been taken so as to create basic infrastructure, firming up of geo-physical data, project parameters etc. Based on studies and investigations, a Detailed Project Report (DPR) is prepared comprising of detailed techno- economic information for the purpose of techno-economic clearance by the CWC/CEA. Detailed studies and investigations to be undertaken prior to the preparation of DPR have been prescribed by the CWC/CEA. After the techno-economic clearance by CWC/CEA, Detailed Feasibility Report (DFR) is to be prepared summarising the informations needed for appraisal/investment decision by the Government. This Chapter briefly outlines those studies and investigations, which have to be covered in the DFR.

3.1.2 The adequacy of a Detailed Feasibility Report (DFR) as a basis for investment decision is largely determined by the thoroughness of studies and investigations that have gone into the preparation of the Detailed Feasibility Report. In view of peculiar nature of the power projects owing to their inter- connectedness within the power sector and their integration with the energy sector and overall development, the studies and investigations have to be undertaken with the object of selecting `least cost option' among the various alternatives so as to achieve desired benefits in the form of power generation and transmission.

3.1.3 In case of the power projects, the studies and investigations are concerned with the establishment of the need of the project for a particular region/state, choice of technology, design, size, location etc., water availability, infrastructure available and required to be created, geophysical conditions, river flow data, power evacuation arrangements, environment impact and other project specific studies and investigations etc.

3.1.4 The studies and investigations required to be under taken for Hydroelectric projects are listed below:

a) Demand Analysis;

b) Hydrology;

c) Geological conditions;

d) Other site conditions;

e) Basic Engineering ;

f) Environment Impact Assessment

3.2.0 Demand Analysis :

3.2.1 The demand analysis is concerned with the estimation of medium and long term demand availability of power so as to establish need for investment in new projects. Demand forecasting for power is an elaborate and continuous exercise undertaken by the Planning Commission (PC) and the Central Electricity Authority (CEA). The projections of both normal and peak demand and energy demand and availability are made available by the Annual Power Surveys at the national, regional and state levels. These forecasts generally cover the peak and energy demand for a period upto 20 years. If the time span for which forecasts are required for the project extends beyond the period for which the CEA/PC forecasts are available, the growth rate implicit in the CEA/PC forecasts should be used for the extra period.

3.2.2 The Detailed Feasibility Report (DFR) should be based on whatever is the currently agreed demand forecast used by the CEA and the Planning commission. The demand and availability gap for power and energy in a particular region/state need be analysed 'with project'

and 'without project' situations considerng the availablity from existing, ongoing and sanctioned schemes from hydro, thermal and other sources.

3.3.0 Hydrology :

3.3.1 A careful assessment of hydrological features is central to the formulation of hydel power projects. The hydrological studies and investigations for hydel projects should cover the following:

i) Detailed analysis of all available flow data;

ii) Detailed analysis of catchment area, rainfall, run-of- river, etc.;

iii) Analysis of sediment flows and reservoir sedimentation;

iv) River profile and cross-section, problems of bank erosion, aggradation, degradation, etc.;

v) Reservoir simulation studies:

vi) Establishment of:

a) Two (at Dam site, P.H. site) or more gauges and discharge stations;

b) Silt observation laboratory;

c) Meteorological station.

These observation stations may contain following instruments:

1. Rain gauge
2. Anemometer (to measure total passage of wind)
3. Hydrometer (to measure the humidity)
4. Evaporometer (to measure wind evaporation)

3.4.0 Geological Conditions :

3.4.1 Full information on geological conditions, particularly those relating to underground structures, will only be available with the progress of construction. However, careful study and investigation can reduce the range of uncertainty and the following studies and investigations should be carried out before final investment decision:

i) Analysis of available toposheets, aerial photomaps, satellite imagery, etc.;

ii) Reconnaisance of site;

iii) Topographical survey of dam site, power house site (1 : 1000 1 : 2000), H.R.T. (1 : 5000 to 1: 10000) alignment depending upon length of tunnel, reservoir survey (1 : 15000), and burrow areas surveys;

iv) X- and L- sections of various important sites;

v) Seismic lines to be laid at Dam site, P.H. site H.R.T. (where the cover is less), etc. A length about 4-5 kms of lines should be adequate;

vi) Drilling to a depth sufficient to describe the main features of the project to be carried on; about 1000 mts. of drilling on 10 bore holes of 100 mts. in this phase would be adequate;

vii) Drifting at important places to be done around 500 mts in all;

viii) Burrow areas to be identified and the material to be got tested for the suitability for use as construction material;

ix) Geological mapping, logging of bore holes, drifting etc. to be carried out. On the basis of this classification the underground works shall be quantified which are susceptible to changes after confirmation by investigation and

x) Investigations for design of underground structures.

3.5.0 Other Site Conditions :

3.5.1 Apart from geological conditions there are other features of the site which have to be studied before formulating a hydro project. The most important of these is the assessment of the impact of the land submerged. This assessment must cover the following:

i) The extent of land submerged classified by type of land use;

ii) Ownership of the land which will have to be acquired and likely problems of acquisition;

iii) Number of people affected by submergence and the scope for rehabilitation;

iv) Bench-mark survey of affected population and

v) Specific projects for resettlement of affected population.

3.5.2 In order to obtain environmental clearance a detailed Environmental impact assessment is required in the form specified by the Deptt. of Environment. This will require a minimum of one year baseline data on land use, water use, demography, soils, hydrology, etc.

3.6.0 Transmission Facilities :

A power project will need transmission capabilities for evacuating power. In order to provide a basis for planning such facilities the studies and investigations required for associated transmission system and the agency responsible should be indicated.

3.7.0 Basic Engineering :

The cost estimates posed for investment sanction can be reliable only if a certain amount of basic engineering has been done to provide a basis for these estimates. In hydel projects, the basic engineering must cover the following:

i) Dimensions and material of construction of dam;

ii) Dimensions and basic design of Head Race Tunnel/Tail Race Tunnel (H.R.T./T.R.T) including surface water conductor system and Power House (P.H.);

iii) Sizing of turbines/generators;

iv) Location of dam, H.R.T/T.R.T., P.H. and surface water conductor system

v) Specification of quantities of work for dam, H.R.T., T.R.T. alongwith surface water conductor system, P.H. etc.;

vi) Access to site;

vii) Burrow areas for construction materials;

viii) Construction technology and equipment requirements;

ix) Basic design of turbines/generators and

x) Base design of switchyard and transmission facilities.

3.8.0 Environment Impact Assessment:

A detailed environment impact assessment (EIA) study is required to be undertaken as per guidelines of the Ministry of Environment and Forests.

CHAPTER 4

DETAILED FEASIBILITY REPORT

4.1.1 The studies and investigations suggested in Chapter-3 often generate several investment options which are worth considering. On the basis of the preliminary analysis of these options, a feasible option is selected. The selected option is developed into a project and Detailed Feasibility Report (DFR) is prepared for further processing and seeking Government's approval. In this report a detailed description of the project parameters based on the studies and investigations, is to be given to enable the appraising agencies to evaluate the technical feasibility and financial & economic viability of the proposed project. The information about the project to be provided in DFR should be adequate and reliable.

4.1.2 It should be noted that while preparing DPR (as is the current practice) the existing guidelines issued by the CWC in 1983 and IS 4877 will continue to be followed. The DFR is sought to be prepared following techno-economic approval by CEC/CEA, for the appraisal and approval of the project by the Government.The details of information required to be furnished in the DFR for a Hydroelectric Project have been discussed in the following paragraphs.

4.2.1 The information required to be presented in DFR for a hydroelectric project is indicated below:

i) Need for the project

ii) Project Description (Technical Aspects)

- a) Site, Hydroelectric Potential, Type and Design
- b) Choice of Power Plant Capacity and Unit size
- c) Equipment and Construction Requirements
- d) Manpower Requirements
- e) Arrangements for Evacuation of Power
- f) Linked Projects

iii) Organisational and Management aspects

- a) Implementation Plan
- b) State of Preparedness
- c) Infrastructural Backup

iv) Environment Aspects

v) Project Costs

- a) Capital Cost requirements
- b) Operational Cost requirements
- c) System Costs

vi) Cost Effectiveness Analysis

vii) Sensitivity Analysis

4.2.2 The details under each of the above items have to be furnished and the salient features of the project are to be given in format DFR-1.1.

4.3.0 NEED FOR THE PROJECT :

4.3.1 Demand Analysis:

The need for creation of additional generation capacity is to be established on the basis of demand analysis of power and energy (para 3.3.1 & 3.3.2) for the concerned region/state. In the detailed feasibility report (DFR), it is expected to provide wider perspective of the power sector and explain how the project fits into the overall framework of power development plans of the country and concerned region/state. Relevant information is to be provided as per formats DFR-1.2 & 1.3.

4.3.2 Alternatives Analysed:

In view of the existence of strong interdependence among power projects, it has to be ensured that the proposed project represents the most optimal solution for meeting the deficit. The alternative available in terms of projects which may have been either formulated or identified but not formulated for meeting the deficit as projected by the demand analysis, may be listed and the choice of the proposed project in relation to available alternatives has to be justified. The above justification would have to be based on the relative merits and demerits (qualitative and quantitative analysis) of different modes of generating power viz. nuclear, hydro, thermal etc. and establish the case for the chosen mode of generation. Further, within the selected mode of generation, the analysis of alternative in terms of their location, the analysis of design, fuel availability and transport, infrastructure, impact on environment, capital and operating costs, system costs, funding arrangements, possibility of external assistance etc. has to be presented so as to indicate that the selected project is the best among available alternatives. Details are to be furnished as per formats DFR-1.4 - 1.6 for each alternative.

4.4.0 PROJECT DESCRIPTION (Technical Aspects) :

4.4.1 Site, Hydroelectric Potential, Type and Design :

The characteristics of hydroelectric projects vary from site to site as a result of which a uniform set of guidelines cannot be prescribed. It is, however, possible to suggest that the project be split up into meaningful sub-systems somewhat on the following lines of a brief overall discription of the project. In this brief discussion, it should be brought out whether the project is run-of-the River or Storage type, whether it involves any pumped storage etc, how the hydro electric potential of the project has been estimated and why it is proposed to take it up in stages. A brief historical perspective of the project in terms of various developments which may have taken place since its identification etc. would also be desirable. If it involves more than one State either for cost sharing or benefits then this should be brought out together with agreements, alternatve designs which may have been considered and rationale behind the choice of ultimate design for tapping the hydro-electric potential should also be stated.

Sub-Systems	Technical Specifications& Description
i) Dam/Division Weir	
ii) Pondage/Reservoir	
iii) Intake Structure	
iv) Desilting basins	
v) Head Race Tunnel (incl. crossings etc.)	

vi) Surge Shaft

vii) Pen Stock Tunnels

viii) Power House

ix) Tail Race Tunnel

x) Switch Yard

xi) Navigation Works

xii) Water-Supply Works

4.4.2 Technical alternatives and rationale for selecting the proposed alternative under each of these sub-systems should be presented. For instance in the case of generation equipment the specific reasons for opting for a particular unit size and design could be brought out. Similarly, it may be possible to consider varying dam heights, storage capacity, submergence, etc. Exercises on economic optimisation of such technical features may also be presented here.

4.4.3 Power Plant Capacity and Choice of Unit Size :

Having established a case for additional generation capacity, the rationale for project scale (total plant capacity) should be provided. If the present proposal forms one phase of an ultimately envisaged development, it may be explained as to how the ultimate project capacity has been conceived and why this should be implemented in a phased manner. The proposed timing of different phases of project should also be explained. Further the precise choice of unit size as well as mix of units must be explained in the light of economies of scale, indigeneous manufacturing capacity etc. Thereafter, the technical specifications of different components such as turbo-generators should be indicated. Specific advantages of these specifications in the light of the latest available technology should be mentioned. Any studies and investigations which may have been carried out in the context of this sub-system should be furnished.

4.4.4 Equipment and Construction Requirement :

a) The DFR should contain a complete list of capital equipment (by type and size) of the main units of the proposed plant, requirements of buildings and structures by type and size and a broad plant layout. It should give justification for the choice of size and specifications proposed for important items of equipment and plant structure.

b) The DFR should also indicate the possible source of supply of capital equipment, construction services, engineering services etc. This is particularly important in the case of imported items. For imported items which are of high value or are critical to operation of plant, alternative sources of supplies should be indicated in order of performance.

c) The level of township statisfaction which has been assumed in the project cost may be indicated together with the details of the various types of houses which are proposed to be constructed as laid down by the Bureau of Public Enterprises (BPE). The precise location of the project and township and the distance between them may also be indicated. If the project authorities are planning to seek a separate sanction for the township at a later date, the years in which they may come up for such a sanction together with the likely requiement of funds in those years may have to be foreseen at the investment decision making stage itself as per the instructions in vogue.

d) Choice of equipment: The DFR should also deal with the analysis underlying the choice of equipment and specifications of the construction requirements. The DFR should outline the construction methodology and technology to be used, including capital labour intensive options considered, construction equipment to be used, use of new materials planned, innovations in

methodology, quality assurance, improvements planned over present construction methodologies/technologies and their likely benefit on project construction time and cost.

4.4.5 Manpower Requirement :

The DFR should indicate the unitwise and category-wise requirement of personnel for the project and plan for induction of different categories of personnel. It should also indicate the arrangement proposed for training in-plant and outside. If the project involves redundancies, it should indicate plans for redeployment of the staff rendered surplus. The DFR should indicate the steps envisaged for avoiding retrenchment or redeployment of construction staff after completion of construction, wherever necessary. The DFR should also indicate the organisational structure envisaged for the project after it is in production, and the time scdedule for filling up of key posts, particularly that of the Chief Executive. It should also indicate the arrangements contemplated for ensuring continuity in top management.

4.4.6 Arrangements for Evacuation of Power:

The arrangements to be made to evacuate power from the generating station to the regional grid/consumer need be specified in terms of voltage of transmission, transmission lines required for inter regional and intra regional power transfers, strengthening of transmission and distribution system of the beneficiary states, expected T & D losses, right of way, agreements with beneficiary states/ consumers concerning sale of power etc.

4.4.7 Linked projects :

The hydroelectric projects, by their very nature are located in remote areas. For successful implementation of a hydroelectric project, a number of related projects such as construction of roads, bridges, telecommunication, construction power etc. have to be completed involving many agencies other than the project authorities. All such projects should be listed giving details of their size, location, implementing agency, completion schedule etc. Further there may be interstate problems on water sharing and construction of transmission lines. Timely completion of linked projects may prove critical for successful implementation of the proposed project.

4.5.0 ORGANISATIONAL & MANAGEMENT ASPECTS :

4.5.1 Implementation Plan :

a) The feasibility report should indicate the activity- wise phasing of construction preferably in the form of a critical path diagram, or a master control net work (PERT/CPM) diagram. Quantitative information on the phasing of material and labour requirements during construction should be specified. The report should also indicate the timing of deliveries of imported (if any) and indigeneous equipment. The physical specification of phasing given in this chart should be consistent with the phasing of expenditure given in the section on capital costs. While indicating the phasing of construction activities of the project the phasing of inter-related facilities should also be clearly indicated so as to present an integrated view of all the connected items. Steps which could be taken to reduce the period of construction should also be indicated.

b) The feasibility report should also deal with the types of problems that may affect the phasing of construction. For example, possible difficulties in the movement of oversized components,special requirements of skills for onsite fabrication, etc. It should indicate the arrangements envisaged for housing workers during construction and for ensuring the supply of utilities during construction.

c) The report should also deal with the proposed capacity build-up for generation. The report should try to identify the types of problems that could arise during the capacity build up stage particularly with respect to possible equipment failures. In this connection the report

should set out the experience of other plants of the implementing agency and analyse this in the context of its own anticipations.

d) The DFR should provide organisational structure intended for implementing the project.

4.5.2 State of Preparedness :

The following information may have to be furnished by the project authorities to illustrate their preparedness for the implementation of the project under consideration.

a) Studies & Investigations:

How far the required studies and investigations have been completed leading to, in general, a better prepared project?

b) Mode of implementation:

i) Whether the project will be implemented departmentally or through a turnkey contractor/various contractors or both. If so, whether the turnkey packages have been chosen as homogeneous parts for facilitating easy supervision, monitoring, fixing responsibility for non-attainment of performance, targets and even carrying out a disaggregated cost benefit analysis wherever possible/required.

ii) If the project is to be implemented by the departmental personnel, whether adequate number of key personnel of required experience and calibre are available? If fresh recruitment is to be resorted to, whether it will be possible to get such requisite manpower within the stipulated time? Whether the present recruitment rules and procedures would permit the same.

iii) If the project is to be implemented by hiring the services of a turn-key contractor, the standing of the contractor, his track record in the implementation of similar projects, major works on hand, capability to mobilise the requisite resources at a required time so that the project does not slip, may be explained.

iv) What is the progress in the acquisition of basic engineering and performing the detailed engineering work in connection with the project?

v) How far the material resources have been estimated and the tender documents made ready so that the notice inviting tenders could be released as soon as the investment decision is taken.

vi) Whether detailed schedules have been made for the various activities forming part of the PERT Chart used for the estimation of the gestation period. A copy of the Chart may be furnished. How will the project be monitored particularly for the activities on the critical path?

c) Infrastructural Backup:

Whether the following infrastructural facilities have been acquired/tied-up:

i) Allotment of land and problems associated therewith;

ii) Whether the project site is well connected by a road/highway of the required standard. If not, what steps are being taken to acquire/augment this facility?

iii) Whether there is a need for a railway siding during the construction stage, for easy movement of plant and equipment upto the site by rail? If so, what steps have been taken to ensure that the siding will be available in time;

iv) Arrangements for making construction power for the project specifying need for laying of transmission line, if any.

v) Whether any temporary housing/warehousing have been provided wherever circumstances warrant the same?

4.6.0 ENVIRONMENTAL ASPECTS :

The hydroelectric projects,particularly those involving dam construction and associated works, affect environment by way of submergence of vast tracts of land, forests etc. besides affecting the flora and fauna of the region. Their impact on the local population which may have to be rehabilitated, agriculture and other productive activities and geology of the affected areas have to be clearly brought out in this section. The project will have to be cleared from the ecological and environmental point of view by the Ministry of Environment and Forests of the Government of India as well as the Environmental Control Boards of the respective State Governments. In view of this, the individual requirements of these organisations will have to be foreseen and complied with. The measures envisaged to prevent environmental deterioration and hazards should be fully discussed in the DFR together with the cost implications. The environmental clearance should be obtained before the project is submitted for Government approval and relevant costs of environment related aspects separately mentioned in the cost estimates. Information on the following items is required for the this purpose:

a) Site Plan indicating location of different works such as dam, channels, power generation units, switch yard, township etc.

b) Afforestation programme and works related to reduce environmental impact of the project.

c) Rehabilitation plan.

4.7.0 PROJECT COST :

a) Capital Cost Requirements :

4.7.1 In case of a Power Plant, the Capital Costs are essentially those costs which are incurred for creation of fixed assets such as Power Plant and associated facilities. A Power Project may be implemented in more than one stage and involve expenditure in foreign exchange. Summary of capital cost for major items of works appertaining power plant and associated facilities under each stage both in terms of Indian Rupee and foreign exchange is to be furnsihed in the formats DFR-2.0.

