APPRAISAL OF IRRIGATION, FLOOD MANAGEMENT, MULTIPURPOSE PROJECTS INCLUDING ERM OF IRRIGATION PROJECTS, WATER BODIES

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A) APPRAISAL OF MAJOR MEDIUM IRRIGATION PROJECTS

1.0 INTRODUCTION:

One of the important activities assigned to Central Water Commission is techno-economic appraisal of irrigation, flood control and multipurpose projects proposed by the State Governments. This task is performed and coordinated by the Project Appraisal Organization (PAO) of Water Planning and Projects (WP&P) Wing. After establishment of techno-economic feasibility of the project, the Advisory Committee of Ministry of Water Resources (MOWR) on Irrigation, Flood Control and Multipurpose Projects headed by the Secretary, Water Resources (WR) considers projects for acceptance and thereafter recommends the same for investment clearance to the Planning Commission.

A similar function is discharged by the Project Preparation Organization (PPO) in respect of Major, Medium Irrigation and Water Resources Consolidation Projects, which are declared as National projects or posed for external assistance.

After appraisal, proposals are processed by PAO for consideration of advisory committee of MoWR, RD & GR.

2.0 NEED OF APPRAISAL:

There tends to be a natural sequence in the way projects are planned and carried out, and this sequence is often called the "project cycle." This cycle may be divided into following stages:

i. Identification of project,
ii. Survey & Investigation and Preparation of project report,
iii. Appraisal of project proposal and
iv. Implementation of the project proposal.

The project appraisal is an important stage in the complete life of the water resource project. This is probably the best-known stage of the cycle, which is the responsibility and primary concern of the lender. Its purpose is to establish the worthwhileness of a prepared project in the light of its resource commitments and expected benefits.

Appraisal of Major Irrigation Projects is essential because of the following reasons:

i. Inputs being large and sources are varied,
ii. There is probability that the project is prepared with-
    a. In-adequate information and investigation,
    b. Incorrect estimate and financial forecast,
    c. Little consideration to Environment & Forest aspect and R&R Plan; and
    d. Without caring for International / Interstate aspects.

The guidelines for Submission, Appraisal and Clearance of Irrigation and Multipurpose projects were last reviewed and revised in the year 2010 and the revised guidelines came into effect from 31st August, 2010. The guidelines provide for appraisal of projects by CWC in two stages. In the initial stage, based on examination of preliminary report, CWC conveys 'In Principle' consent for preparation of Detailed Project Report (DPR). In the second stage, the DPR thus prepared is examined in detail. In States where central design and planning organizations do not exist, the CWC also scrutinizes the designs. A time period of 18 weeks has been specified for according "In Principle" consent of CWC for preparation of DPR (para 2.3 of the Guidelines). The appraisal of DPR is to be completed within six months where designs are not to be scrutinized and for other DPRs it is be completed within 12 months provided compliance to the observations are received promptly (para 3.12 of the Guidelines).

The measures to expeditiously complete the appraisal by CWC and streamline the process were deliberated in 184th meeting of the Commission and it has been decided to clarify and elaborate certain provisions of the Guidelines as detailed hereunder:

(A) Preliminary Project Proposal (1st Stage Appraisal)

(i) 1st stage appraisal of Major Irrigation and Multipurpose projects is to be undertaken/ co-ordinated by the concerned Directorate under the Project Appraisal Organisation (PAO), Central Water

Commission (CWC), New Delhi, while the Medium projects are to be appraised by the respective regional offices of CWC. However, "In Principle" consent of CWC for preparation of DPR is to be issued only after clearance by the Screening Committee.

(ii) While maintaining the overall time period of 18 weeks for 1st Stage Appraisal as mentioned in the Guidelines, the break-up of time has been revised to the extent indicated in the subsequent paragraphs.

(iii) In respect of Medium Projects, after examination of the preliminary report, the concerned Regional Office will prepare a self-contained note latest by the end of 15 weeks and forward the same to PAO, CWC, New Delhi for consideration of the Screening Committee.

(iv) Whenever projects appraised by the Regional Office are to be considered by the Screening Committee, the Director (Appraisal) concerned of the Regional Office will attend the meeting of the Committee.

(v) On receipt of the report of Major Irrigation and Multi-purpose Projects, preliminary examination to be undertaken in the respective Appraisal Directorates to ascertain that the report is as per the guidelines to a large extent and contains data/studies required for according in-principle approval.