4.7.2 While framing capital cost estimate of a hydro-electric project, based on various guidelines issued by a Central Water Commission and Indian Standard Institution, the following points can be considered:

i) Basic information should be collected in regard to:

a) Assessment of quantity of works involved;

b) Schedule of basic wages;

c) Schedule of basic rates of materials;

d) Schedule of transport rates;

e) Equipment prices and their use rates;

f) Basic outputs of men and machines;

g) Whether the work is proposed to be done departmentally;

h) Extent to which machanised construction is contemplated;

i) Distance of railheads,quarries and burrow areas,leads of other materials involved in the construction; and

j) Details of communication facilities available.

ii) The following points may be kept in view while framing estimates:

a) As river valley projects have generally to be constructed in out of the way places, no standard or scheduled rates are strictly applicable for working out

costs of different items of works. For the purpose of estimation, therefore, the item rates should be based on detailed analysis prepared for the local conditions for all principal items. Such analysis should be enclosed with the estimates.

b) In some project estimates, the rates are taken from a district or State Schedule and charges for extra leads added to arrive at the rate to be adopted. This is to be avoided, as firstly the project rates have their own structure, different from the normal works of buildings, roads or irrigation maintenance works, secondly, the schedule of rates in the area may not have been updated, and the escalations to be considered for updating the rates may pose a problem.

c) Actual rates obtained on constructed works in nearby areas could with advantage be used in the estimate. It should, however, be seen that working conditions in the two projects are similar, the differences in the leads of materials in the two projects should be accounted and escalations wherever necessary are taken into account. The project from where the actual rate is taken and the year in which such rate was realised should be specified.

d) For working out the rates of used machinery, the norms of life, depreciation, repair provisions etc. should be taken as given in the "Guide Book on Transfer of Used Equipment, May, 1975". These norms were recommended by the Select Group constituted by CW&PC to examine the report of the Second Construction Plant and Machinery Committee, and have been approved by the erstwhile Ministry of Irrigation & Power (in the past the norms adopted were those given in the CPMC Report as modified by the 7th I&P Seminar).

e) Lumpsum provisions, should as far as possible, be minimised and efforts made to assess them by working out details to the maximum extent practicable. When it is not possible to avoid making lumpsum provisions the cost should be based on the experience obtained on works of similar magnitude elsewhere.

iii) For classification of estimates into units and account heads, the Indian Standards Institution has published a standard numbered I.S. 4877 - 1968 entitled "Guide for preparation of estimate for river valley projects" on this subject. The project works have to be grouped into the following units:

a) Unit-I: Headworks including main dam and auxillary dam, dykes, spillway, outlet works, energy dissipation devices, barrages, weir regulator including intake structures and diversion works.

b) Unit-II: Main Canals, branches, and distributaries inclusive of all pucca works.

c) Unit-III: Hydro-electric installation.

1. Power Plant and appertenant works:

i) Civil works and

ii) Power Equipment

2. Transmission Lines

3. Sub-Stations

d) Unit-IV: Navigation works

e) Unit-V: Water Supply works.

iv) Each unit and if necessary each sub-unit, should be covered under the following minor heads classified as direct and indirect charges.

Direct Charges: These shall include the following:

a) Works;

b) Establishment;

c) Tools and Plant;

d) Suspense and

e) Receipts and Recoveries on Capital Account.

Indirect Charges: These shall include the following:

a) Capitalised value of abatement of land revenue and

b) Audit and Accounts charges

v) The provisions, under the Minor Head I - works will be further sub-divided under the following detailed heads;

a) Preliminary;

b) Land;

c) Works;

d) Regulators and measuring devices;

e) Falls (for canals only);

f) Gross drainage works (for canals only);

g) Bridges (for canals only);

h) Escapes (for canals only);

i) Navigation works;

j) Power Plant appertenances (civil works);

k) Building;

l) For canals only:

i) Earthwork and

ii) Lining

m) Plantations;

n) Tanks and reservoirs;

o) Miscallaneous;

p) Maintenance;

q) Special tools and Plant;

r) Communications;

s) Power plant and Electrical System;

t) Water Supply works and

u) Losses on stock and unforeseen.

4.7.3 The ISI standard also indicates the various items of work in the detailed heads. While the list of items may not be exhaustive, nevertheless it serves as a check list and reference to these is useful to check broadly that all relevant items have been included in the estimate and no important item is overlooked. Further detailed break-up of major items to be included under each account head is set out at Formats DFR-2.1 to 2.10.

4.7.4 The capital cost should include all items of expenditure required to be incurred before the commencement of commercial operation of the plant. Apart from expenditure on fixed assets, the cost estimates must also include township, engineering and administration costs as well as interest during construction (IDC), working capital margin, costs of training, expenditure on testing and stablization, staff, etc. After commencemnt of production, capital costs will be incurred when some items of equipment are replaced. Basically the intention is to analyse the profitability of projects over a single life time and the costestimates presented

should not allow for a large scale rehabilitation of the plant. However, there will be some items of equipment e.g. vehicles etc., which may require replacement during the economic life of the project as a whole. These costs should be estimated and be shown in the respective year of their occurance. It is necessary that replacement expenditure should be distinguished clearly from repair and maintenance expenditure. The distinction will not always be easy to make but for practical purposes the distinction can be considered capital expenditure under tax laws. Estimates of repair and maintenance expenditure should be presented under operating costs. The enterprise should also develop a uniform way of coding items of expenditure under all heads.

4.7.5 The project authorities should adhere to the norms approved by PIB regarding admissible level of contingencies. Further, as per PIB procedures, no built in provision for forward escalation in the Capital Cost estimates is allowed. Hence the cost estimates, should correspond to a fairly recent date perferably not more than six month's old.

4.7.6 The major assumptions forming the basis of the capital cost estimates should also be listed in the text alongwith presentation in the relevant format DFR-2.0. The major itemwise details of cost estimate are to be covered in formats DFR-2.1to 2.7. It is desirable that following information should also be presented in the text:

i) The reference price level of estimates;

ii) Currencies and exchange rates and their reference period

iii) Level of contingencies

iv) The level of inventories of materials, spares etc.

v) Scaling factors used for scaling up/down cost of any major equipment/item;

vi) The status of engineering and design on the basis of which the estimates have been framed and

vii) Rates and quantities of items on the basis of value analysis.

viii) Debt Equity Ratio, interest rates.

ix) Customs duty, Excise duty , Sales tax etc.

4.7.7 The cost on account of environmental safeguards including pollution abatement, rehabilitation, afforestation etc. would need to be estimated with the help of concerned authorities and the cost involved may be shown in the capital cost estimates as a separate item. (DFR-2.8)

4.7.8 Format DFR-2.9 has been designed with a view to collect information about the working capital requirements. Based on this, the margin money for the working capital required for the project and forming a part of the capital cost estimates will have to be determined for the purpose of sanction for the investment. However, for the purpose of viability analysis the interest on borrowed portion of the working capital should also be reflected in the separate column.

4.7.9 The information on the capitalised interest (on loan portion only) during construction should be furnished in detail (DFR-2.10) with the necessary back up calculations.

4.7.10 The DFR should also deal with the capital cost phasing of the project taking into account the various critical activities, requirements of resources, terms and conditions at which these resources could be mobilised, budget for the funds and arrive at an yearly requirements of funds for execution of the proejct.

b) Operating Costs Requirements :

4.7.11 For the purpose of project appraisal, operating costs are essentially those costs which are incurred after the commencement of commercial production, excluding costs incurred for the replacement of capital equipment but including cost incurred for repairing and maintenance of capital equipment. The formats DFR.3.1 & 3.2 have been designed to collect information about operating costs in the form required for social profitability and financial appraisal.

4.7.12 The operating costs in case of a hydro-electric project mainly consist of labour, operating and maintenance charges. These costs will however vary according to variation of peak load catered by the project. The practice of taking operating and maintenance as a percentage of Capital Cost need be discontinued.

4.7.13 The operating costs comprising variable and fixed costs, are to be presented in the format DFR-3.1. The quantitative requirements of various inputs based on established norms and unit rates, wherever possible, are to be furnished alongwith their estimated costs. The cost data is to be furnished both in financial and economic terms for full capacity generation for a full year based on the prices prevailing in the reference year.

4.7.14 DFR-3.2 has been designed to collect data on labour requirements and labour costs. The coding of labour by category suggested in this annexure could be modified to suit the requirements of each enterprise. However, as far as possible the modifications should take the form of an addition of such categories rather then a complete change in the classifications suggested here.

c) Total System Costs :

4.7.15 The system costs are incurred in the creation of the required complementary facilities by the other organisations which are not owned by the enterprise. But, nevertheless, these are required for the smooth construction/operation of the project. The purpose of this section is to obtain information on identity of these linked projects, the agencies responsible for these, the total cost of these projects, the corresponding provisions in the plans, the cost sharing arrangements, if any etc. Information is to be given in format DFR-2.11.

4.8.0 COST EFFECTIVENESS ANALYSIS :

4.8.1 Cost Effectiveness Analysis is undertaken to determine whether proposed investment in the proposed project is consistent with overall national and sectoral objectives and represents the best means of achieving the intended benefits.

4.8.2 The benefits of power projects are determined in terms of additional availablity of electricity and net additional energy flow through the system comparing the "with" and "without" project situations. Considering interconnected nature of power projects system analysis of project's impact would be the appropriate way of estimating benefits accruing to the power utilities and consumers. However, in view of considerable difficulties in getting data for system analysis, the benefits of a power project are treated as non quantifiable and Cost Effectiveness Analysis is carried out in terms of unit cost of generation.

4.8.3 Financial Cost of Generation

For the purpose of appraisal, the capital cost and the operating costs are worked out at market prices. The formats DFR 4.1 - 4.3 have been designed to assess financial position of the enterprise. Cashflow is prepared for the projected cost and the generation/flow of energy in each year of their occurance covering entire economic life of the project. The costs and the units generated are discounted at a rate specified by the Government to workout unit cost of generation (DFR-4.4). It may be added that cost of generation by conventional method would continue to be calculated alongwith calculation of cost of generation by DCF method, as per requirement of the CEA for techno-economic clearance purposes.

4.8.4 Economic Cost of Generation

The objective of the economic analysis of power project is to determine the cost of generation and transmission at their true resources cost to the economy as the financial cost of generation/transmission may not reflect the true cost of power to the economy on account of distortions inherent in the market prices. While working out the economic cost of generation/ transmission, both the costs and power generated have to be valued at their true resources cost. This process involves removal of taxes and duties from the costs as they are not the costs to the society. Similarly, the subsidies are also not allowed as they are only transfer payments. The foreign exchange being scarce , there is certain amount of premium on it. All the imported items such as plant and machinery have to be valued at CIF prices. Apart from adjustment in the costs, the economic analysis also covers the impact of the proposed project on the power system. As a result of the proposed project coming into the stream, there may be some existing power plants which may be backed down in the interest of optimal operation of the power system resulting in resources cost saving and additional energy availability from the system besides improving the quality of supply in the system. Efforts should be made to bring out the possible reduction in operating costs for the rest of the system on account of addition of the proposed project.

4.8.5 Likewise the financial analysis, cash flow for the economic analysis will also be prepared on the similar lines covering the capital cost and operating cost in the economic terms and the proposed units generated/energy flow in the system for each year during the life of the project. These cash flow will be discounted at a rate specified by the Government to arrive at the economic cost of generation.

4.9.0 SENSITIVITY ANALYSIS :

4.9.1 It is assumed that the DFR is prepared on the basis of, as far as possible, realistic assumption of demand supply gap, capital cost estimates, gestation period, operating cost estimates, production build-up, turnover, economic life, etc. But, the project is in the nature of a venture which means exposure to chance and some of the assumptions/estimates may go wrong. Experience shows that in several areas assumptions have often gone wrong. It is, therefore, necessary to carry out sensitivity analysis to indicate the project's financial viability when there are changes in the estimates of key parameters such as capital costs particularly the foreign exhchange component, operating costs etc. The extent of changes in the key parameters should be based on the past experience relating to the sector.

HYDROELECTRIC PROJECTS

DFR - 1.1

SALIENT FEATURES OF THE PROJECT

A. Indentification Characteristics

1. Name of the project:

2. Location (District/State)

   i) River

   ii) State/District

3. Implementation Agency

4. Department/Ministry sponsoring the project

5. Sector

6. Objectives/nature of project (Grassroot/ expansion/ replacement/ rehabilitation/modernisation).

B. Physical Characteristics

1. Project Capacity	Stage I	Stage II	Stage III
i) a) Installed capacity(MW)			
b) Generation (MKwh)No. of Units (...../dependable year)			
c) Transmission Requirement *			
- Voltage level			
- SC/DC			
- Line length (CKT,Km)			
- Substation (MVA)			
ii) Irrigation Potential			
iii) System benefits			

* may form part of linked transmission project.

2. Type: i) Run of River/Storage Dam

ii) If storage dam type, whether Multipurpose? If not, can it be made multipurpose through modifications.

3. Total Catchment Area (Sq.km)

(contd.)

4. Total Land area to be submerged
   - Forest land
   - Agriculture land
   - Other land
5. Total No. of villages/population to be displaced
6. Principal Technical features:
   - Dam
   - Pond
   - Intake structure
   - Desilting basins
   - Head race tunnel
   - Penstock tunnel
   - Power house
   - Tail race tunnel
   - Switch yard
7. Additional Employment Generation (Nos.)

C. Financial and Economic Characteristics

1. Total Capital cost (Rs. Crores)
2. Foreign exchange component (Rs. Crores)
3. Exchange Rate:
4. Interest during construction (Rs. crores)
5. Working Capital Margin (Rs. Crores)
6. Funding arrangement for Indigenous Cost (IC) and FE
7. Total system cost (Rs. crores)
8. Base date of capital cost (month/year)
9. Annual operation and maintenance cost (at_____% cap. ut.)
   (Rs. crores)

(contd.)

10. Selling Price (Rs./Kwh)

D. Evaluation Indicies

	Cost of Generation * Rs. / k(wh)
1	2
(i) Financial	
(ii) Economic **	

* This has to be worked out at a discount rate specified by the Government.

** With premium on foreign exchange and other shadow prices as specified by the Government.

E. Commissioning Schedule

a) Generating units

1. From the date of sanction to synchronisation of units _____ years _____ months.
2. From the date of sanction to commercial operation _____ years _____ months.

b) Transmission Lines

1. From date of sanction to commissioning _____years _____months.

HYDROELECTRIC PROJECTS

* DFR - -1.2

ANALYSIS OF DEMAND & AVAILABILITY OF POWER IN THE REGION IN THE YEARS THE REGION IN THE YEARS

Item	YEAR @		YEAR @		YEAR @	
	Without project	With project	Without project	With project	Without project	with project
1 2	3	4	5	6	7	8
1. Installed Capacity (MW)						
2. Peak Demand (MW)						
3. Peak Availability (MW)						
4. Peak Deficit (MW)						
5. Energy Requirement(M.Kwh)						
6. Energy Availability (M.Kwh)						
7. Energy Surplus/deficit (M.Kwh)						

* Basis of demand and availability (existing projects in operation and sanctioned projects) to be indicated .

@ Year: Year of full benefits, end of current and next Five Year Plan.

HYDROELECTRIC PROJECTS

DFR - 1.3

DETAILS OF POWER AVAILABILITY IN THE REGION

Region/ Plants	First year of full production: Installed Capacity (MW)	Likely Benefits: Peak Load (MW)	Likely Benefits: Energy (Mkwh)	Basis
1	2	3	4	5
A. Existing Plants				
Total (in operation)				
Hydro				
Thermal				
Nuclear				
Total A:				
B. Sanctioned Projects				
I.1 Hydro				
.				
.				
.Sub Total I.1				
I.2 Thermal				
.				
.				
Sub Total I.2				
I.3 Nuclear				
.				
.				
Sub Total I.3				
Total B :				

HYDROELECTRIC PROJECTS

DFR - 1.3 (contd.)

PLANT-WISE DETAILS OF POWER AVAILABILITY

Region/ Projects	First year of full benefits: Installed Capacity (MW)	Likely Benefits: Peak Load (MW)	Likely Benefits: Energy Mkwh)	Basis
1	2	3	4	5
C. Cleared by CEA or				
DAE etc. but awaiting				
Govt. Approval *				
I.1 Hydro				
.				
.				
Sub Total I.1				
I.2 Thermal				
.				
.				
Sub Total I.2				
I.3 Nuclear				
.				
.				
Sub Total I.3				
Total C :				
Grand Total : (A+B+C)				

* Assumptions on likely date of approval and gestation period may be stated.

HYDROELECTRIC PROJECTS

DFR - I.4

ALTERNATIVE PROJECTS IDENTIFIED FOR MEETING PROJECTED POWER DEFICIT

Name of Project & Owner/ Region	Type of Project *	Present Status @	Capacity Envisaged (MW)	Estimated Cost Rs. crores	Likely date of Commissioning	Yearwise Likely Benefits #	
						Yr1..	Yr2...
1	2	3	4	5	6	7	8
1.							
2.							
3.							
.							
.							
.							

* Whether Hydro, Thermal, Nuclear, etc.

@ Whether identified, formulated, under CEA's consideration.

Peak load availability and Energy availability.

HYDROELECTRIC PROJECTS

DFR - 1.5

ITEMWISE BREAKUP OF CAPITAL COST AND OPERATION & MAINTENANCE COST

(Separately for each Alternative)

Unit of measurement :

Base date (month & Year):

Exchange rate * :

Item	Unit	Qty.	Market Price	Financial Cost			# Economic Cost	
				IC	FC	Taxes & Duties in IC	IC	FC
1	2	3	4	5	6	7	8	9
A. Capital Cost								
1. Studies & Investigations								
2. Land & Civil Works								
3. Know-how & Engineering								
4. Plant & Equipment								
5. Project Management								
6. Commissioning Expenditure								
7. Environment Related Cost								
8. Margin Money for Working Capital								
9. Capitalised Interest During Construction								
Total (1-9) :								
Cost (Rs. / kwh) :								

(contd.)

HYDROELECTRIC PROJECTS

DFR - 1.5(contd.)

ITEMWISE BREAKUP OF CAPITAL COST AND OPERATION & MAINTENANCE COST

(Separately for each Alternative)

Item	Unit	Qty.	Market Price	Financial Cost			# Economic Cost	
				IC	FC	Taxes & Duties in IC	IC	FC
1	2	3	4	5	6	7	8	9
B. Operation & Maintenance at full capacity operation								
1. Labour cost								
01								
02								
2. Repair & Maintenance								
3. Other expenses								
Total (1-3) :								
Cost (Rs. / kwh) :								

* In case a number of Foreign Currencies are involved the amount and the exchange rate assumed may be specified separately.

\# For all traded and tradable items, the economic cost would be fob / cif prices and internal transportation cost. For non-traded items, thiswill be social opportunity cost/ economic cost of production/market price excluding taxes, duties and subsidies and any other transfer payments.

Note: IC indicates the indigenous component and FC the Foreign component.

HYDROELECTRIC PROJECTS

DFR - 1.6

CASHFLOW STATEMENT FOR CALCULATION OF COST OF GENERATION

(Separate statements for financial and economic unit costs for different alternatives)

Alternative ..... Base date (month & Year)

Exchange rate :

(Rs. crores)

YEAR	CASH OUT FLOW									Units Generated
	Capital Cost			O & M Cost			Total			(M.Kwh)
	IC	FC	Taxes and duties in IC	IC	FC	Taxes and duties in IC	IC	FC	Taxes and duties in IC	
1	2	3	4	5	6	7	8	9	10	11
1.										
2.										
3.										
N										
Total										

IC : Indigenous Component FC : Foreign Co mponent

Cost of Generation (Rs/kwh): Financial_____, Economic_____

Note: i) Interest during construction (IDC) will be exlcuded fromcols.2 & 3. Depreciation will be excluded from col.5. Interest on Working Capital will,however,be included in col. 5.

ii) Recovery of salvage value is to be shown in N+1 year.Replacement cost of capital nature, if any,Fgnot included in the annual O&M cost should be shown in thecapital cost column against the appropriate years.

iii) For economic analysis the capital and operation and maintenance cost should be taken at their economic values (as given in DFR 1.6) and after using premium/ shadow prices for foreign exchange, labour, etc. as may be specified by PIB from time to time.

HYDROELECTRIC PROJECTS

DFR - 2.0

SUMMARY OF CAPITAL COST

Base date (month & year):

Exchange rate* :

(Rs. crores)

Statement No.	Item	Capital Cost			@ Basis of estimates	Degree of reliability within (+/-)....%
		IC	FC	Total		
1	2	3	4	5	6	7
2.1	Studies & Investigations & Preliminary Works					
2.2	Pre-Construction Activities					
2.3	Cost of Civil Works (including land)					
2.4	Know-how, Engineering and consultancy					
2.5	Plant & Equipment					
2.4.1	Electrial Equipment					
2.4.2	Control Instrumentation and DAS					
2.4.3	Misc. tools & Plants					
2.6	Project Management (Administration)					
2.7	Commissioning Expenditure					
2.8	Environment Related cost					
2.9	Working Capital Margin					
2.10	Interest During Construction					

(contd.)

HYDROELECTRIC PROJECTS

DFR - 2.0(contd.)

SUMMARY OF CAPITAL COST

1	2	3	4	5	6	7
A. Total Project Cost (2.1 to 2.10)						
2.11	Cost of linked projects					
2.12	Cost of unskilled labour included in A (Total)					
2.13	Any other cost (specify)					
B. Total system cost:						

* In case the number of foreign currencies involved are more than one, the amount and exchange rate for each of the currencies may be indicated in the footnote.

@ TQ - Tender Quotation

BQ - Budgetary Quotation

IH - In-House Cost Data

CD - Consultants Data

IC - Indigenous Component

FC - Foreign Component

HYDROELECTRIC PROJECTS

DFR - 2.1

DETAILS OF THE COST OF THE STUDIES AND INVESTIGATIONS AND PRELIMINARY WORKS

Base date (month & year):

Exchange Rate:

(Rs. Crores)

Sl. No.	Studies and Investigations and Preliminary works	Cost of the Study/ Investigation			** Agency responsible for carrying out the study/ investigation
		IC	FC	Total	
1	2	3	4	5	6
1. Demand Analysis					
2. Hydrology					
3. Geological conditions					
4. Site selection, site conditions and investigations					
5. Preliminary works					
6. Basic Engineering					
7. Environmental Impact					
8. Others					
9. Total					

IC : Indigenous Component FC : Foreign Component

** Indicate whether inhouse or outside agency.

HYDROELECTRIC PROJECTS

DFR 2.2

DETAILS OF PRE CONSTRUCTION ACTIVITIES

Activities	Expenditure (Rs. crores)
1	2
1. Land (except submergence)	
2. Road & bridges	
3. Buildings	
4. Construction Power	
5. Communication	
6. Construction Equipment	
7. Others	
8. Total	

HYDROELECTRIC PROJECTS

DFR - 2.3

DETAILS OF COST CIVIL WORKS

Base date (month & year):

Exchange Rate :

Sl.No.	Item	Unit	Qty.	Rate (Rs)	Amount (Rs.Crs.) IC	FC	Remarks
	2	3	4	5	6	7	8
1.	LAND (Other than included in pre-construction)						
2.	ROADS & BRIDGES (Other than pre-construction)						
3.	BUILDINGS (Other than pre-construction)						
4.	RIVER DIVERSION WORKS						
	i) Coffer dam						
	ii) Tunnel Excavation						
	iii) Tunnel Lining and Grouting						
	iv) Others						
5.	DAM & DYKES						
	a) DAM						
	i) Excavation						
	ii) Concreting						
	iii) Masonary						
	iv) Earth fill						
	v) Others						
	b) DYKES						
	i) Excavation						
	ii) Fill Material						
	iii) RR Masonary						
	iv) Others						

(contd.)

1	2	3	4	5	6	7	8

6. SPILLWAY AND GATES
   - i) Hydro Mechanical Works
     - a) Fabrication and supply
     - b) Installation
   - ii) Others
7. INTAKE STRUCTURES
   - i) Excavation
   - ii) Concreting
   - iii) Hydro Mech. Works
     - a) Fabrication and Supply
     - b) Installation
   - iv) Others
8. HEAD RACE TUNNEL/CHANNEL TUNNEL
   - i) Excavation
     - a) Adits & Construction Shaft
     - b) Head Race Tunnel
   - ii) Concreting
     - a) Overt
     - b) Invert
   - iii) Grouting
   - iv) Cleaning and Plugging
   - v) Open Channel
     - a) Excavation
     - b) Concrete Lining
   - vi) Others

(contd.)

HYDROELECTRIC PROJECT

DFR - 2.3 (contd.)

1	2	3	4	5	6	7	8

9. BARRAGE / FOREBAY
   - i) Excavation
   - ii) Foundation Treatment
   - iii) Concreting
   - iv) Hydro Mech. Works
     - a) Fabrication and Supply
     - b) Installation
   - v) Others

10. SURGE TANK
    - i) Excavation
    - ii) Concreting
    - iii) Others

11. B F VALVE/SPHERICAL VALVE HOUSE
    - i) Civil Works
      - a) Excavation
      - b) Concreting
    - ii) Valve House Crane
    - iii) Installation of valves
    - iv) Others

12. PRESSURE SHAFT (line-wise)
    - i) Excavation
    - ii) Fabrication of steel liners
    - iii) Erection of steel liners
    - iv) Concreting/Grouting
    - v) Others

1	2	3	4	5	6	7	8

13. SURFACE PENSTOCKS (line-wise)
    - i) Excavation
    - ii) Concreting
    - iii) Fabrication & supply
    - iv) Erection and Testing
    - v) Others
14. POWER HOUSE BUILDING
    - i) Excavation
    - ii) Concreting sub-structures
    - iii) Super structure concreting
    - iv) Concreting (Unit-wise)
        - a) Draft Tubes
        - b) Scroll casing
        - c) Turbine pit
        - d) Generator barrel
    - v) Others
15. UNDER GROUND POWER HOUSE
    - i) Approach Tunnel
        - a) Excavation
        - b) Concreting
    - ii) Adits - Excavation

(contd.)

1	2	3	4	5	6	7	8

iii) Power House Cavern

a) Excavation

b) Concreting/Shot Creting

c) Turbine Pit Excavation (unit-wise)

d) Turbine Pit Concreting (unit-wise)

e) Crane Column

f) Crane Beam

iv) Transformer Cavern

a) Excavation

b) Concreting/Shot Creting

v) Bus Duct/Cable Cavern

a) Excavation

b) Concreting/Shot Creting

vi) Valve House Cavern

a) Excavation

b) Concreting/Shot Creting

vii) Others

16. PUMP STORAGE SCHEME/TAIL POOL DAM

i) Pump Storage Scheme/Tail Pool Dam

a) Excavation

b) Concreting

ii) Others

(contd.)

HYDROELECTRIC PROJECT

DFR - 2.3 (contd.)

1	2	3	4	5	6	7	8

17. TAIL RACE TUNNEL/CHANNEL
    - i) Excavation
    - ii) Lining
    - iii) Hydro Mechanical Equipment gates
        - a) Fabrication & Supply
        - b) Installation
    - iv) Others
18. CABLE TUNNEL & TRENCHES
    - i) Excavation
    - ii) Concreting
19. SWITCH YARD
    - i) Excavation & Levelling
    - ii) Preparation of Foundation for Structure/Equipment
20. Township
21. Maintenance during construction
22. Special tools and plants
23. Losses on stocks
24. Suspense
25. Others
26. Total

HYDROELECTRIC PROJECTS

DFR - 2.4

DETAILS OF KNOWHOW, ENGINEERING AND CONSULTANCY

Item	Amount (Rs. Crores)
1. Indian Consultacy -(IC)	
2. Foreign Consultancy-(FC)	
-(IC)	

IC : Indigenous Component FC : Foreign Component

HYDROELECTRIC PROJECTS

DFR - 2.5

BREAK UP OF PLANT AND EQUIPMENT COST

Base date (month & year):

Exchange Rate :

(Rs.Crores)

Sl. No.	Item	Cost of Equipment/ supplies				Inland Transport & Insurance	Erection charges	Others (to be specified)		Total	
		cif	Custom Duties & Other Taxes	Indigenous cost	Tax element in IC						
		FC	IC	IC		IC	IC	IC	FC	IC	FC
1	2	3	4	5	6	7	8	9	10	11	12
1.	MECHANICAL EQUIPMENT										
	i) Earth moving Equipment(to be listed)										
	ii) Drilling and Tunnelling equipment										
	iii) Concrete Equipment										
	iv) Misc. other equipment										
2.	TRANSPORT VEHICLES										
3.	EOT CRANE										
	i) Procurement										
	ii) Erection of crane beams										
	iii) Installation of Runway										
	iv) Erection of crane and commissioning										
4.	TURBINE (Unit-wise)										
	i) Procurement										
	ii) Placement of Draft Tube Liner										
	iii) Assembly, Alignment Pressure testing and Concreting of Spiral Casing upto Pit Liner										
	iv) Assembly, Alignment of Pit Liner and Concreting upto Generator Barrel										
	v) Assembly, Erection and Alignment of Runner and Shaft										
	vi) Assembly of Turbine top Cover										

(contd.)

1	2	3	4	5	6	7	8	9	10	11	12

5. GENERATOR (Unit-wise)

i) Procurement

ii) Assembly of Brake System, Lower bracket and Bearing

iii) Assembly of stator sections, Winding, testing & lowering and its Centring and levelling

iv) Assembly of rotor in service bay Testing & lowering

v) Centring of rotor, coupling of turbine generator Shaft & Centring of combined assembly

vi) Completion of Unit installation

vii) Pre-commissioning Test & Mechanical Run

6. UNIT STEP UP TRANSFORMER (unitwise)

i) Procurement

ii) Assembly and Installation

iii) Testing and Commissioning

7. POWER HOUSE AUXILIARIES

i) Procurement

ii) Erection

iii) Control, Relaying and protection Panels

a) Procurement

b) Erection

iv) Power Cables

a) Procurement

b) Erection

(contd.)

1	2	3	4	5	6	7	8	9	10	11	12

v) Control Cables

a) Procurement

b) Erection

8. SWITCH YARD

i) Steel Structures

a) Procurement

b) Erection

ii) Equipment

a) Procurement

b) Erection

iii) Testing & Commissioning of Switchyard

iv) Air Conditioning & Ventillation Eqpt.

a) Procurement

b) Installation

v) Fire Protection Eqpt.

a) Procurement

b) Installation

9. DG SET

10. OTHERS

11. TOTAL

IC : Indigenous Component FC : Foreign Component

HYDROELECTRIC PROJECTS

DFR - 2.6

A. PROJECT MANAGEMENT EXPENSES

Base date (month & year):

Exchange Rate :

(Rs.Crores)

Sl. No.	Item	Project Managment Expenses *			
		IC	FC	Total	Basis
1	2	3	4	5	6
1.	Site Establishments				
2.	HQ Establishment				
3.	Audit & Accounts				
4.	Training and O & M staff				
5.	Others				

IC : Indigenous Component FC : Foreign Component

* Excluding expenditure covered under `Knowhow and Engineering payments'.

Note: This format may be completed based on the experience of the project authorities and their consultants as a percentage of plant costs including plantand equipment.

(Contd.)

B. CATEGORYWISE MANPOWER DURING CONSTRUCTION

Year	Managerial/ Administrative		Technical		Skilled		Semi-skilled		Un-skilled		Total	
	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost
1	2	3	4	5	6	7	8	9	10	11	12	13
1.												
1												
2.												
3.												
.												
.												
Till commissioning												

HYDROELECTRIC PROJECTS

DFR - 2.7

DETAILS OF COMMISSIONING EXPENDITURE

Base date (month & year):

Exchange Rate :

(Rs. crores)

Items	Amount		
	IC	FC	Total
1	2	3	4
A. Expenditure on Commissioning			
1.			
2.			
3.			
Total (A):			
B. Credit for Generation during commissioning period			
C. Net commissioning expenditure : (A - B)			

IC : Indigenous Component FC : Foreign Component

1. Duration of trial runs alongwith the cost incurred for carrying out trial production after adjusting the receipts from such trial runs.
2. The pre-operative training includes the cost of training required to be given to the various categories of work force alongwith the duration of training and Institutes where they are to be imparted, may be indicated. If required, a separate annexure may be used for presenting additional details.

HYDROELECTRIC PROJECTS

DFR - 2.8

ENVIRONMENT RELATED COSTS

Base Date (month & year) :

Exchange Rate :

(Rs. crores)

Sl. No.	Item	Amount			Basis
		IC	FC	Total	
1	2	3	4	5	6
1.	Rehabilitation of displaced persons *				
2.	Compensatory afforestation (including land)				
3.	Land treatment				
	.				
	.				
	.				
	Total				

IC : Indigenous Component FC : Foreign Component

* Number of families/persons affected, compensation basis and other details to be given in the formats.

(Items to be included as per requirement of the project)

HYDROELECTRIC PROJECTS

DFR - 2.9

ASSESSMENT OF WORKING CAPITAL

Base date (month & year) :

Exchange Rate :

(Rs. crores)

Sl. No.	Item	Norms of inventory	Unit rate	Total value	Remarks
1	2	3	4	5	6
1.	Stores and Spares				
2.	Annual Generation of Energy (M.Kwh)				
3.	Debtors				
4.	Cash and Bank balance				
A.	Total current assets (1-4)				
5.	Creditors				
6.	Advances from customers (if any)				
B.	Total current liabilities (5-6)				
7.	Working capital gap (A-B)				
8.	Margin Money (as per norms)				
9.	Gap for bank finance				
10.	Annual interest on bank financed amount (excl. margin money)				

Note:-

1. This is required to be furnished yearwise till one year after stable level of production is achieved;
2. Incremental working capital requirements on annual basis may be shown in a footnote.

DFR - 2.11

COST OF LINKED PROJECTS INCURRED BY OTHER AGENCIES

(Normally for facilities which will not be owned by the enterprise)

Base date (month & year) :

Exchange Rate :

(Rs. crores)

Sl. No.	Project	Total cost	Implementing Agency	Completion date (month/year)
1	2	3	4	5

DFR - 3.1

ESTIMATION OF OPERATING REQUIREMENT AND COSTS

Base date (month & year):

Exchange Rate:

(Rs. crores)

Item/Details	Total requirement (Qty.)	Unit rate	Financial			
			IC	FC	T&DC	Total
1	2	3	4	5	6	7
1. Labour & Supervision						
a)						
b)						
2. Fixed Overheads						
a)						
b)						
3. Repairs & Maintenance						
4. Depreciation						
5. Interest on Long Term Loans						
6. Interest on Working Capital Loans						
7. Others to be specified						
8. Total Operating Cost:						

HYDROELECTRIC PROJECTS

DFR - 3.1 (Contd.)

ESTIMATION OF OPERATING REQUIREMENT AND COSTS

Base date (month & year):

Exchange Rate:

(Rs. crores)

Item/Details	Total requirement (Qty.)	Unit rate	Economic			
			* IC	@ FC	Inland Transport	Total
	2	3	8	9	10	11
1. Labour & Supervision						
a)						
b)						
2. Fixed Overheads						
a)						
b)						
3. Repairs & Maintenance						
4. Depreciation						
5. Interest on Long Term Loans						
6. Interest on Working Capital Loans						
7. Others to be specified						
8. Total Operating Cost:						

IC : Indigenous Component

FC : Foreign Component,

T&DC : Taxes & Duties component

* For non-traded goods.

@ For traded & tradable goods at cif value.

In case any cost item is at subsidised rate, the actual economic cost would be reported.

HYDROELECTRIC PROJECTS

DFR - 3.2

REQUIREMENTS OF LABOUR AND COSTS

(At Stable Level of Capacity Utilisation for a Full Year)

Base date (month & year):

Exchange Rate:

(Rs. crores)

Category of Labour	No. of workers	Total wage cost	Costs of P.F. ESIS, gratuity scheme etc.	Average earnings per worker (Rs.)
1	2	3	4	5
1. Power Plant				
01 Unskilled				
02 Semi-skilled				
03 Skilled				
04 Technical				
05 Managerial				
2. Workers at Administration				
01 Unskilled				
02 Clerical				
03 Junior Managerial				
04 Senior Managerial				
Total:				

HYDROELECTRIC PROJECTS

DFR - 4.1

PROJECTED BALANCE SHEET

(Rs. Crores)

Item	Year 1	Year 2	Year 3 .....
1	2	3	4

I. Assests

01 Gross block

Less 02 Depreciation and amortisation

03 Net block

04 Capital work in progress

05 Unallocated expenditure during construction

06 Other items in the nature of assets

07 Total net fixed assets (03 - 06)

08 Investments

09 Working Capital/Net Current assets

10 Inventories

101 Spare parts

102 Other stores

11 Sundry debtors

12 Loans and advances

13 Cash and bank balance/deposits

14 Other assests

15 Total current assests (10 - 14)

(contd.)

HYDROELECTRIC PROJECTS

DFR - 4.1 (contd.)

PROJECTED BALANCE SHEET

(Rs. Crores)

Item	Year 1	Year 2	Year 3 .....
1	2	3	4
Less 16 Current liabilities and provision			
17 Net current assets/working capital			
18 Deferred revenue/preliminary expenditure			
19 Accumulated deficit			
Grand total :			
Authorised share capital			
II. Liabilities			
01 Paid up share capital			
011 From Central Government			
012 From others			
02 Loans			
021 Loans from Central Government			
022 Loans from foreign parties			
023 Working capital loans from Central Government			
024 Loans from others			
03 Cash credit/advances			
04 Reserves and surplus			
041 Development rebate/Investment allowance reserve			
042 General and other reserves			
043 Specific reserves			
05 Balance from profit/loss			
Grand Total :			

Note: The above data may be furnished till one year after project operation is stabilised.

HYDROELECTRIC PROJECTS

DFR - 4.2

PROJECTED PROFIT AND LOSS STATEMENT

(Rs. crores)

Item	Year1	Year 2	Year3 .....
1	2	3	4 .....
I. Income			
01 Gross sales/operating income			
Less 02 Commission, rebate and discount			
Less 03 Excise duty			
04 Net sales/operating income			
05 Other income/Misc. receipts			
Total (04 + 05) :			
II. Expenses			
06 Consumption of fuels, cooling water stores and spares			
07 Salaries, wages and welfare benefits			
08 Repairs & maintenance			
09 Misc. expenditure			
10 Prior period adjustment			
Total (06 - 10) :			

(contd.)

HYDROELECTRIC PROJECTS

DFR - 4.2 (contd.)

PROJECTED PROFIT AND LOSS STATEMENT

(Rs. crores)

Item	Year1	Year 2	Year3 .....
1	2	3	4 .....
III. Gross margin (I - II)			
Less 11 Depreciation			
Less 12 Deferred revenue/preliminary expenditure			
IV. Gross profit/loss (III - 11 - 12)			
13 Interest			
131 On Central Govt. loans			
132 On foreign loans			
133 On other loans			
134 On cash credit			
135 On supplier's credit			
136 On bonds & others (specify)			
Less 137 Interest capitalised			
14 Net chargeable interest			
V. Profit/loss before tax (IV-14)			
Less 15 Tax provision			
VI. Net profit/loss (V-15)			
Less 16 Dividend payment			
VII. Retained profit/loss (VI-16)			

Note: The above data may be furnished till one year after project operation is stabilised

HYDROELECTRIC PROJECTS

DFR - 4.3

SOURCES OF FINANCING OF THE PROJECT

(Rs. crores)

Item	Total	Yearly phasing during implementation		
		Year 1	Year 2	Year 3 .....
1	2	3	4	5 .....
1. Capital cost				
a) IC				
b) FC				
Domestic				
2. Internal resources				
3. Institutional loans				
4. Market borrowings				
5. Supplier's credit				
6. Public equity				
7. Budgetary support				
8. Collaborators contribution				
9. Other sources (specify)				
Total (2 - 9) :				

(contd.)