(vi) If the Appraisal Directorates do not find the project proposal in accordance with the guidelines, especially in terms of data requirements for hydrological studies, Irrigation Planning and inter-State issues, the proposal should be returned back by Appraisal Directorate within two weeks of its submission and need not be circulated.

(vii) If the proposal qualifies for circulation, the Appraisal Directorate will prepare a self-contained note on various aspects of the project and circulate the report to the specialised units along with self-contained note by the end of 2 weeks.

(viii) The preliminary report is mainly to be examined by Hydrological Studies Organisation (HSO) and Irrigation Management Organisation (IMO). As regards hydrological aspects, the major emphasis is on the water availability studies. It is suggested

that while according in-principle approval to such projects, the basic parameters be frozen and at the DPR stage, there should not be large-scale changes. This should be clearly indicated while according in-principle approval.

(ix) All comprehensive comments are to be issued by HSO in 2 weeks time from the date of circulation by Appraisal Directorate.

(x) The replies to HSO comments to be made available by project authorities in 2 weeks from the date of issue of such comments / observations. HSO will re-examine the replies in 2 weeks time and convey final views/concurrence.

(xi) IMO to examine Irrigation Planning aspects in 2 weeks from the date of issue of concurrence from HSO and convey comprehensive comments.

(xii) Project authorities to reply to the observations of IMO in 2 weeks. IMO to examine replies and convey final views/concurrence in one week.

(xiii) The examination of inter-state aspects of the proposal, also to be undertaken by IMO, to be completed in a period of 2 weeks from the receipt of proposal from PAO.

(xiv) PAO to consolidate the views/clearances in one week's time and prepare the note for the meeting of the Screening Committee for grant of approval in 1 week from the date of receipt of concurrence from IMO.

(xv) On according 'in-principle' consent to the project proposal, the approval will be issued within 5 days of the meeting of the Committee. The approval will also be uploaded on CWC website.

(B) Detailed Project Report (DPR) (2nd Stage Appraisal)

I. Medium Irrigation Projects (Regional Offices of CWC)

(i) The DPR of Medium projects are to be appraised by the respective regional offices of CWC.

(ii) The initial examination to ensure that the requisite details on survey & investigations, data for planning, designs of various

structures, cost estimates etc have been included in the report, will be completed in 1 month time and preliminary comments issued.

(iii) The project authorities to submit the clarifications / replies to the comments in 1 month time.

(iv) Detailed examination including cost estimates to be completed in 2 months time. During the process of detailed examination, the field organization may have consultations with specialised Directorates, wherever required, but the appraisal will have to be completed by the regional office only.

(v) Chief Engineer, Regional Office will submit the TAC note to Chief Engineer, PAO by the end of 5 months of submission of DPR to field office.

(vi) Chief Engineer, PAO will act as a link officer between Chief Engineer of respective regional office and Member (WP&P) before the TAC note is approved and circulated for consideration during the TAC meeting.

(vii) Project proposals without CDO certificates will involve appraising the design aspects of various structures proposed in the DPR. In addition to the above, the observations on the design aspects will be issued within 2 months of the receipt of the proposal. The project authorities will be required to submit the clarifications in 3 months time. The submitted clarifications will be examined in 1 month time including consultations, if required, with the project authorities. The other aspects of appraisal will be as per Para 1-5.

II. Major Irrigation and Multi-purpose Projects (CWC, New Delhi)

(i) The detailed examination of DPRs of Major Irrigation and Multipurpose projects is to be undertaken/ co-ordinated by the concerned Directorate under the Project Appraisal Organisation (PAO), Central Water Commission (CWC), New Delhi.

(ii) Concerned Directorate under PAO shall initially examine the project report to decide if the same is fit for circulation to specialized Directorates. It will also be examined whether the suggestions / modifications / observations communicated at the

time of issuing in-principle consent have been suitably incorporated in the report.

(iii) A self-contained note on various aspects of the project will be prepared by the concerned Directorate of PAO and the same shall be forwarded to all the specialized Directorates along with copies of the project report within 1 month time. The note shall also contain the contact details of the project coordinator from the respective state organization.

(iv) Six weeks after submission of the report in PAO, a presentation by the Project Authorities will be arranged by PAO which will be attended by the officers of all the specialised directorate concerned. Based on the deliberations, PAO may take a view on further examination of the report in the submitted form or suggest for re-submission after incorporation of requisite details.