HYDROELECTRIC PROJECTS

DFR-4.3(contd.)

(Rs. Crores)

Item	Total	Yearly phasing during implementation		
		Year 1	Year 2	Year 3 .....
1	2	3	4	5 .....
Foreign				
10. Multilateral loans (specify)				
11. Bilateral loans (specify)				
12. Direct commercial borrowings				
13. Supplier's credit				
14. Collaborator's contribution				
15. Others (specify)				
Total (10 - 15) :				
16. Debt Equity Ratio :				

HYDROELECTRIC PROJECTS

DFR - 4.4

CASHFLOW STATEMENT FOR CALCULATION OF COST OF GENERATION

Base date (month & year):

Exchange Rate:

(Rs. Crores)

YEAR	CASH OUTFLOW									
	Capital Cost			O & M Cost			Total			
	IC	FC	Taxes and duties in IC	IC	FC	Taxes and duties in IC	IC	FC	Taxes and duties in IC	No.of units available at busbar (M.KWH)
1	2	3	4	5	6	7	8	9	10	11
1.										
2.										
3.										
.										
.										
.										
N.										
Total										

NPV (Financial): _____, NPV (Economic):_____

Cost of generation (Rs./kwh) : Financial_____, Economic _____

Note: i) Interest during construction (IDC) will be excluded from cols. 2 and 3. Depreciation will be excluded from col. 5. Interest on Working Capital will, however, be included in col. 5.

ii) Recovery of salvage value is to be shown in N+1 year. Replacement cost of capital nature, if any, not included in the annual O & M cost should be shown in the capital cost column against the appropriate years.

iii) For the alternative proposed, cashflow statements would need to be prepared for "with" and "without project" situations, for working out cost generation (Financial & Economic) on incremental basis.

HYDROELECTRIC PROJECTS

DFR - 4.5

SENSITIVITY ANALYSIS

Sl. No.	Case	Cost of Generation		
		Financial	Economic	
			With Premium	Without Premium
1	2	3	4	5
1.	Base case			
2.	Capital cost + 50%			
3.	Capital cost + 30%			
4.	Capital cost + 100%			
5.	Time overrun + 50%			
6.	Time overrun + 70%			
7.	Time overrun + 100%			

CHAPTER 5

REVISED COST ESTIMATES (RCE)

5.1.1 All projects, requiring Government approval, have to be reappraised and require Government approval again if the increase in Capital Cost exceeds a specified percentage. These revised cost estimates have to be submitted well before incurring the additional expenditure or making commitments. Necessary procedures and instructions required for RCE are laid down by the Government from time to time. This chapter outlines the information to be given in RCE proposals which have to be submitted for this purpose. In many cases, when the Detailed Project Report is prepared after the investment approval, the revised costs became known and often a proposal for revised approval, based on DPR, is submitted. This could also be treated as RCE.

5.1.2 The proposal of revised cost estimates (RCE) should be in the nature of a memorandum on 'exceptions'. The primary aim of subjecting RCE to techno-economic appraisal is to focus on the changes which have taken place since the original approval of the proposal and reasons thereof. As far as possible,repetitions of information on the need and justification, technology, location and other parameters should be avoided, if there is no change vis-a-vis the latest sanctioned project.

5.1.3 The information to be presented in DPR/RCE cases will compare the revised status with the sanctioned project. In case of first Revised Cost Estimate, the comparison is with the original project sanctioned. In case of second RCE, the comparison will be with the first RCE sanctioned and so on. The RCE formats have been designed on the same lines as DFR formats so as to enable a comparison of the RCE with the DFR estimates as per sanctioned project.

5.1.4 The comparative picture should cover all the important techno-economic parameters such as, the project cost, capacity, completion time, O&M expenditure, financial/economic benefits, financial and economic viabilities as given earlier vis-a-vis those now proposed. In case there are major variations in the parameters like technology, location, size of the plant, funding pattern or in the need and justification of the project from the latest sanctioned project, the project authorities should clearly indicate such change together with the reasons/justifications underlying the proposed changes.

5.1.5 Project Status: It is necessary to indicate the latest physical and financial progress achieved. The date upto which the progress is reported should be clearly indicated. Major milestones achieved should also be recorded in the form of a calender of events. While indicating the financial progress, the project authorities should not simply furnish the latest expenditure incurred on the project, it should also indicate the expenditure committed till the date of report. Apart from achivement of major milestones, the physical progress may give the achievement in percentage terms for each of the components/ contracts of the project separately. The details to be furnsihed are indicated in the Format RCE-4.1.

5.1.6 Cost Over-run: It is also necessary to indicate the basis on which the sanctioned estimates were framed and how the circumtances changed that basis. Similarly, project authorities should also give the basis underlying the revised estimates proposed. The degree of reliability of the revised estimates must also be indicated together with the reference level of prices.

5.1.7 The cost over-run should be subjected to the standardised variance analysis to segregate the effect of a) cost increases due to fiscal reasons within approved project schedule, (b) cost increases due to fiscal reasons beyond approved project schedule and (c) cost increases due

to other reasons. The itemwise cost variance analysis should be presented in the Format RCE-4.3. Detailed reasons/justifications for each variation in the cost proposed should be furnished. The variation in cost due to increase in quantitites and/or unit rates should be indicated separately in the formats RCE-4.3.

5.1.8 The variation in the annual operation and maintenance cost and the working capital requirement, if any, should also be indicated together with the justification/reasons underlying the change.

5.1.9 Funding: The arrangements for funding of RCE as compared to sanctioned project, both for Indigenous cost (IC) and FE, should be outlined.

5.1.10 Time Over-run: In analysing the total time over-run the starting point should be taken as the change from the zero date (i.e. the date of sanction). Similarly, the project commissioning should be taken as the final event. If the time over-run is on account of elongation of activities on the critical path, then the list of all such critical activities and reasons for inability to assess accurately their time duration in the sanctioned proposal should be clearly explained. It is also important that the reasons for the inability to adhere to the sanctioned commissioning schedule are clearly brought out in the Format RCE-4.1 . The project authorities should also highlight the steps being envisaged to crash some of the critical activities so as to commission the project in the original time profile. A schedule of major milestones on a comparative basis should be provided. The cost over-run as a result of time over- run should be estimated and indicated separately.

5.1.11 Viability Analysis of the Revised Proposal: The project authorities should also furnish the financial and economic viabilities of the revised cost proposal together with the cashflow statements in support of the above calculations as per format RCE-4.4 .

HYDROELECTRIC PROJECTS

RCE - 1.1

SALIENT FEATURES OF THE PROJECT

1. Name of the project:

2. Department/Ministry sponsoring the project:

3. Date of sanction of original proposal

	LS	RCE	Variation
1	2	3	4

A. Physical Characteristics

1. Project Capacity

i)

a) Installed capacity (MW)

b) Generation (MKwh)

No. of Units(...../dependable year)

ii) Irrigation potential

iii)System benefits

2. Total land area to be submerged (sq. km.)

- Forest land
- Agriculuture land
- Other land

3. No. of villages/population displaced

4. Additional Employment Generation (Nos.)

B. Financial and Economic Characteristics

1. Total Capital cost (Rs. Crores)

2. Foreign exchange component (Rs. Crores)

3. Exchange Rate:

4. Interest during construction (Rs. crores)

5. Funding arrangement for Indigenous Cost (IC) and FE

6. Total system cost (Rs. crores)

7. Base date of capital cost (month/year)

8. Annual operation and maintenance cost (at_____% cap. ut.) (Rs. crores)

9. Selling Price (Rs./Kwh)

(contd.)

HYDROELECTRIC PROJECTS

RCE - 1.1 (contd.)

SALIENT FEATURES OF THE PROJECT

C. Evaluation Indicies

Cost of Generation * (Rs./Kwh)

i) Financial

ii) Economic **

D. Commissioning Schedule

1. From the date of sanction to synchronisation of units

_____ years _____ months.

2. From the date of sanction to commercial operation

_____ years _____ months.

* This has to be worked out at a discount rate specified by the Government.

** With premium on foreign exchange and other shadow prices as specified by the Government.

LS: Latest Sanctioned

RCE: Revised Cost Estimate

*

ANALYSIS OF DEMAND & AVAILABILITY OF POWER IN THE REGION IN THE YEARS

(Sparate statements for Latest Sanctioned and RCE)

Item	YEAR @		YEAR @		YEAR @	
	Without project	With project	Without project	With project	Without project	with project
1	2	3	4	5	6	7
1. Installed Capacity (MW)						
2. Peak Demand (MW)						
3. Peak Availability (MW)						
4. Peak Deficit (MW)						
5. Energy Requirement(M.Kwh)						
6. Energy Availability (M.Kwh)						
7. Energy Surplus/deficit (M.Kwh)						

* Basis of demand and availability (existing projects in operation and sanctioned projects) to be indicated

@ Year: Year of full benefits, end of current and next Five Year Plan.

HYDROELECTRIC PROJECTS

RCE - 1.3

DETAILS OF POWER AVAILABILITY IN THE REGION

(Separate Statements for LS and RCE)

First year of full benefits

Region/ Plants	Installed Capacity (MW)	Likely Benefits		Basis
		Peak Load (MW)	Energy (Mkwh)	
1	2	3	4	5
A.Existing Plants				
(Total in operation)				
Hydro				
Thermal				
Nuclear				
Total A:				
B. Sanctioned Projects				
I.1 Hydro				
.				
.				
Sub Total I.1				
1.2 Thermal				
.				
.				
Sub Total I.2				
I.3 Nuclear				
.				
.				
Sub Total I.3				
Total B :				

(Contd.)

HYDROELECTRIC PROJECTS

RCE - 1.3 (contd.)

PLANT-WISE DETAILS OF POWER AVAILABILITY

First year of full benefits

Region/ Plants	Installed Capacity (MW)	Likely Benefits		Basis
		Peak Load (MW)	Energy (Mkwh)	
1	2	3	4	5
C. Cleared by CEA or				
DAE etc. but awaiting				
Govt. Approval *				
I.1 Hydro				
.				
.				
Sub Total I.1				
I.2 Thermal				
.				
.				
Sub Total I.2				
I.3 Nuclear				
.				
.				
Sub Total I.3				
Total C :				
Grand Total : (A+B+C)				

* Assumptions on likely date of approval and gestation period may be stated.

HYDROELECTRIC PROJECTS

RCE - 2.0

SUMMARY OF CAPITAL COST

Base date (month & year):

Exchange rate* :

(Rs. crores)

Statement No.	Item	Capital Cost						@ Basis of estimates	Degree reliability within (+/-)....%
		LS			RCE				
		IC	FC	Total	IC	FC	Total		
1	2	3	4	5	6	7	8	9	10
2.1	Studies & Investigations & Preliminary Works								
2.2	Pre Construction Activities								
2.3	Cost of Civil Works (including land)								
2.4	Know-how, engineering and consultancy								
2.5	Plant & Equipment								
	2.5.1 Electrial Equipment								
	2.5.2 Control Instrumentation and DAS								
	2.5.3 Misc. tools & Plants								
2.6	Project Management (Administration)								
2.7	Commissioning Expenditure								
2.8	Environment Related cost								
2.9	Working Capital Margin								
2.10	Interest During Construction								

(contd.)

HYDROELECTRIC PROJECTS

RCE - 2.0(contd.)

SUMMARY OF CAPITAL COST

Base date (month & year):

Exchange rate* :

(Rs. crores)

Statement No.	Item	Capital Cost						@ Basis of estimates	Degree reliability within (+/-)....%
		LS			RCE				
		IC	FC	Total	IC	FC	Total		
1	2	3	4	5	6	7	8	9	10
	A. Total Project Cost (2.1 - 2.10)								
2.11	Cost of linked projects								
2.12	Cost of unskilled labour included in A (Total)								
2.13	Any other cost (specify)								
	B. Total system cost:								

IC: Indigenous Component. FC: Foreign Component

LS : Latest Sanction, RCE : Revised Cost Estimates

* In case the number of foreign currencies involved are more than one, the amount and exchange rate for each of the currencies may be indicated in the footnote.

@ TQ - Tender Quotation

IH - In-House Cost Data

BQ - Budgetary Quotation

CD - Consultants Data

HYDROELECTRIC PROJECTS

RCE - 2.1

DETAILS OF THE COST OF THE STUDIES AND INVESTIGATIONS AND PRELIMINARY WORKS

Base date (month & year):

Exchange Rate:

(Rs. Crores)

Sl. No.	Studies and Investigations and Preliminary works	Cost of the Study/ Investigation						Agency @ responsible for carrying out the study/investigations
		LS			RCE			
		IC	FC	Total	IC	FC	Total	
1	2	3	4	5	6	7	8	9
1.	Demand Analysis							
2.	Hydrology							
3.	Geological conditions							
4.	Site selection, site conditions and investigations							
5.	Preliminary works							
6.	Basic Engineering							
7.	Environmental Impact							
8.	Others							
9.	Total							

IC: Indigenous Component. FC: Foreign Component

@ Indicate whether in-house of outside agency.

HYDROELECTRIC PROJECTS

RCE 2.2

DETAILS OF PRE CONSTRUCTION ACTIVITIES

Activities	Expenditure (Rs. crores) LS	RCE
1	2	3
1. Land (except submergence)		
2. Road & bridges		
3. Buildings		
4. Construction Power		
5. Communication		
6. Construction Equipment		
7. Others		
8. Total		

HYDROELECTRIC PROJECTS

RCE - 2.3

DETAILS OF COST CIVIL WORKS

Base date (month & year):

Exchange Rate :

Sl.No.	Item	Unit	Qty.		Rate (Rs)		Amount (LS)		(Rs.crores) RCE		Remarks
			LS	RCE	LS	RCE	IC	FC	IC	FC	
1	2	3	4	5	6	7	8	9	10	11	12
1. LAND (Other than included in pre-construction)											
2. ROADS & BRIDGES (Other than pre-construction)											
3. BUILDINGS (Other than pre-construction)											
4. RIVER DIVERSION WORKS											
i) Coffer dam											
ii) Tunnel Excavation											
iii) Tunnel Lining and Grouting											
iv) Others											
5. DAM & DYKES											
a) DAM											
i) Excavation											
ii) Concreting											
iii) Masonary											
iv) Earth fill											
v) Others											

(contd.)

1	2	3	4	5	6	7	8	9	10	11	12

b) DYKES

i) Excavation

ii) Fill Material

iii) RR Masonary

iv) Others

6. SPILLWAY AND GATES

i) Hydro Mechanical Works

a) Fabrication and supply

b) Installation

ii) Others

7. INTAKE STRUCTURES

i) Excavation

ii) Concreting

iii) Hydro Mech. Works

a) Fabrication and Supply

b) Installation

iv) Others

8. HEAD RACE TUNNEL/CHANNEL TUNNEL

i) Excavation

a) Adits & Construction Shaft

b) Head Race Tunnel

ii) Concreting

a) Overt

b) Invert

iii) Grouting

iv) Cleaning and Plugging (Contd.)

1	2	3	4	5	6	7	8	9	10	11	12

v) Open Channel

a) Excavation

b) Concrete Lining

vi) Others

9. BARRAGE / FOREBAY

i) Excavation

ii) Foundation Treatment

iii) Concreting

iv) Hydro Mech. Works

a) Fabrication and Supply

b) Installation

v) Others

10. SURGE TANK

i) Excavation

ii) Concreting

iii) Others

11. B F VALVE/SPHERICAL VALVE HOUSE

i) Civil Works

a) Excavation

b) Concreting

ii) Valve House Crane

iii) Installation of valves

iv) Others

(contd.)

RCE - 2.3 (contd.)

1	2	3	4	5	6	7	8	9	10	11	12

12. PRESSURE SHAFT (line-wise)
    - i) Excavation
    - ii) Fabrication of steel liners
    - iii) Erection of steel liners
    - iv) Concreting/Grouting
    - v) Others
13. SURFACE PENSTOCKS (line-wise)
    - i) Excavation
    - ii) Concreting
    - iii) Fabrication & supply
    - iv) Erection and Testing
    - v) Others
14. POWER HOUSE BUILDING
    - i) Excavation
    - ii) Concreting sub-structures
    - iii) Super structure concreting
    - iv) Concreting (Unit-wise)
        - a) Draft Tubes
        - b) Scroll casing
        - c) Turbine pit
        - d) Generator barrel
    - v) Others

(Contd.)

1	2	3	4	5	6	7	8	9	10	11	12

15. UNDER GROUND POWER HOUSE

i) Approach Tunnel

a) Excavation

b) Concreting

ii) Adits - Excavation

iii) Power House Cavern

a) Excavation

b) Concreting/Shot Creting

c) Turbine Pit Excavation (unit-wise)

d) Turbine Pit Concreting (unit-wise)

e) Crane Column

f) Crane Beam

iv) Transformer Cavern

a) Excavation

b) Concreting/Shot Creting

v) Bus Duct/Cable Cavern

a) Excavation

b) Concreting/Shot Creting

vi) Valve House Cavern

a) Excavation

b) Concreting/Shot Creting

vii) Others

(Contd.)

1	2	3	4	5	6	7	8	9	10	11	12

16. PUMP STORAGE SCHEME/TAIL POOL DAM
    - i) Pump Storage Scheme/Tail Pool Dam
      - a) Excavation
      - b) Concreting
    - ii) Others
17. TAIL RACE TUNNEL/CHANNEL
    - i) Excavation
    - ii) Lining
    - iii) Hydro Mechanical Equipment gates
      - a) Fabrication & Supply
      - b) Installation
    - iv) Others
18. CABLE TUNNEL & TRENCHES
    - i) Excavation
    - ii) Concreting
19. SWITCH YARD
    - i) Excavation & Levelling
    - ii) Preparation of Foundation for Structure/Equipment
20. Township
21. Maintenance during construction
22. Special tools and plants
23. Losses on stocks
24. Suspense
25. Others
26. Total

HYDROELECTRIC PROJECTS

RCE - 2.4

DETAILS OF KNOWHOW, ENGINEERING AND CONSULTANCY

(Separate Statements for LS and RCE)

Item	Amount (Rs. Crores)
1. Indian Consultancy - (IC)	
2. Foreign Consultancy - (FC)	
- (IC)	

IC : Indigenous Component FC : Foreign Component

HYDROELECTRIC PROJECTS

RCE - 2.5

BREAK UP OF PLANT AND EQUIPMENT COST

(Separate statements for latest sanctioned and RCE)

Base date (month & year)

Exchange Rate :

(Rs.Crores)

Sl. No.	Item	Cost of Equipment/ supplies				Inland Transport & Insurance	Erection charges		Others (to be specified)		Total	
		cif	Custom Duties & Other Taxes	Indigenous cost								
					Tax element in IC							
		FC	IC	IC	in IC	IC	IC	FC	IC	FC	IC	FC
1	2	3	4	5	6	7	8	9	10	11	12	13
1.	MECHANICAL EQUIPMENT											
	i) Earth moving Equipment(to be listed)											
	ii) Drilling and Tunnelling Equipment											
	iii) Concrete Equipment											
	iv) Misc. Other Equipment											
2.	TRANSPORT VEHICLES											
3.	EOT CRANE											
	i) Procurement											
	ii) Erection of crane beams											
	iii) Installation of Runway											
	iv) Erection of crane and commissioning											

HYDROELECTRIC PROJECTS

RCE - 2.5 (contd.)