(v) In case the report is be examined in the submitted form, the HSO will issue preliminary comments directly to the project authorities through e-mail and also by post with a copy to PAO within 2 weeks. The project authorities will submit the clarifications on Hydrological aspects to HSO within 3 weeks.

(vi) HSO will examine the clarifications and if required will have consultations with the project authorities and will finalize the Hydrological parameters within 3 weeks of receipt of replies. The copies / details of the finalized parameters will be sent to concerned design directorates and Irrigation Planning Directorate.

(vii) Irrigation Planning Directorate will examine the project proposal on receipt of Hydrological parameters and will issue preliminary comments, if any, to project authorities through e-mail and also by post with a copy to PAO within 3 weeks. If required consultations can be held with the project authorities by sending them the request through email / post. The examination of Inter-state aspects is to be carried out simultaneously within same timelines.

(viii) Project authorities are required to submit the clarifications / replies in 3 weeks time and will have consultations with concerned Directorate, if required. Examination by Irrigation

Planning Directorate is to be completed in 2 months time from the receipt of project parameters from HSO.

(ix) The Cost Appraisal directorate will examine the cost estimates and general observations as regards to detailing, procedure etc. to be issued within 1.5 month of receipt of proposal.

(x) On finalization of project parameters the cost estimate will be firmed up and if required, the consultations can be held with the project authorities. The estimate has to be finalized within 5 months of receipt of the project proposal and within 1 month of finalization of project parameters.

(xi) PAO will coordinate the TAC note for consideration of Advisory Committee in the 6^{th} month of receipt of the proposal. The highlights of the appraisal carried out by each specialised Directorate to invariably form part of the TAC note.

(xii) For project proposals without CDO certificate, having finalized the Hydrological and Irrigation parameters the specialized design directorates will examine the project proposal and will issue comprehensive observations by the end of 4 months from the receipt of project proposal. All observations are to be sent through email / post with a copy to PAO.

(xiii) The project authorities are required to submit the clarifications / replies within 2 months of issue of observations.

(xiv) The specialized design Directorate will finalize the project details within 1 month of receipt of replies and if required, consultations can be held with the project authorities.

(xv) While submitting the replies / clarifications to any specialized directorate it is the sole responsibility of the project authorities that such replies have to comprehensive covering all details as asked for and if required, they can seek clarifications from the specialized directorates immediately after receipt of the observations.

(xvi) Project proposals without CDO certificates are to be completed by 10-11 months of submission and the TAC note to be finalized immediately within 3 weeks of completion of appraisal for consideration of Advisory Committee.

(xvii) Any other statutory clearances required before the project proposal is considered by the Advisory Committee are to be made available before the finalization of TAC note.

(C) General

(i) Multipurpose Projects having CCA less than 10000 ha and power component less than 50 MW are to be treated as Medium projects and to be appraised by the respective regional offices of CWC.

(ii) At all stages PAO will keep the project authorities informed of the status of appraisal through e-mail as well as post. The email of the contact officer of the project under appraisal will be maintained by PAO and will be forwarded to all the units associated with the appraisal for reference and communication with respect to the subject matter of the specialized Directorate.

(iii) PAO will coordinate with the concerned Directorate and project authorities and will have meetings / consultations so that the time lines as prescribed for various specialized directorates are adhered to.

(iv) Web-based Project Appraisal Management System to be utilised fully for communication between Project Authorities and CWC. PAO to ensure that updated status of the appraisal is maintained on the system.

3.2.1 Details of Examination of Detailed Project Report (DPR) by CWC

Techno-economic appraisal of an irrigation project involves appraisal of various aspects like Hydrology, Design of dam/barrage, Canal and distribution system, Irrigation Planning, Cost, Inter-State clearance etc.

(a) Hydrology

An accurate assessment of hydrology at the project site is very important for planning and design of an irrigation project. Hydrological examination includes:

(i) Availability of water
(ii) Life of reservoir vis-à-vis rate of sedimentation
(iii) Ability of structure to withstand the flood

An overestimate of water availability may lead to higher investment which may be un-productive. Simultaneously, a lower estimate of water availability will result in under utilization of potential. Therefore, for scientific assessment of hydrology, there is need for historical data on rainfall in the project area, appropriate sedimentation rate, flow measurement, and other climatic variable such as temperature and snowfall. One of the basic problems with Hydrological assessment is non-availability of data on rainfall and sedimentation rate in the project area. Accordingly, it requires statistical approximation based on the data available in similar catchment areas. This is arena where majority of State Irrigation Departments face problems either due to inability to collect scientific data or because of their inability of performing statistical analysis of whatever fragmented data is available. CWC rechecks the validity of data submitted by project authorities and recalculates the availability of water and flood estimation.