1	2	3	4	5	6	7	8	9	10	11	12	13

4. TURBINE (Unit-wise)
   - i) Procurement
   - ii) Placement of Draft Tube Liner
   - iii) Assembly, Alignment Pressure Testing and Concreting of Spiral Casing upto Pit Liner
   - iv) Assembly, Alignment of Pit Liner and Concreting upto Generator Barrel
   - v) Assembly of Turbine top Cover
5. GENERATOR (Unit-wise)
   - i) Procurement
   - ii) Assembly of Brake System, Lower bracket and Bearing
   - iii) Assembly of Stator sections, Winding, testing & lowering and its Centring and levelling
   - iv) Assembly of rotor in service bay testing & lowering
   - v) Centring of rotor, coupling of turbine generator Shaft & Centring of combined assembly
   - vi) Completion of Unit installation
   - vii) Pre-commissioning Test & Mechanical Run
6. UNIT STEP UP TRANSFORMER (Unit-wise)
   - i) Procurement
   - ii) Assembly and Installation
   - iii) Testing and Commissioning

(Contd.)

1	2	3	4	5	6	7	8	9	10	11	12	13

7. POWER HOUSE AUXILIARIES
   - i) Procurement
   - ii) Erection
   - iii) Control, Relaying and protection Panels
     - a) Procurement
     - b) Erection
   - iv) Power Cables
     - a) Procurement
     - b) Erection
   - v) Control Cables
     - a) Procurement
     - b) Erection
8. SWITCH YARD
   - i) Steel Structures
     - a) Procurement
     - b) Erection
   - ii) Equipment
     - a) Procurement
     - b) Erection
   - iii) Testing & Commissioning of Switchyard
   - iv) Air Conditioning & Ventilation Eqpt.
     - a) Procurement
     - b) Installation
   - v) Fire Protection Eqpt.
     - a) Procurement
     - b) Installation
9. D.G. SETS
10. OTHERS
11. TOTAL

IC: Indigenous Component. FC: Foreign Component

HYDROELECTRIC PROJECTS

RCE - 2.6

A. PROJECT MANAGEMENT EXPENSES

Base date (month & year):

Exchange Rate :

(Rs.Crores)

Sl. No.	Item	Project Managment Expenses *						
		LS			RCE			
		IC	FC	Total	IC	FC	Total	Basis RCE
1	2	3	4	5	6	7	8	9
1.	Site Establishments							
2.	HQ Establishment							
3..	Audit & Accounts							
4.	Training and O & M staff							
5.	Others							
6.	Total							

IC : Indigenous Component FC : Foreign Component

* Excluding expenditure covered under `Knowhow and Engineering payments'.

Note: This format may be completed based on the experience of the project authorities and their consultants as a percentage of plant costs including plant and equipment.

B. CATEGORYWISE MANPOWER DURING CONSTRUCTION

(Separate statements for LS and RCE)

Year	Managerial/ Administrative		Technical		Skilled		Semi-skilled		Un-skilled		Total	
	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost
1	2	3	4	5	6	7	8	9	10	11	12	13
1.												
2.												
3.												
.												
.												
Till commissioning												

HYDROELECTRIC PROJECTS

RCE - 2.7

DETAILS OF COMMISSIONING EXPENDITURE

Base date (month & year):

Exchange Rate :

(Rs. crores)

Items	Amount					
	LS			RCE		
	IC	FC	Total	IC	FC	Total
1	2	3	4	5	6	7
A. Expenditure on Commissioning						
1.						
2.						
3.						
Total (A):						
B. Credit for Generation during commissioning period						
C. Net commissioning expenditure : (A - B)						

IC : Indigenous Component FC : Foreign Component

Note: Duration of trial runs alongwith the cost incurred for carrying out trial production after adjusting the receipts from such trial runs.

HYDROELECTRIC PROJECTS

RCE - 2.8

ENVIRONMENT RELATED COSTS

Base Date (month & year) :

Exchange Rate :

(Rs. crores)

Sl. No.	Item	Amount						Basis of RCE
		LS			RCE			
		IC	FC	Total	IC	FC	Total	
1	2	3	4	5	6	7	8	9
1. Rehabilitation of displaced persons *								
2. Compensatory afforestation (including land)								
3. Land Treatment								
.								
.								
.								
Total								

IC : Indigenous Component FC : Foreign Component

* Number of families/persons affected, compensation basis and other details to be given in the footnotes.

(Items to be indicated as per requirement of the project)

HYDROELECTRIC PROJECTS

RCE - 2.9

ASSESSMENT OF WORKING CAPITAL

(Separate statements for latest sanctioned and RCE)

Base date (month & year):

Exchange Rate:

(Rs. crores)

Sl. No.	Item	Norms of inventory	Unit rate	Total Value	Remarks
1	2	3	4	5	6
1.	Stores and Spares				
2.	Annual Generation of Energy (M.Kwh)				
3.	Debtors				
4.	Cash and Bank balance				
5.	Total current assets (1-4)				
6.	Creditors				
7.	Advances from customers (if any)				
8.	Total current liabilities (6-7)				
9.	Working Capital gap (5-8)				
10.	Margin Money (as per norms)				
11.	Gap for bank finance				
12.	Annual interest on bank financed amount (excl. margin money)				

Note:-

1. This is required to be furnished yearwise till one year after stable level of production is achieved;

2. Incremental working capital requirements on annual basis may be shown in a footnote.

HYDROELECTRIC PROJECTS

RCE - 2.10

CAPITALISED INTEREST DURING CONSTRUCTION (IDC)

(Contents flexible depending upon specific requirements of the project)

Base date (month & year) :

Exchange Rate :

(Rs. crores)

Year	Source		Loan				Rate of Interset		Period		Total Amount	
			Currency		Amount							
	LS	RCE	LS	RCE	LS	RCE	LS	RCE	LS	RCE	LS	RCE
1	2	3	4	5	6	7	8	9	10	11	12	13
Total												

RCE - 2.11

COST OF LINKED PROJECTS INCURRED BY OTHER AGENCIES

(Normally for facilities which will not be owned by the enterprise)

Base date (month & year) :

Exchange Rate :

(Rs. crores)

Sl. No.	Project	Total cost		Implementing Agency	Completion date (month/year)	
		LS	RCE		LS	RCE
1	2	3	4	5	6	7

HYDROELECTRIC PROJECTS

RCE - 3.1

ESTIMATION OF OPERATING REQUIREMENT AND COSTS

(Seperate Statement for Latest Sanctioned and RCE)

Base date (month & year):

Exchange Rate:

(Rs. crores)

Item/Details	Total require-ment (Qty.)	Unit rate	Financial			
			IC	FC	T&DC	Total
1	2	3	4	5	6	7
1. Labour & Supervision						
a)						
b)						
2. Fixed Overheads						
a)						
b)						
3. Repairs & Maintenance						
4. Depreciation						
5. Interest on Long Term Loans						
6. Interest on Working Capital Loans						
7. Others (to be specified)						
8. Total Operating Cost:						

(Contd.)

HYDROELECTRIC PROJECTS

RCE - 3.1 (contd.)

ESTIMATION OF OPERATING REQUIREMENT AND COSTS

(Seperate Statement for Latest Sanctioned and RCE)

Base date (month & year):

Exchange Rate:

(Rs. crores)

Item/Details	Total requirement (Qty.)	Unit rate	Economic			
			* IC	@ FC	Inland Transport	Total
1	2	3	8	9	10	11
A. Variable Cost						
1.						
2.						
3.						
Total (A)						
B. Fixed Cost						
1. Labour & Supervision						
a)						
b)						
2. Fixed Overheads						
a)						
b)						
3. Repairs & Maintenance						
4. Depreciation						
5. Interest on Long Term Loans						
6. Interest on Working Capital Loans						

(contd.)

1	2	3	8	9	10	11
7. Others (to be specified)						
Total Fixed Cost:						
Total Operating Cost:						

IC : Indigenous Component FC : Foreign Component

T & DC - Taxes & Duties Component

* For non-traded goods.

@ For traded & tradable goods at cif value.

In case any cost item is at subsidised rate, the actual economic cost would be reported.

HYDROELECTRIC PROJECTS

RCE - 3.2

REQUIREMENTS OF LABOUR AND COSTS

(At Stable Level of Capacity Utilisation for a Full Year)

[Seperate Statement for Latest Sanctioned and RCE]

Base date (month & year):

Exchange Rate:

(Rs. crores)

Category of Labour	No. of workers	Total wage cost	Costs of P.F. ESIS, gratuity scheme etc.	Average earnings per worker (Rs.)
1	2	3	4	5
1. Power Plant				
01 Unskilled				
02 Semi-skilled				
03 Skilled				
04 Technical				
05 Managerial				
2. Workers at				
Administration				
01 Unskilled				
02 Clerical				
03 Junior Managerial				
04 Senior Managerial				
Total:				

HYDROELECTRIC PROJECTS

RCE - 4.1

PRESENT STATUS OF THE PROJECT

(Progress upto .....month & year)

Sl. No.	Item of work/ acti-vity	Date of award of cont-ract	Target date of completion (month & Year)		Reasons for delay	Progress achieved			
			LS	RCE		Phys-ical@	Financial * # IC	FC	Total
1	2	3	4	5	6	7	8	9	10
1.									
2.									
3.									
.									
.									
.									

IC: Indigenous Component. FC: Foreign Component

LS : Latest Sanctioned, RCE : Revised Cost Estimate

@ In terms of percentage.

* Actual expenditure incurred upto the month and year of progress is reported in rupee crores.

Exchange rates assumed would need to be specified.

HYDROELECTRIC PROJECTS

RCE - 4.2

DETAILS OF YEARWISE EXPENDITURE TILL.....(MONTH/YEAR)

Base date (month/year) :

Exchange rate :

(Rs. crores)

Item	Latest sanctioned cost		Year		Year		Year		Balance expend-iture
	IC	FC	IC	FC	IC	FC	IC	FC	
1	2	3	4	5	6	7	8	9	10
1. Studies & Investigations									
2. Cost of civil works									
3. Know-how & Engineering									
4. Plant & Equipment									
5. Project Management									
6. Commissioning Expenditure									
7. Environment Related Cost									
8. Margin Money for Working Capital									
9. Capitalised Interest During Construction									
A. Total Project Cost(1 to 9)									
10. Cost of Linked Projects									
11. Cost of Unskilled Labour included in item A (Total)									
B. Total System Cost									
12. Weighted average * Exchange Rate									

IC : Indigenous Component FC : Foreign Component

* In case the number of foreign currencies involved are more than one, the amount and exchange rate for each of the currencies are to be indicated.

ITEMWISE COST VARIANCE ANALYSIS

LS RCE

Base date (month/year) :

Exchange rate :

(Rs. crores)

Sl. No.	Items	LS	RCE	Vari-ation in cost	Variation due to			
					Escalation (based on Index) @	Exchange rate variation	Change in statu-tory duties *	Change in sta-tutory duties due to exch. rate varia-tion
1	2	3	4	5	6	7	8	9
A. Cost overrun for fiscal reasons within approved time schedule:								
1.								
2.								
3.								
.								
.								
IDC								
Margin money								
Total (A)								

(contd.)

RCE-4.3(contd.)

ITEMWISE COST VARIANCE ANALYSIS

LS RCE

Base date (month/year) :

Exchange rate :

(Rs. crores)

Sl. No.	Items	LS	RCE	Vari-ation in cost	Variation due to			
					Escalation (based on Index) @	Exchange rate variation	Change in statutory duties *	Change in statutory duties due to exch. rate variation
1	2	3	4	5	6	7	8	9
B. Cost overrun for fiscal reasons beyond approved time schedule								
1.								
2.								
3.								
.								
.								
IDC								
Margin money								
Total (B)								

(contd.)

ITEMWISE COST VARIANCE ANALYSIS

LS RCE

Base date (month/year) :

Exchange rate :

(Rs. crores)

Sl. No.	Items	LS	RCE Proposed	Vari-ation in cost	Variation due to			
					Changes in scope		Under/ over-estma-tion	Others rea-sons (specify)
					A ppr-oved items	Addi-tional items		
1	2	3	4	5	10	11	12	13
C. Cost overrun due to other reasons								
1.								
2.								
3.								
.								
IDC								
Margin Money								
Total (C)								

LS : Latest Sanctioned, RCE : Revised Cost Estimate

@ Yearwise indices used for LS and RCE to be given in the footnote.

* Statutory duties	LS		RCE	
	Rate	Amount	Rate	Amount
-Excise duty				
-Customs duty				
-Sales tax				
-Others(specify)				

HYDROELECTRIC PROJECTS

RCE - 4.4

CASHFLOW STATEMENT FOR CALCULATION OF COST OF GENERATION

(Separate statements for cost of generation for the Latest Sanctioned and proposed RCE)

Base date (Month & Year).....

Exchange rate .....

(Rs. crores)

YEAR	CASH OUTFLOW									
	Capital Cost			O & M cost			Total			
	IC	FC	Taxes and duties in IC	IC	FC	Taxes and duties in IC	IC	FC	Taxes and duties in IC	No.of units available at bus-bar (M.Kwh)
1	2	3	4	5	6	7	8	9	10	11
1.										
2.										
3.										
.										
.										
.										
N										
Total :										

IC: Indigenous Component. FC: Foreign Component

NPV (Financial) :_____, NPV (Economic) :_____

Cost of Generation (Rs.Kwh): Financial_____, Economic_____

Note:

i)Interest during construction (IDC) will be excluded from cols. 2 and 3. Depreciation will be excluded from col. 5. Interest on Working Capital will, however, be included in col. 5.

ii)Recovery of salvage value is to be shown in N + 1 year. Replacement cost of capital nature, if any, not included in the annual O & M cost should be shown in the capital cost column against the appropriate years.

RCE - 4.5

SENSITIVITY ANALYSIS

(Separate Statements for LS and RCE)

Sl. No.	Case	Cost of Generation		
		Financial	Economic	
			With Premium	Without Premium
1	2	3	4	5
1. Base case				
2. Capital cost	+ 50%			
3. Capital cost	+ 70%			
4. Capital cost	+100%			
5. Time overrun	+ 50%			
6. Time overrun	+ 70%			
7. Time overrun	+ 100%			

PART - C : TRANSMISSION PROJECTS

CHAPTER 2

ADVANCE ACTION PROPOSAL

Where the organisations like NPTC etc. have been delegated powers to incur expenditure for taking advance action without seeking approval from government as specified in the memorandum of understanding (MOU), these organisations may take up advance action in respect of projects to be undertaken within the monetary limits as indicated in the MOUs.

CHAPTER 3

STUDIES AND INVESTIGATIONS

3.1.1 The adequacy of a Detailed Feasibility Report (DFR) as a basis for investment decision is largely determined by the thoroughness of studies and investigations that have gone into the preparation of the Detailed Feasibility Report. In view of peculiar nature of the power projects owing to their inter- connectedness within the power sector and their integration with the energy sector and overall development, the studies and investigations have to be undertaken with the object of selecting `least cost option' among the various alternatives so as to achieve desired benefits in the form of power generation and transmission.

3.1.2 In case of the power projects, the studies and investigations are concerned with the establishment of the need of the project for a particular region/state, choice of technology, design, size, location etc., type of fuel required and its availability, water availablity, infrastructure available and required to be created,transportation of fuel, geophysical conditions, river flow data, power evacuation arrangements, route survey for transmission lines, environment impact and other project specific studies and investigations etc.

3.1.3 Based on the above studies and investigations, a Detailed Feasiblity report is prepared. After the project is approved, the orders for main plant and equipment placed, funding arrangements tied, and detailed engineering conducted, a Detailed Project Report indicating the firmed up cost estimates and project implementation schedule is prepared. Between DFR and DPR stage, there may be some further studies required to improve information about site conditions and other project parameters.

3.2.1 With regard to the transmission projects, the following studies and investigations should be undertaken:

i) System planning study based on load flow analysis while considering the location specifics of the impinging loads on the system;

ii) Steady state stability analysis, at least for a base case;

iii) Short circuit study in order to estimate the switching parameters and

iv) Assessment of need for establishment of new transmission lines or strengthening of the existing connections

v) Transmission line survey to include the following:

a) Line route based upon topo sheets and theodolite survey;

b) Soil resistivity as this will give necessary data for induced currents and on that PTCC clearance is to be obtained;

c) Crossing details e.g. river roads, telephone lines and forest etc. and

d) Angle points so as to know the line route.

Besides above, other project specific studies, if any, may also be included.

CHAPTER 4

DETAILED FEASIBILITY REPORT

4.1.0 The studies and investigations suggested in Chapter-3 often generate several investment options which are worth considering. On the basis of the preliminary analysis of these options, a feasible option is selected. The selected option is developed into a project and Detailed Feasibility Report (DFR) is prepared for further processing and seeking Government's approval. In this report a detailed description of the project parameters based on the studies and investigations, is to be given to enable the appraising agencies to evaluate the technical feasibility and financial & economic viability of the proposed project. The information about the project to be provided in DFR should be adequate and reliable. The details of information required to be furnished in the DFR as discussed in the following paragraphs, mainly concern with a transmission project. The pattern of informaion for transmission related projects such as load despatch centres etc. may be suitably amended to meet project specific requirements.

4.2.0 The DFR of a transmission project is expected to furnish following information:

i) Need for the project

ii) Project Description.

a) Choice of voltage level of the transmission lines, route and length of lines, single/double circuit, type of towers etc.

b) Location of substations, their capacities

c) Equipment & Construction requirements

d) Manpower Requirements

e) Transmission losses

f) Linked projects

iii) Organisational and management aspects

a) Implementation Plan

b) State of Preparedness

c) Infrastructural Backup

iv) Environment Aspects

v) Project Costs

a) Capital Cost requirements

b) Operational Cost requirements

c) System Costs

vi) Cost Effectiveness Analysis

vii) Sensitivity Analysis

4.2.1 The details under each of the above items have to be furnished and the salient features of the project are to be given in format DFR-1.1.

4.3.0 NEED FOR THE PROJECT

4.3.1 A transmission project needs to be undertaken to connect a new power generation plant with the grid, provide inter regional and inter-state connections or strengthening the existing transmission system. The transmission planning being essential part of power planning alongwith generation planning, the justification of the transmission project should be built on the basis of system studies involving simulated operation of network under normal and critical

conditions which establish that the proposed systems would be capable of meeting the transmission needs over the entire range of system operating conditions in the optimal manner. The DFR needs to bring out clearly whether or not the proposed lines and substations are based on system optimisation studies and to what extent they fulfill the objectives of delivering power at minimum cost and ensuring a fair degree of reliability of power supply.

4.3.2 The alternatives considered in regard to route of the transmission lines, voltage level, choice between AC/DC trans mission, single or double circuit lines, type of transmission towers, location and capacity of substations etc. should be spelt out in the DFR alongwith their techno-economic analysis.

4.4.0 PROJECT DESCRIPTION (Technical Aspects)

4.4.1 Voltage level, Route, Single or Double Circuit, Towers etc.: The choice of particular level of voltage of transmission, route and length of transmission lines, AC or DC transmission, single or double circuit lines, type of tower chosen etc. should be described bringing out technical requirement of the project.

4.4.2 Sub Stations: The location of substations, their number and capacity , requirement of transformers by types, circuit breakers etc. have to be brought out in the DFR.

4.4.3 Equipment and Construction Requirements:

a) The DFR should contain a complete list of capital equipment (by type and size) for the transmission lines including towers, transformers, cables etc. and requirements of buildings and structures by type and size for sub stations. It should give justification for the choice of type size and specifications proposed for important items of equipment and structure.

b) The DFR should also indicate the possible source of supply of capital equipment, construction services, engineering services, etc. This is particularly important in the case of imported items. For imported items which are of high value or are critical to operation of plant, alternative sources of supplies should be indicated in order of performance.

c) The level of township satisfaction which has been assumed in the project cost may be indicated together with the details of the various types of houses which are proposed to be constructed as laid down by the Bureau of Public Enterprises (BPE). The precise location of the project and township and the distance between them may also be indicated. If the project authorities are planning to seek a separate sanction for the township at a later date, the years in which they may come up for such a sanction together with the likely requiement of funds in those years may have to be foreseen at the investment decision making stage itself as per the instructions in vogue.

d) Choice of equipment: The DFR should also deal with the analysis underlying the choice of equipment and specifications of the construction requirements. The DFR should outline the construction methodology and technology to be used, including capital vs labour intensive options considered, construction equipment to be used, use of new materials planned, innovations in methodology, quality assurance, improvements planned over present construction methodologies/technologies and their likely input/benefit on project construction time and cost.

4.4.4 Manpower Requirement: The DFR should indicate the categorywise requirement of personnel for the project construction and operation and plan for induction of different categories of personnel. It should also indicate the arrangement proposed for training. The DFR should indicate the steps envisaged for avoiding retrenchment or redeployment of construction staff after completion of construction, wherever necessary. The DFR should also indicate the organisation structure envisaged for the project after it is in operation and the time

scdedule for filling up of key posts, particularly that of the Chief Executive. It should also indicate the arrangements contemplated for ensuring continuity in top management.

4.4.5 Transmission Losses: The level of transmission losses and basis for these estimates should be provided. The assumed level of transmission losses should be compared with actual experience of other transmission projects operating at same voltage level.

4.4.6 Linked Projects: On account of intermediary nature of a transmission project, the linked projects include generation projects and arrangement to receive power at the regional/state grid, or consumers ends. Besides there may be certain infrastructure such as roads bridges etc. constituting linked projects. All such projects which are critical for the construction and operation of the project have to be listed and their details, costs, completion schedule has to be brought out.

4.5.0 ORGANISATIONAL & MANAGEMENT ASPECTS

4.5.1 Implementation Plan:

a) The feasibility report should indicate the activity-wise phasing of construction preferably in the form of a bar chart or a master control net work (PERT/CPM) diagram. Quantitative information on the phasing of material and labour requirements during construction should be specified. The report should also indicate the timing of deliveries of imported and indigenous equipment. The physical specifications of phasing given in this chart should be consistent with the phasing of expenditure given in the section on capital costs. To the extent possible the report should indicate the targetted levels for pouring of concrete and erection of equipment structures per month. While indicating the phasing of construction activities of the project the phasing of inter-related facilities should also be clearly indicated so as to present an integrated view of all the connected items. Steps which could be taken to reduce the period of construction should also be indicated.

b) The DFR should also deal with the types of problems that may affect the phasing of construction and energisation after completion. For example, possible difficulties in the movement of oversized components, erection of towers etc. It should indicate the arrangements envisaged for housing for workers during construction and for ensuring the supply of utilities during construction.

c) The DFR should provide organisational structure intended for implementation of the project.

4.5.3 State of Preparedness:

The following information may have to be furnished by the project authorities to illustrate their preparedness for the implementation of the project under consideration.

a) Studies & Investigations:

How far the required studies and investigations have been completed leading to, in general, a better prepared project?

b) Mode of implementation:

i) Whether the project will be implemented departmentally or through a turnkey contractor/various contractors or both ? If so, whether the turnkey packages have been chosen as homogeneous parts for facilitating easy supervision, monitoring, fixing responsibility for non- attainment of performance, targets and even carrying out a disaggregated cost benefit analysis wherever possible/required.

ii) If the project is to be implemented by the departmental personnel, whether adequate number of key personnel of required experience and calibre are available? If fresh recruitment is to be resorted to, whether it will be possible to get such requisite

manpower within the stipulated time? Whether the present recruitment rules and procedures would permit the same.

iii) If the project is to be implemented by hiring the services of a turn-key contractor, the standing of the contractor, his track record in the implementation of similar projects, major works on hand, capability to mobilise the requisite resources at a required time as that the project does not slip, may be explained.

iv) What is the progress in designing of towers and engineering of sub stations.

v) How far the material resources have been estimated and the tender documents made ready so that the notice inviting tenders could be released as soon as the investment decision is taken.

vi) Whether detailed schedules have been made for the various activities forming part of the PERT Chart used for the estimation of the gestation period. A copy of the Chart may be furnished. How will the project be monitored particularly for the activities on the critical path?

c) Infrastructural Back-up:

Whether the following infrastructural facilities have been acquired/tied-up:

i) Allotment of land and problems associated therewith

ii) Right of way for the tansmission lines obtained, if not what steps are being taken.

iii) Accessability to sites for location of towers and their accquisition.

iv) Whether the sites for substations are well connected by a road. If not, what steps are being taken to acquire/augment this facility?

v) Whether any temporary housing/warehousing have been provided wherever circumstances warrant the same?

4.6.0 ENVIRONMENTAL ASPECTS:

4.6.1 The project will have to be cleared from the ecological and environmental point of view by the Ministry of Environment and Forests of the Government of India as well as the Environ mental Control Boards of the respective State Governments. In view of this, the individual requirements of these organisations will have to be foreseen and complied with. The environmental impact of the project and the measures envisaged to prevent damage to environment should be fully discussed in the DFR together with the cost implication. The environmental clearance should be obtained before the project is submitted for Government approval and relevant costs of environment related aspects separately mentioned in the cost estimates. Information on the following items are required for this purpose:

a) Forest clearing along the transmission lines.

b) Compensatory afforestation plan.

c) Others.

4.7.0 PROJECT COST

a) Capital Cost Requirements:

4.7.1 In case of a transmission project, the Capital Costs are essentially those costs which are incurred for creation of fixed assets such as transmission lines, substations and associated works. Summary of capital cost for major items of works appertaining transmission lines and substations both in terms of Indian Rupee and foreign exchange, is to be furnsihed in the format DFR-2.0.

4.7.2 The capital cost should include all items of expenditure required to be incurred before energisation of the transmission project including the IDC. Apart from expenditure on fixed

assets, engineering and administration, costs of training, expenditure on testing, staff, etc. should be capitalised. After the transmission lines become operative, capital cost will be incurred when some items of equipment are replaced. There will be some items of equipment e.g. transformers, cables, vehicles etc., which may require replacement during the economic life of the project. These costs should be distinguished clearly from repair and maintenance expenditure. The distinction will not always be easy to make but for practical purposes the distinction can be made on the basis of whether or not the expenditure would be considered capital expenditure under tax laws. Estimates of repair and maintenance expenditure should be presented under operating costs. The enterprise should also develop a uniform way of coding items of expenditure under all heads.

4.7.3 The project authorities should adhere to the norms approved by PIB regarding admissible level of contingencies. Further, as per PIB procedures, no built in provision for forward escalation in the Capital Cost estimates is allowed. Hence the cost estimates, should correspond to a fairly recent date perferably not more than six month's old.

4.7.4 The major assumptions forming the basis of the capital cost estimates should also be listed in the text alongwith presentation in the relevant format DFR-2.0. The major itemwise details of cost estimates are to be covered in formats 2.1 to 2.5. It is desirable that following information should also be presented in the text:

i) The reference price level of estimates;

ii) Currencies and exchange rates and their reference period

iii) Level of contingencies

iv) The level of inventories of materials, spares etc.

v) Scaling factors used for scaling up/down cost of any major equipment/item;

vi) The status of engineering and design on the basis of which the estimates have been framed and

vii) Rates and quantities of items on the basis of value analysis.

viii) Debt Equity Ratio, interest rates

ix) Customs Duty, Excise duty , Sales Tax etc.

4.7.5 The cost on account of environmental safeguards including compensatory afforestation etc. would need to be estimated with the help of concerned authorities and the cost involved may be shown in the capital cost estimates as a separate item. (DFR-2.6)

4.7.6 Format DFR-2.7 has been designed with a view to collect information about the working capital requirements. Based on this, the margin money for the working capital required for the project and forming a part of the capital cost estimates will have to be determined for the purpose of sanction for the investment. However, for the purpose of viability analysis the interest on borrowed portion of the working capital should also be reflected in the separate column.

4.7.7 The information on the capitalised interest (on loan portion only) during construction should be furnished in detail (DFR-2.8) with the necessary back up calculations.

4.7.8 The DFR should also deal with the capital cost phasing of the project taking into account the various critical activities, requirements of resources, terms and conditions at which these resources could be mobilised, budget for the funds and arrive at an yearly requirements of funds for execution of the proejct.

b) Operating Costs Requirements

4.7.9 For the purpose of project appraisal, operating costs are essentially those costs which are incurred after the transmission lines become operative, excluding costs incurred for the replacement of capital equipment but including cost incurred for repairing and maintenance of capital equipment. In case of transmission project, the operating cost consist of the labour, repairs and maintenance costs. The O&M costs should not be expressed as a percent of capital cost. The O&M cost should be based on the actual experience of similar projects. The formats DFR-3.1 & 3.2 have been designed to collect information about operating costs in the form required for social profitability and financial appraisal.

c) Total System Costs

4.7.10 The system costs are incurred in the creation of the required complementary facilities by the other organisations which are not owned by the enterprise. But, nevertheless, these are required for the smooth construction/operation of the project. The purose of this section is to obtain information on identity of these linked projects, the agencies responsible for these, the total cost of these projects, the corresponding provisions in the plans, the cost sharing arrangements, if any etc. Information is to be given is format DFR-2.9.

4.8.0 COST EFFECTIVENESS ANALYSIS:

4.8.1 Cost Effectiveness Analysis is undertaken to determine whether proposed investment in the proposed project is consistent with overall national and sectoral objectives and represents the best means of achieveing the intended benefits.

4.8.2 The benefits of a transmission project are determined in terms of net additional energy flow through the system and improved reliability of power supply comparing the with and without project situations. Considering interconnected nature of power project, the benefits of transmission project should be analysed through system analysis. However, in view of considerable difficulties in getting data for system analysis, the benefits of a transmission are treated as non quantifiable and Cost Effectiveness Analysis is carried out in terms of unit cost of transmission.

4.8.3 Financial Cost of Transmission

For the purpose of appraisal, the capital cost and the operating costs are worked out at market prices. Cashflow is prepared for the projected cost and the flow of energy in each year of their occurance covering entire economic life of the project. The costs and the units transmitted are discounted at a pre-determined rate of discount as may be specified by the Government to workout unit cost of transmission (DFR-4.4). It will be seen that cost of transmission by conventional method besides discounted cost of transmission will continue to be worked for the techno economic appraisal by CEA. It should also be clarified whether the beneficiary states have agreed to the transmission costs.

4.8.4 Economic Cost of Transmission:

The objective of the economic analysis of transmission project is to determine the cost of transmission at their true resources cost to the economy as the financial cost of transmission may not reflect the true cost of power to the economy on account of distortions inherent in the market prices. While working out the economic cost of transmission, both the costs and power transmitted have to be valued at their true resources cost. This process involves removal of taxes and duties from the costs as they are not the costs to the society. Similarly, the subsidies are also not allowed as they are only transfer payments. The foreign exchange being scarce , there is certain amount of premium on it. All the imported items such as plant and machinery have to be valued at CIF prices. Apart from adjustment in the costs, the economic analysis also covers the impact of the proposed project on the power system. As a result of the proposed project becoming operative, there may be some improvement in realiability of the system.

This aspect should be quantified and valued as far as possible. If it is not possible, then, the envisaged improvement in system reliability should be described fully.

4.8.5 Likewise the financial analysis, cash flow for the economic analysis will also be prepared on the similar lines covering the capital cost and operating cost in the economic terms and the proposed energy flow in the system for each year during the life of the project. These cash flow will be discounted at a rate specified by the Government to arrive at the economic cost of transmission.

4.9.0 SENSITIVITY ANALYSIS :

4.9.1 It is assumed that the DFR is prepared on the basis of, as far as possible, realistic assumption of demand supply gap, capital cost estimates, gestation period, operating cost estimates, production build-up, turnover, economic life, etc. But, the project is in the nature of a venture which means exposure to chance and some of the assumptions/estimates may go wrong. Experience shows that in several areas assumptions have often gone wrong. It is, therefore, necessary to carry out sensitivity analysis to indicate the project's financial viability when there are changes in the estimates of key parameters such as capital costs particularly the foreign exhchange component,operating cost etc. The extent of changes in the key parameters should be based on the past experience relating to the sector.

TRANSMISSION PROJECTS

DFR 1.1

SALIENT FEATURES OF THE PROJECT

A. Indentification Characteristics

1. Name of the project:
2. Location (District/State)
3. Implementation Agency
4. Department/Ministry sponsoring the project
5. Sector
6. Objectives/nature of project (Grassroot/ expansion/ replacement/ rehabilitation/ modernisation).

B. Physical Characteristics

1.

i) Transmission Lines

- Voltage level
- SC/DC
- Line length (CKT,Km)

ii) Substations

- Number
- Capacity (MVA)
- Load Demand (Voltage wise)

2. Total Anticipated flow of energy through the project(M.Kwh)
3. Linkages

i) Power Generating Projects

- Name
- Capacity (MW)
- Anticipated no. of units likely to flow through the proposed transmission project

(contd.)

ii) Connecting the **DFR - 1.1(contd.)**

- Regional grid/State/Consumer
- Share in terms of energy of each region/state/ consumer

4. Transmission losses (percent)

5. Land

- Total requirement

(Include requirement for right of way, substations etc.)

- Availability

(Specify, whether Government land or privately owned (areawise), status of acquisition

- No. of families affected/requiring rehabilitation (if any)
- Whether agriculture or non-agriculture

(Present use may be specified)

C. Financial and Economic Characteristics

1. Total Capital cost (Rs. Crores)
2. Foreign exchange component (Rs. Crores)
3. Exchange Rate:
4. Interest during construction (Rs. crores) (included in C-1)
5. Working capital margin (Rs. crores)
6. Funding arrangement for Indigenous Cost (IC) and FE
7. Total system cost (Rs. crores)
8. Base date of capital cost (month/year)
9. Annual operation and maintenance cost (at_____% cap. ut.)(Rs. crores)

(contd.)

D. Evaluation Indicies

	Cost of transmission * (Rs./Kwh)
1	2
(i) Financial	
(ii) Economic **	

*This has to be worked out at a discount rate specified by the Government.

**With premium on foreign exchange and other shadow prices as specified by the Government.

E. Commissioning Schedule

a) Transmission Lines

1. From the date of sanction to commissioning :

_____ years _____ months.

b) Substations

1. From the date of sanction to commissioning :

_____ years _____ months.

TRANSMISSION PROJECTS

* **DFR 1.2**

JUSTIFICATION FOR TRANSMISSION FACILITIES IN THE CONCERNED REGION

Item	Year
1	2
1. Demand for power (MW)	
2. Power Availability (MW)	
3. Power Surplus/Deficit (MW)	
4. Transmission Facilities required *	
a) Transmission Lines (Ckt kms)	
b) Substations	

* Details of systems studies establishing the need for augmentation of transmission lines and substations their capacity, voltage level, etc. to be indicated.

TRANSMISSION PROJECTS

DFR 1.3

ALTERNATIVE PROJECTS IDENTIFIED FOR MEETING PROJECTED ENERGY FLOW THROUGH THE SYSTEM

Name of Project/ Region	Type of Project *	Present Status @	Capacity Envisaged #	Estimated Cost (Rs. crores)	Likely date of Commi-ssioning	Yearwise # Likely Benefits	
						Yr1..	Yr2...
1	2	3	4	5	6	7	8
1.							
2.							
3.							
.							
.							
.							
.							
.							
.							

* The voltage level, line length, no. of substations etc.

@ Whether identified, formulated, under CEA's consideration.

Estimated Energy flow.

TRANSMISSION PROJECTS

DFR - 1.4

ITEMWISE BREAKUP OF CAPITAL COST,OPERATION & MAINTENANCE COST
(Separately for each Alternative)

Unit of measurement:

Base date (month & Year):

Exchange rate * :

Item	Unit	Qty.	Market Price	Financial Cost			# Economic Cost	
				IC	FC	Taxes & Duties in IC	IC	FC
1	2	3	4	5	6	7	8	9
A. Capital Cost								
1. Studies & Investigations								
2. Land & Civil Works								
3. Know-how & Engineering								
4. Equipment for (i) transmission lines								
(ii) substations								
5. Special Tools & Plants								
6. Environment Related Cost								
7. Project Management								
8. Interest During Construction								
9. Working Capital Margin								
Total (1 - 9) :								

TRANSMISSION PROJECTS

DFR - 1.4(contd.)

ITEMWISE BREAKUP OF CAPITAL COST,OPERATION & MAINTENANCE COST
(Separately for each Alternative)

Unit of measurement:

Base date (month & Year):

Exchange rate * :

Item	Unit	Qty.	Market Price	Financial Cost			# Economic Cost	
				IC	FC	Taxes & Duties in IC	IC	FC
1	2	3	4	5	6	7	8	9
B. Operation & Maintenance at full capacity operation								
1. Labour cost								
01								
02								
.								
2. Repair & Maintenance								
3. Other expenses								
Total (1-3) :								

* In case a number of Foreign Currencies are involved the amount and the exchange rate assumed may be specified separately.

\# For all traded and tradable items, the economic cost would be fob / cif prices and internal transportation cost. For non-traded / tradable item, this will be social opportunity cost/economic cost of production/market price excluding taxes, duties and subsidies and any other transfer payments.

Note: IC indicates the indigenous component and

FC the Foreign component.

DFR - 1.5

CASHFLOW STATEMENT FOR CALCULATION OF COST OF TRANSMISSION

(Separate statements for unit financial and economic costs for different alternatives)

Alternative .....

Base date (month & Year) :

Exchange rate :

(Rs. crores)

YEAR	CASH OUT FLOW									Energy flow (M.Kwh)
	Capital Cost			O & M cost			Total			
	IC	FC	Taxes and duties in IC	IC	FC	Taxes and duties in IC	IC	FC	Taxes and duties in IC	
1	2	3	4	5	6	7	8	9	10	11
1.										
2.										
3.										
.										
.										
.										
N										
Total :										

IC : Indigenous Component FC : Foreign Component

Cost of Transmission (Rs./Kwh): Financial_____, Economic_____

Note:

i) Interest during construction (IDC) will be exlcuded from cols. 2 & 3. Depreciation will be excluded from col. 5. Interest on Working Capital will, however, be included in col. 5.

ii) Recovery of salvage value is to be shown in N+1 year. Replacement cost of capital nature, if any, not included in the annual O&M cost should be shown in the capital cost column against the appropriate years.

iii) For economic analysis the capital and operation and maintenance cost should be taken at their economic values (as given DFR 1.4) and after using premium/shadow prices for foreign exchange, labour etc. as may be specified by PIB from time to time.

TRANSMISSION PROJECTS

DFR - 2.0

SUMMARY OF CAPITAL COST

Base date (month & year):

Exchange rate* :

(Rs. crores)

Statement No.	Item	Capital Cost			Basis of estimates	@ Degree of reliability within (+/-)....%
		IC	FC	Total		
1	2	3	4	5	6	7
1.	Studies & Investigations Preliminary Works & Detailed surveys					
2.	Cost of Civil Works (including Land, Compensation, tree cutting, right of way etc.)					
3.	Engineering & Consultancy					
4.	Plant & Equipment					
	4.1 Transmission Lines					
	4.2 Substations					
	4.3 Communications					
	- Power Line carrier					
	- Micro wave					
	- Others					
	4.4 Misc. tools & Plants					
5.	Project Management (Administration)					
6.	Environment Related cost					
7.	Working Capital Margin					

(contd.)

TRANSMISSION PROJECTS

DFR - 2.0(contd.)

SUMMARY OF CAPITAL COST

Base date (month & year):

Exchange rate* :

(Rs. crores)

Statement No.	Item	Capital Cost			Basis of estimates	@ Degree of reliability within (+/-)....%
		IC	FC	Total		
1	2	3	4	5	6	7
8. Interest During Construction						
A. Total Project Cost (1 to 8)						
9. Cost of linked projects						
10. Contingency						
B. Total System Cost						

* In case the number of foreign currencies involved are more than one, the amount and exchange rate for each of the currencies may be indicated in the footnote.

@ TQ - Tender Quotation IH - In-House Cost Data

CD - Consultants Data BQ - Budgetary Quotation

IC - Indigenous Component FC - Foreign Component

DFR - 2.1

DETAILS OF THE COST OF THE STUDIES AND INVESTIGATIONS AND PRELIMINARY WORKS

Base date (month & year):

Exchange Rate:

(Rs. Crores)

Sl. No.	Studies and Investigations and Preliminary works	Cost of the Study/ Investigation			* Agency responsible for carrying out the study/ investigation
		IC	FC	Total	
1	2	3	4	5	6
1.	Demand Analysis/System studies				
2.	Route survey				
3.	Detailed survey				
4.	Communication facilities				
5.	Site selection, site conditions and investigations for towers, substations				
6.	Preliminary works				
7.	Basic Engineering				
8.	Environmental Impact				
9.	Others				

IC : Indigenous Component FC : Foreign Component

* Indicate whether inhouse or outside agency.

TRANSMISSION PROJECTS

DFR - 2.2

DETAILS OF COST OF CIVIL WORKS

Base date (month & year):

Exchange Rate :

Sl.No.	Item	Unit	Qty.	Rate (Rs)	Amount (Rs.Crs.) IC	FC	Remarks
1	2	3	4	5	6	7	8
1. Design, Engineering &Consultancy							
2. Preliminary survey, detailed survey, soil investigations etc.							
3. Land							
a) Land acquisition:-							
i) Substations							
ii) Other purposes(to be specified)							
b) Land Development							
4. Civil Works							
(i) Buildings							
(ii) Substations							
(iii) Cable Laying							
(iv) Other civil works							
5. Erection							
i) Transformers							
ii) Circuit Breakers							
iii) CR Panels							
iv) Structures							
6. Contingency							
7. Loss on stocks							
8. Township							
9. Total							

IC : Indigenous Component FC : Foreign Component

TRANSMISSION PROJECTS

DFR - 2.3

DETAILS OF KNOWHOW, ENGINEERING AND CONSULTANCY

(Rs. Crores)

Item	Amount
1. Indian Consultancy (IC)	
2. Foreign Consultancy (FC)	
(IC)	

IC : Indigenous component FC : Foreign component

TRANSMISSION PROJECTS

DFR - 2.4

BREAK UP OF PLANT AND EQUIPMENT COST

Base date (month & year)

Exchange Rate :

(Rs.Crores)

Sl. No.	Item	Unit	Cost of Equipment/ supplies				Inland Transport & Insurance	Erection charges		Others (to be specified)	Total	
			cif	Custom Duties & Other Taxes	Indigenous cost	Tax element in IC						
			FC	IC	IC	IC	IC	IC	FC	IC	IC	FC
1	2	3	4	5	6	7	8	9	10	11	12	13
1. Towers												
2. Power conductor												
3. Earth wire												
4. Insulator discs												
5. Erection												
a) Towers erected												
b) Stringing												
6. * Transformers												
a)												
b)												
c)												
d)												

(contd.)

TRANSMISSION PROJECTS

DFR - 2.4 (contd.)

BREAK UP OF PLANT AND EQUIPMENT COST

Base date (month & year)

Exchange Rate :

(Rs.Crores)

1	2	3	4	5	6	7	8	9	10	11	12	13
7. * Circuit Breakers												
a)												
b)												
c)												
d)												
8. * Current transformers												
a)												
b)												
c)												
d)												
9. * Potential transformers												
a)												
b)												
c)												
d)												
10. * Lightening arrestors												
a)												
b)												
c)												
d)												
11. * Reactor Eqpt/Cap.												
a)												
b)												
c)												
d)												

(contd.)

TRANSMISSION PROJECTS

DFR - 2.4 (contd.)

BREAK UP OF PLANT AND EQUIPMENT COST

Base date (month & year)

Exchange Rate :

(Rs.Crores)

1	2	3	4	5	6	7	8	9	10	11	12	13
12. Power Cables												
13. Control cable												
14. C&R Panel												
15. D.C Equipment												
16. PLCC												
17. * Isolators												
a)												
b)												
c)												
d)												
18. Sub-station structures												
19. Communications												
i) Power line carrier												
ii) Micro-wave												
iii) Telephones & Wireless												
20. Misc. Tools & Plants												
21. Contingencies												
22. Total												

IC: Indigenous Component FC: Foreign Component

* Separate subitems per each voltage

TRANSMISSION PROJECTS

DFR - 2.5

A. PROJECT MANAGEMENT EXPENSES

Base date (month & year):

Exchange Rate :

(Rs.Crores)

Sl. No.	Item	Project Managment Expenses *			
		IC	FC	Total	Basis
1	2	3	4	5	6
1.	HQ Establishment				
2.	Audit & Accounts				
3.	Training and O & M staff				
4.	Others				
5.	Total				

IC: Indigenous component. FC: Foreign component

* Excluding expenditure covered under `Knowhow and Engineering payments'.

Note: This format may be completed based on the experience of the project authorities and their consultants as a percentage of plant costs including plant and equipment.

B. CATEGORYWISE MANPOWER DURING CONSTRUCTION

Year	Managerial/ Administrative		Technical		Skilled		Semi-skilled		Un-skilled		Total	
	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost
1	2	3	4	5	6	7	8	9	10	11	12	13
1.												
2.												
3.												
.												
Till commissioning												

TRANSMISSION PROJECTS

DFR - 2.6

ENVIRONMENT RELATED COSTS

Base Date (month & year) :

Exchange Rate :

(Rs. crores)

Sl. No.	Item *	Amount			Basis
		IC	FC	Total	
1	2	3	4	5	6
1.	Compensatory Afforestation on account of Right of way, Tree cutting, etc.				
2.	Others				
	.				
	.				
	.				
	Total :				

IC : Indigenous Component FC: Foreign Component

* Items may be indicated as per requirement of the project.

TRANSMISSION PROJECTS

DFR - 2.7

ASSESSMENT OF WORKING CAPITAL

Base date (month & year) :

Exchange Rate :

(Rs. crores)

Sl. No.	Item	Norms of inventory	Unit rate	Total value	Remarks
1	2	3	4	5	6
1.	Stores and Spares				
2.	Annual Transmission of Energy (M.Kwh)				
3.	Debtors				
4.	Cash and Bank balance				
A.	Total current assets (1-4)				
5.	Creditors				
6	Advances from customers (if any)				
B.	Total current liabilities (5-6)				
7.	Working capital gap (A-B)				
8.	Margin Money (as per norms)				
9.	Gap for bank finance				
10.	Annual interest on bank financed amount (excl. margin money)				

Nte:- 1. This is required to be furnished yearwise ti ll one year after stable level of production is achieved;

2. Incremental working capital requirements on annual basis may be shown in a footnote.

TRANSMISSION PROJECTS

DFR - 2.8

CAPITALISED INTEREST DURING CONSTRUCTION (IDC)

(Contents flexible depending upon specific

requirements of thc projcct)

Base date (month & year) :

Exchange Rate :

(Rs. crores)

Year	Source	Loan		Rate of Interset	Period	Total Amount
		Currency	Amount			
1	2	3	4	5	6	7
Total :						

TRANSMISSION PROJECTS

DFR - 2.9

COST OF LINKED PROJECTS INCURRED BY OTHER AGENCIES

(Normally for facilities which will not be owned by the enterprise)

Base date (month & year) :

Exchange Rate :

(Rs. crores)

Sl. No.	Project	Total cost	Implementing Agency	Completion date (month/year)
1	2	3	4	5

TRANSMISSION PROJECTS

DFR - 3.1

ESTIMATION OF OPERATING REQUIREMENT AND COSTS

Base date (month & year):

Exchange Rate:

(Rs. crores)

Item/Details	Consu-mption Norms	Total require-ment (Qty.)	Unit rate	Financial			
				IC	FC	T&DC	Total
1	2	3	4	5	6	7	8
1. Labour & Supervision							
a)							
b)							
2. Fixed Overheads							
a)							
b)							
3. Repairs & Maintenance							
4. Depreciation							
5. Interest on Long Term Loans							
6. Interest on Working Capital Loans							
7. Others (to be specified)							
Total Operating Cost:							

(Contd.)

TRANSMISSION PROJECTS

DFR - 3.1 (Contd.)

ESTIMATION OF OPERATING REQUIREMENT AND COSTS

Base date (month & year):

Exchange Rate:

(Rs. crores)

Item/Details	Consu-mption Norms	Total require-ment (Qty.)	Unit rate	Economic			
				* IC	@ FC	Inland Trans-port	Total
1	2	3	4	9	10	11	12
1. Labour & Supervision							
a)							
b)							
2. Fixed Overheads							
a)							
b)							
3. Repairs & Maintenance							
4. Depreciation							
5. Interest on Long Term Loans							
6. Interest on Working Capital Loans							
7. Others (to be specified)							
Total Operating Cost:							

IC: Indigenous component. FC: foreign component

T&DC: Tax and Duties component

* For non-traded goods.

@ For traded & tradable goods at cif value.

In case any cost item is at subsidised rate, the actual economic cost would be reported.

TRANSMISSION PROJECTS

DFR - 3.2

REQUIREMENTS OF LABOUR AND COSTS

(At Stable Level of Capacity Utilisation for a Full Year)

Base date (month & year):

Exchange Rate:

(Rs. crores)

Category of Labour	No. of workers	Total wage cost	Costs of P.F. ESIS, gratuity scheme, etc.	Average earnings per worker (Rs.)
1	2	3	4	5
1. Production Workers				
01 Unskilled				
02 Semi-skilled				
03 Skilled				
04 Technical				
05 Managerial				
2. Workers at Administration				
01 Unskilled				
02 Clerical				
03 Junior Managerial				
04 Senior Managerial				
Total:				

TRANSMISSION PROJECTS

DFR - 4.1

PROJECTED BALANCE SHEET

(Rs. Crores)

Item	Year 1	Year 2	Year 3 .....
1	2	3	4
I. Assests			
01 Gross block			
Less 02 Depreciation and amortisation			
03 Net block			
04 Capital work in progress			
05 Unallocated expenditure during construction			
06 Other items in the nature of assets			
07 Total net fixed assets (03 - 06)			
08 Investments			
09 Working Capital/Net Current assets			
10 Inventories			
11 Sundry debtors			
12 Loans and advances			
13 Cash and bank balance/deposits			
14 Other assests			
15 Total current assests (10 - 14)			

(contd.)

TRANSMISSION PROJECTS

DFR - 4.1(contd)

PROJECTED BALANCE SHEET

(Rs. Crores)

Item	Year 1	Year 2	Year 3 .....
1	2	3	4
Less 16 Current liabilities and provision			
17 Net current assets/working capital			
18 Deferred revenue/preliminary expenditure			
19 Accumulated deficit			
Grand total :			
Authorised Share Capital			
II. Liabilities			
01 Paid up share capital			
011 From Central Government			
012 From others			
02 Loans			
021 Loans from Central Government			
022 Loans from foreign parties			
023 Working capital loans from Central Govt.			
024 Loans from others			
03 Cash credit/advances			
04 Reserves and surplus			
041 Development rebate/ Investment allowance reserve			
042 General and other reserves			
043 Specific reserves			
05 Balance from profit/loss			
Grand Total :			

Note: The above data may be furnished till one year after production is stabilised.

TRANSMISSION PROJECTS

DFR - 4.2

PROJECTED PROFIT AND LOSS STATEMENT

(Rs. crores)

Item	Year 1	Year 2	Year 3 .....
1	2	3	4
I. Income			
01 Gross sales/operating income			
Less 02 Commission, rebate and discount			
Less 03 Excise duty			
04 Net sales/operating income			
05 Other income/Misc. receipts			
Total (04 + 05) :			
II. Expenses			
06 Consumption of raw materials, stores and spares			
07 Salaries, wages and welfare benefits			
08 Repairs & maintenance			
09 Misc. expenditure			
10 Prior period adjustment			
Total (06 - 10) :			

(contd.)

TRANSMISSION PROJECTS

DFR - 4.2(contd.)

PROJECTED PROFIT AND LOSS STATEMENT

(Rs. crores)

Item	Year 1	Year 2	Year 3 .....
1	2	3	4
III. Gross margin (I - II)			
Less 11 Depreciation			
Less 12 Deferred revenue/ preliminary expenditure			
IV. Gross profit/loss (III - 11 - 12)			
13 Interest			
131 On central Govt. loans			
132 On foreign loans			
133 On other loans			
134 On cash credit			
135 On supplier's credit			
136 On bonds & others (specify)			
Less 137 Interest capitalised			
14 Net chargeable interest			
V. Profit/loss before tax (IV-14)			
Less 15 Tax provision			
VI. Net profit/loss (V-15)			
Less 16 Dividend payment			
VII. Retained profit/loss (VI-16)			

Note: The above data may be furnished till one year after production is stabilised.

TRANSMISSION PROJECTS

DFR - 4.3

SOURCES OF FINANCING OF THE PROJECT

(Rs. crores)

Item	Total	Yearly phasing during implementation		
		Year 1	Year 2	Year 3 .....
1	2	3	4	5
1. Capital cost				
a) IC				
b) FC				
Domestic				
2. Internal resources				
3. Institutional loans				
4. Market borrowings				
5. Supplier's credit				
6. Public equity				
7. Budgetary support				
8. Collaborators contribution				
9. Other sources (specify)				
Total (2 - 9) :				
Foreign				
10. Multilateral loans (specify)				
11. Bilateral loans (specify)				
12. Direct commercial borrowings				
13. Supplier's credit				
14. Collaborators contribution				
15. Others (specify)				
Total (10 - 15) :				

IC: indicates the indigenous compoent and FC: the foreign component

TRANSMISSION PROJECTS

DFR - 4.4

CASHFLOW STATEMENT FOR CALCULATION OF COST OF TRANSMISSION

Base date (month & Year):

Exchange rate:

(Rs. crores)

YEAR	CASH OUTFLOW									
	Capital Cost			O & M cost			Total			
	IC	FC	Taxes and duties in IC	IC	FC	Taxes and duties in IC	IC	FC	Taxes and duties in IC	No. of units transmitted (M.Kwh)
1	2	3	4	5	6	7	8	9	10	11
1.										
2.										
3.										
.										
.										
.										
.										
N										
Total										

NPV (financial):_____, NPV (economic):_____

Cost of transmission (Rs./kwh): Financial:_____, Economic:_____

Note:

i) Interest during construction (IDC) will be excluded from cols. 2 & 3. Depreciation will be excluded from col. 5. Interest on Working Capital will, however, be included in col. 5.

ii) Recovery of salvage value is to be shown in N+1 year. Replacement cost of capital nature, if any, not included in the annual O&M cost should be shown in the capital cost column against the appropriate years.

iii) For the alternative proposed, cashflow statementswould need to be prepared for "with" and "without project" situations, for working out cost of transmission (Financial & Economic) on incremental basis.

TRANSMISSION PROJECTS

DFR - 4.5

SENSITIVITY ANALYSIS

S. No.	Case	Cost of Transmission (Rs./kwh)		
		Financial	Economic	
			With Premium	Without Premium
1	2	3	4	5
1.	Base case			
2.	Capital cost + 20%			
3.	Capital cost + 30%			
4.	Capital cost + 50%			
5.	Time overrun + 20%			
6.	Time overrun + 30%			
7.	Time overrun + 50%			

CHAPTER 5

REVISED COST ESTIMATES (RCE)

5.1.1 All projects, requiring Government approval, have to be reappraised and require Government approval again if the increase in Capital Cost exceeds a specified percentage. These revised cost estimates have to be submitted well before incurring the additional expenditure or making commitments. Necessary procedures and instructions required for RCE are laid down by the Government from time to time. This chapter outlines the information to be given in RCE proposals which have to be submitted for this purpose. In many cases, when the Detailed Project Report is prepared after the investment approval, the revised costs became known and often a proposal for revised approval, based on DPR, is submitted. This could also be treated as RCE.

5.1.2 The proposal of revised cost estimates (RCE) should be in the nature of a memorandum on 'exceptions'. The primary aim of subjecting RCE to techno-economic appraisal is to focus on the changes which have taken place since the original approval of the proposal and reasons thereof. As far as possible,repetitions of information on the need and justification, technology, location and other parameters should be avoided, if there is no change vis-a-vis the latest sanctioned project.

5.1.3 The information to be presented in DPR/RCE cases will compare the revised status with the sanctioned project. In case of first Revised Cost Estimate, the comparison is with the original project sanctioned. In case of second RCE, the comparison will be with the first RCE sanctioned and so on. The RCE formats have been designed on the same lines as DFR formats so as to enable a comparison of the RCE with the DFR estimates as per sanctioned project.

5.1.4 The comparative picture should cover all the important techno-economic parameters such as, the project cost, capacity, completion time, O&M expenditure, financial/economic benefits, financial and economic viabilities as given earlier vis-a-vis those now proposed. In case there are major variations in the parameters like technology, location, size of the plant, funding pattern or in the need and justification of the project from the latest sanctioned project, the project authorities should clearly indicate such change together with the reasons/justifications underlying the proposed changes.

5.1.5 Project Status: It is necessary to indicate the latest physical and financial progress achieved. The date upto which the progress is reported should be clearly indicated. Major milestones achieved should also be recorded in the form of a calender of events. While indicating the financial progress, the project authorities should not simply furnish the latest expenditure incurred on the project, it should also indicate the expenditure committed till the date of report. Apart from achivement of major milestones, the physical progress may give the achievement in percentage terms for each of the components/ contracts of the project separately. The details to be furnished are indicated in the Format RCE-4.1.

5.1.6 Cost Over-run: It is also necessary to indicate the basis on which the sanctioned estimates were framed and how the circumtances changed that basis. Similarly, project authorities should also give the basis underlying the revised estimates proposed. The degree of reliability of the revised estimates must also be indicated together with the reference level of prices.

5.1.7 The cost over-run should be subjected to the standardised variance analysis to segregate the effect of a) cost increases due to fiscal reasons within approved project schedule, (b) cost increases due to fiscal reasons beyond approved project schedule and (c) cost increases due

to other reasons. The itemwise cost variance analysis should be presented in the Format RCE-4.3. Detailed reasons/justifications for each variation in the cost proposed should be furnished. The variation in cost due to increase in quantitites and/or unit rates should be indicated separately in the formats RCE-4.3.

5.1.8 The variation in the annual operation and maintenance cost and the working capital requirement, if any, should also be indicated together with the justification/reasons underlying the change.

5.1.9 Funding: The arrangements for funding of RCE as compared to sanctioned project, both for Indigenous cost (IC) and FE, should be outlined.

5.1.10 Time Over-run: In analysing the total time over-run the starting point should be taken as the change from the zero date (i.e. the date of sanction). Similarly, the project commissioning should be taken as the final event. If the time over-run is on account of elongation of activities on the critical path, then the list of all such critical activities and reasons for inability to assess accurately their time duration in the sanctioned proposal should be clearly explained. It is also important that the reasons for the inability to adhere to the sanctioned commissioning schedule are clearly brought out in the Format RCE-4.1 . The project authorities should also highlight the steps being envisaged to crash some of the critical activities so as to commission the project in the original time profile. A schedule of major milestones on a comparative basis should be provided. The cost over-run as a result of time over- run should be estimated and indicated separately.

5.1.11 Viability Analysis of the Revised Proposal: The project authorities should also furnish the financial and economic viabilities of the revised cost proposal together with the cashflow statements in support of the above calculations as per format RCE-4.4 .

TRANSMISSION PROJECTS

RCE - 1.1

SALIENT FEATURES OF THE PROJECT

1. Name of the project:

2. Department/Ministry sponsoring the project

3. Date of sanction of Original proposal

	LS	RCE	Variation
1	2	3	4

A. Physical Characteristics

1.

i) Transmission Lines

- Voltage level
- SC/DC
- Line length (CKT,Km)

ii) Substations

- Number
- Capacity (MVA)
- Load Demand

(Voltage wise)

2. Total Anticipated flow of energy through the project (M.Kwh)

3. Transmission losses (percent)

B. Financial and Economic Characteristics

1. Total Capital cost (Rs. Crores)

2. Foreign exchange component (Rs. Crores)

3. Exchange Rate:

4. Interest during construction (Rs. crores)

5. Funding arrangement for Indigenous Cost (IC) and FE

6. Total system cost (Rs. crores)

7. Base date of capital cost (month/year)

8. Annual operation and maintenance cost (at_____% cap. ut.)

(Rs. crores)

(contd.)

TRANSMISSION PROJECTS

RCE - 1.1 (contd.)

SALIENT FEATURES OF THE PROJECT

C. Evaluation Indices

Cost of Transmission (Rs./Kwh)

i) Financial*

ii) Economic **

D. Commissioning Schedule

a) Transmission Lines

1. From the date of sanction to commissioning:

_____ years _____ months.

b) Substations

1. From the date of sanction to commissioning:

_____ years _____ months.

LS : Latest Sanctioned, RCE : Revised Cost Estimate

* This has to be worked out at a discount rate as specified by the Government.

** With premium on foreign exchange and other shadow prices as specified by the Government.

REC - 1.2

*

JUSTIFICATION FOR TRANSMISSION FACILITIES IN THECONCERNED REGION/STATE

(Separate Statement for latest sanctioned and RCE)

Item	Year
1	2
1. Power Requirement(MW)	
2. Power Availability (MW)	
3. Power surplus/Deficit (MW)	
4. Transmission Facilities required *	
a) Transmission Lines (Ckt kms)	
b) Substations	

* Details of systems studies establishing the need for augmentation of transmission lines and substations, their capacity, voltage level, etc. to be indicated.

TRANSMISSION PROJECTS

RCE - 2.0

SUMMARY OF CAPITAL COST

Base date (month & year):

Exchange rate* :

(Rs. crores)

Statement No.	Item	Capital Cost						@ Basis of estimate	Degree of reliability within (+/-)....%
		LS			RCE				
		IC	FC	Total	IC	FC	Total		
1	2	3	4	5	6	7	8	9	10
	1. Studies & Investigations, Preliminary Works & Detailed surveys								
	2. Cost of Civil Works (including Land, Compensation, tree cutting, right of way etc.)								
	3. Engineering & Consultancy								
	4. Plant & Equipment								
	4.1 Transmission Lines								
	4.2 Substations								
	4.3 Communications								
	- Power Line carrier								
	- Micro wave								
	- Others								
	4.4 - Misc. tools & Plants								

(contd.)

TRANSMISSION PROJECTS

RCE - 2.0(contd.)

SUMMARY OF CAPITAL COST

Base date (month & year):

Exchange rate* :

(Rs. crores)

Statement No.	Item	Capital Cost						@ Basis of estimate	Degree of reliability within (+/-)....%
		LS			RCE				
		IC	FC	Total	IC	FC	Total		
1	2	3	4	5	6	7	8	9	10
	5. Project Management (Administration)								
	6. Environment Related Cost								
	7. Working Capital Margin								
	8. Interest During Construction								
	A. Total Project Cost (1 to 8)								
	9. Cost of linked projects								
	10. Contingency								
	B. Total system cost								

LS: Latest Sanctioned, RCE: Revised Cost Estimate

* In case the number of foreign currencies involved are more than one, the amount and exchange rate for each of the currencies may be indicated in the footnote.

@ TQ - Tender Quotation BQ - Budgetary Quotation

IH - In-House Cost Data CD - Consultants Data

IC - Indigenous component FC - Foreign component

TRANSMISSION PROJECTS

RCE - 2.1

DETAILS OF THE COST OF THE STUDIES AND INVESTIGATIONS AND PRELIMINARY WORKS

Base date (month & year):

Exchange Rate:

(Rs. Crores)

Sl. No.	Studies and Investigations and Preliminary works	Cost of the Study/Investigations						Agency responsible for carrying out the study/ investigations *
		LS			RCE			
		IC	FC	Total	IC	FC	Total	
1	2	3	4	5	6	7	8	9
1. Demand Analysis/System studies								
2. Route survey								
3. Detailed survey								
4. Communication facilities								
5. Site selection, site conditions and investigations for towers, substations								
6. Preliminary works								
7. Basic Engineering								
8. Environmental Impact								
9. Others								

IC: Indigenous Component FC: Foreign Component

* Indicate whether inhouse or outside agency.

TRANSMISSION PROJECTS

RCE - 2.2

DETAILS OF COST OF CIVIL WORKS

Base date (month & year):
Exchange Rate :

Sl.No.	Item	Unit	Qty.		Rate		Amount (Rs. crores)				Remarks
			LS	RCE	LS	RCE	LS		RCE		
							IC	FC	IC	FC	
1	2	3	4	5	6	7	8	9	10	11	12
1. Design, Engineering & Consultancy											
2. Preliminary survey, detailed survey, soil investigations etc.											
3. Land											
a) Land acquisition:-											
i) Substaions .											
ii) Other purposes(to be specified)											
b) Land Development											
4. Civil Works											
i) Buildings											
ii) Substations											
iii) Cable Laying											
iv) Other civilworks											
5. Erection											
i) Transformers											
ii) Circuit Breakers											
iii) CR Panels											
iv) Structures											
6. Contingency											
7. Loss on stocks											
8. Township											
9. Total											

IC:indigenous Component FC: Foreign Component

TRANSMISSION PROJECTS

RCE - 2.3

DETAILS OF KNOWHOW, ENGINEERING AND CONSULTANCY

(Rs. Crores)

Item	LS	RCE
1	2	3
Indian Consultancy (IC)		
Foreign Consultancy (FC)		
(IC)		

IC: Indigenous component. FC: Foreign component.

TRANSMISSION PROJECTS

RCE - 2.4

BREAK UP OF PLANT AND EQUIPMENT COST

(Separate Statement for Latest Sanctioned and RCE)

Base date (month & year)

Exchange Rate :

(Rs.Crores)

Sl. No.	Item	Unit	Cost of Equipment/ supplies				Inland Transport & Insurance	Erection charges		Others (to be specified)		Total
			cif	Custom Duties & Other Taxes	Indigenous cost	Tax element in IC						
			FC	IC	IC		IC	IC	FC	IC	IC	FC
1	2	3	4	5	6	7	8	9	10	11	12	13
1. Towers												
2. Power conductor												
3. Earth wire												
4. Insulator discs												
5. Erection												
a) Towers erected												
b) Stringing												
6.* Transformers												
a)												
b)												
c)												
d)												
7.* Circuit Breakers												
a)												
b)												
c)												
d)												

(contd.)

TRANSMISSION PROJECTS

RCE - 2.4(contd.)

BREAK UP OF PLANT AND EQUIPMENT COST

1	2	3	4	5	6	7	8	9	10	11	12	13
8.* Current transformers												
a)												
b)												
c)												
9. * Potential transformers												
a)												
b)												
c)												
10. * Lightening arrestors												
a)												
b)												
c)												
11. * Reactor Eqpt/Cap.												
a)												
b)												
c)												
12. Power Cables												
13. Control cable												
14. C&R Panel												
15. D.C Equipment												
16. PLCC												
17. * Isolators												
a)												
b)												
c)												
18. Sub-station structures												
19. Communications												
i) Power line carrier												
ii) Micro-wave												
iii) Telephones & Wireless												
20. Misc. Tools & Plants												
21. Contingencies												
22. Total												

IC: Indigenous Component FC: Foreign Component

* Separate subitems for each voltage

TRANSMISSION PROJECTS

RCE - 2.5

A. PROJECT MANAGEMENT EXPENSES

Base date (month & year):

Exchange Rate :

(Rs.Crores)

Sl.No.	Item	Project Managment Expenses *						
		LS			RCE			
		IC	FC	Total	IC	FC	Total	Basis of RCE
1	2	3	4	5	6	7	8	9
1.	HQ Establishment							
2.	Audit & Accounts							
3.	Training and O & M staff							
4.	Others							
5.	Total							

* Excluding expenditure covered under `Knowhow and Engineering payments'.

Note: This format may be completed based on the experience of the project authorities and their consultants as a percentage of plant costs including plant and equipment.

B. CATEGORYWISE MANPOWER DURING CONSTRUCTION

Year	Managerial/ Administrative		Technical		Skilled		Semi-skilled		Un-skilled		Total	
	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost
1	2	3	4	5	6	7	8	9	10	11	12	13
1.												
2.												
3.												
.												
Till commissioning												

TRANSMISSION PROJECTS

RCE - 2.6

ENVIRONMENT RELATED COSTS

Base Date (month & year) :

Exchange Rate :

(Rs. crores)

Sl. No.	Item	Amount						Basis of RCE
		LS			RCE			
		IC	FC	Total	IC	FC	Total	
1	2	3	4	5	6	7	8	9
1. Compensatory Afforestation on account of Right of way, Tree cutting, etc.								
2. Others								
.								
.								
.								
Total :								

(Items may be indicated as per requirement of the project)

IC : Indigenous Component FC: Foreign Component

TRANSMISSION PROJECTS

RCE - 2.7

ASSESSMENT OF WORKING CAPITAL

(Separate statements for latest sanctioned and RCE)

Base date (month & year):

Exchange Rate:

(Rs. crores)

Sl. No.	Item	Norms of inventory	Unit rate	Total Value	Remarks
1	2	3	4	5	6
1.	Stores and Spares				
2.	Annual Transmission of Energy (M.Kwh)				
3.	Debtors				
4.	Cash and Bank balance				
5.	Total current assets (1-4)				
6.	Creditors				
7.	Advances from customers (if any)				
8.	Total current liabilities (6-7)				
9.	Working Capital gap (5-8)				
10.	Margin Money (as per norms)				
11.	Gap for bank finance				
12.	Annual interest on bank financed amount (excl. margin money)				

Note:-

1. This is required to be furnished yearwise till one year after stable level of production is achieved;

2. Incremental working capital requirements on annual basis may be shown in a footnote.

TRANSMISSION PROJECTS

RCE - 2.8

CAPITALISED INTEREST DURING CONSTRUCTION (IDC)

(Contents flexible, depending upon specific requirements of the Project)

Base date(Month & Year) :

Exchange Rate :

(Rs. Crores)

Year	Source		Loan				Rate of		Period		Total	
			Interest		Amount							
	LS	RCE	Currency		Amount		LS	RCE	LS	RCE	LS	RCE
			LS	RCE	LS	RCE						
1	2	3	4	5	6	7	8	9	10	11	12	13
Total												

LS : Latest Sanctioned RCE : Revised Cost Estimates

TRANSMISSION PROJECTS

RCE - 2.9

COST OF LINKED PROJECTS INCURRED BY OTHER AGENCIES

(Normally for facilities which will not be owned by the enterprise)

Base date (month & year) :

Exchange Rate :

(Rs. crores)

Sl. No.	Project	Total cost		Implementing Agency	Completion date (month/year)	
		LS	RCE		LS	RCE
1	2	3	4	5	6	7

LS : Latest Sanctioned RCE : Revised Cost Estimates

TRANSMISSION PROJECTS

RCE - 3.1

ESTIMATION OF OPERATING REQUIREMENT AND COSTS

(Separate Statement for latest Sanctioned & RCE)

Base date (month & year):

Exchange Rate:

(Rs. crores)

Item/Details	Consu-mption Norms	Total require-ment (Qty.)	Unit rate	Financial			
				IC	FC	T&DC	Total
1	2	3	4	5	6	7	8
1. Labour & Supervision							
a)							
b)							
2. Fixed Overheads							
a)							
b)							
3. Repairs & Maintenance							
4. Depreciation							
5. Interest on Long Term Loans							
6. Interest on Working Capital Loans							
7. Others (to be specified)							
Total Operating Cost:							

(Contd.)

TRANSMISSION PROJECTS

RCE - 3.1 (Contd.)

ESTIMATION OF OPERATING REQUIREMENT AND COSTS

(Separate Statement for latest sanctioned & RCE)

Base date (month & year):

Exchange Rate:

(Rs. crores)

Item/Details	Consu-mption Norms	Total require-ment (Qty.)	Unit rate	Economic			
				* IC	@ FC	Inland Trans-port	Total
1	2	3	4	5	6	7	8
1. Labour & Supervision							
a)							
b)							
2. Fixed Overheads							
a)							
b)							
3. Repairs & Maintenance							
4. Depreciation							
5. Interest on Long Term Loans							
6. Interest on Working Capital Loans							
7. Others (to be specified)							
Total Operating Cost:							

IC: Indigenous Component. FC: Foreign component

T&DC: Taxes & Duties component

* For non-traded goods.

@ For traded & tradable goods at cif value.

In case any cost item is at subsidised rate, the actual economic cost would be reported.

TRANSMISSION PROJECTS

RCE - 3.2

REQUIREMENTS OF LABOUR AND COSTS

(Separate Statement for latest Sanctioned & RCE)

[At Stable Level of Capacity Utilisation for a Full Year]

Base date (month & year):

Exchange Rate:

(Rs. crores)

Category of Labour	No. of workers	Total wage cost	Costs of P.F. ESIS, gratuity scheme, etc.	Average earnings per worker (Rs.)
1	2	3	4	5
1. Production Workers				
01 Unskilled				
02 Semi-skilled				
03 Skilled				
04 Technical				
05 Managerial				
2. Workers at				
Administration				
01 Unskilled				
02 Clerical				
03 Junior Managerial				
04 Senior Managerial				
Total:				

TRANSMISSION PROJECTS

RCE -4.1

PRESENT STATUS OF THE PROJECT

(Progress upto .....month & year)

Sl. No.	Item of work/ activity	Date of award of contract	Target date of completion (month & Year)		Reasons for delay	Progress achieved			
			LS	RCE		Physical@	Financial *		
							IC	# FC	Total
1	2	3	4	5	6	7	8	9	10
1.									
2.									
3.									
.									
.									
.									

IC: Indigenous Component FC: Foreign Component

LS : Latest Sanctioned, RCE : Revised Cost Estimate

@ In terms of percentage.

* Actual expenditure incurred upto the month and year progress is reported in rupee crores.

\# Exchange rates assumed would need to be specified.

TRANSMISSION PROJECTS

RCE 4-2

DETAILS OF YEARWISE EXPENDITURE TILL.....(MONTH/YEAR)

Base date (month/year) :

Exchange rate :

(Rs. crores)

Item	Latest sanctioned cost		Year		Year		Year		Balance expend-iture
	IC	FC	IC	FC	IC	FC	IC	FC	
1	2	3	4	5	6	7	8	9	10
1. Studies & Investigations									
2. Cost of civil works									
3. Know-how & Engineering									
4. Plant & Equipment									
5. Project Management									
6. Commissioning Expenditure									
7. Environment Related Cost									
8. Margin Money for Working Capital									
9. Capitalised Interest During Construction									
A. Total Project Cost (1 to 9)									
10. Cost of Linked Projects									
11. Cost of Unskilled Labour included in item A (Total)									
B. Total System Cost									
12. Weighted average * Exchange Rate									

* In case the number of foreign currencies involved are more than one, the amount and exchange rate for each of the currencies are to be indicated.

IC: Indigenous Component FC: Foreign Component

TRANSMISSION PROJECTS

RCE-4.3

ITEMWISE COST VARIANCE ANALYSIS

LS RCE

Base date (month/year) :

Exchange rate :
(Rs. crores)

Sl. No.	Items	LS	RCE	Vari-ation in cost	Variation due to			
					Escala tion (based on Index) @	Excha-nge rate varia-tion	Change in statu-tory duties *	Change in sta tutory duties due to Exch. Rate varia-tion
1	2	3	4	5	6	7	8	9
A. Cost overrun for fiscal reasons								
	within approved time schedule:							
1.								
2.								
3.								
.								
.								
	IDC							
	Margin money							
	Total (A)							
B. Cost overrun for fiscal reasons								
	beyond approved time schedule							
1.								
2.								
3.								
.								
.								
	IDC							
	Margin money							
	Total (B)							

(contd.)

TRANSMISSION PROJECTS

RCE - 4.3 (contd.)

ITEMWISE COST VARIANCE ANALYSIS

LS RCE

Base date (month/year) :

Exchange rate :

(Rs. crores)

C. Cost overrun due to other reasons

Sl. No.	Items	Latest sanctioned	RCE proposed	Variation in cost	Variation due to			
					Change in scope		Under/ over-estimation	Other reasons (specify)
					Approved items	Additional items		
1	2	3	4	5	10	11	12	13
1.								
2.								
3.								
.								
.								
IDC								
Margin Money								
Total (C)								

LS : Latest Sanctioned, RCE : Revised Cost Estimate

@ Yearwise indices used for LS and RCE to be given in the footnote.

* Statutory duties	Latest Sanctioned		Revised Cost Proposal	
	Rate	Amount	Rate	Amount
-Excise duty				
-Customs duty				
-Sales tax				
-Others(specify))				

TRANSMISSION PROJECTS

RCE - 4.4

CASHFLOW STATEMENT FOR CALCULATION OF COST OF TRANSMISSION

(Separate statements for LS and RCE)

Base date (month & Year):

Exchange rate:

(Rs. crores)

YEAR	CASH OUTFLOW									
	Capital Cost			O & M cost			Total			
	IC	FC	Taxes and duties in IC	IC	FC	Taxes and duties in IC	IC	FC	Taxes and duties in IC	No. of units trans-mitted
1	2	3	4	5	6	7	8	9	10	11
1.										
2.										
3.										
.										
.										
.										
N-										
Total										

NPV (financial): _____, NPV (economic):_____

Cost of transmission (Rs./kwh): Financial_____, Economic____

- Note: i) Interest during construction (IDC) will be excluded from cols.

2 & 3. Depreciation will be excluded from col. 5. Interest on Working

Capital will, however, be included in col. 5

ii) Recovery of salvage value is to be shown in N+1 year. Replacement cost of capital naturef any, not included in the annual O&M cost should be shown in the capital cost column against the appropriate years.

iii) IC: Indigenous Component FC: Foreign Component

SENSITIVITY ANALYSIS

(Separate statements for LS and RCE)

S. No.	Case	Cost of Transmission (Rs./kwh)		
		Financial	Economic	
			With Premium	Without Premium
1	2	3	4	5
1.	Base case			
2.	Capital cost + 20%			
3.	Capital cost + 30%			
4.	Capital cost + 50%			
5.	Time over run + 20%			
6.	Time over run + 30%			
7.	Time over run + 50%			

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