(b) Design of Dam/Barrage, Canal and Distribution System

Under this appraisal, it is ensured that design of the dam/barrage, Canal and Distribution System and the layout are adequate utilizing state of the art technology and relevant standards.

(c) Inter-State Aspects:

The DPR is examined with respect to following aspects:

- States/countries traversed by the river
- Distribution of catchment in states/countries and yields from the catchment of state/country concerned.
- Inter-state agreement on sharing of waters, sharing of benefits and costs, acceptance of submergence in the upstream state(s), if any.
- Inter-state adjudication, if any

- Inter-state aspects of territory, property etc. coming under submergence, rehabilitation, and compensation etc
- Any other aspect of the project involving inter-state problems
- Inter-national aspects, if any

(d) Irrigation Planning

The DPR is examined to ensure the water requirement for different crops, based on proposed cropping pattern in the command of the irrigation project, is available as indicated by hydrology of the project. The total water requirement can be met either through ground water or through surface water. If the demand of water exceeds the availability of water, it is suggested to change the cropping pattern or in extreme case to reduce the command area of the project.

(e) Conjunctive Use of Surface and Groundwater

The DPR is examined in Central Ground Water Board for ground water aspects. Utilisation of surface and ground water should be planned in such a way that problem of water logging and soil salinity can be avoided in post project condition. It is also examined whether sufficient provision has been made for monitoring of ground water table in post project scenario.

(f) Construction Material

DPR is examined in Central Soil and Material Research Station (CSMRS) for the availability of construction material in terms of quantity, quality and location from the project site.

(g) Construction Machinery & Equipment Planning

Construction Machinery and Equipment Planning aspects of DPR are also examined in CWC. Water resources projects involve construction of different project components, which requires lot of equipments. List and Size of Special Tools & Plants are required to be prepared judiciously. Independent and dependent activities are required to be properly planned so that optimum utilization of machineries can be achieved and project can be completed on time.

(h) Cost Estimates

After the finalization of design and planning of the project, the total cost of the project is calculated for various civil works and is finalized based on the current prices. Concurrence of state finance department is required to be obtained by the project authorities.

(i) Environment Impact Assessment

Development of major irrigation projects may have adverse impact on environment and ecology i.e. deforestation, soil erosion, relocation and rehabilitation of people etc. The environment impact assessment plans are to be prepared by the project authority for clearance by Ministry of Environment and Forest. If forest land is affected by the project, clearance for diversion of forest land is required to be obtained from MoEF. Further, information of rehabilitation and resettlement (R&R) of people affected by the project has to be furnished in terms of village/families/persons affected, R&R plan etc. If the tribal population is affected, R&R plan has to be cleared by Ministry of Tribal Affairs.

3.3 Revised Project/Estimate

In case of major irrigation projects which have been approved by the Planning Commission and where the revised estimates of the project have increased by more than 15% of the original estimates, excluding escalation due to price-rise, or where there is change in scope (i.e. change in projects parameters resulting in change in nature and benefits such as CCA, installed capacity, energy generation etc.), revised project reports including estimates are furnished to CWC for examination as new major schemes. The revised estimate for major Irrigation Projects, where there is no change in scope, is critically examined in the State Standing Committee before submission to CWC.

The revised estimates for medium projects in which there is no change in scope, can be approved by the TAC of concerned State under intimation to CWC, MoWR and Planning Commission. In this regard, a State Government will have to first satisfy the CWC that there has no change in the scope of the project and obtain their clearance for this before approving revised cost. If required, CWC can carry out a site inspection of the project before issue of no objection.

In respect of revised project estimates for major Irrigation Projects where there is no change in the scope and where the costs excluding escalation due to price rise have not changed by more than 15%, the concerned State Government need not forward detailed estimates for examination at Centre. For such projects/estimates, the State Government can send project-wise statements of excess costs to CWC giving the abstract of costs under major sub-heads indicating the excess costs over the sanctioned costs and reasons thereof after obtaining concurrence of the State Finance Department. The covering note will include the salient features of the project contemplated in original proposal and that being executed at site. The CWC examines such estimates broadly and sends its views to the Advisory Committee for consideration and recommendation of the Planning Commission.

A) APPRAISAL OF MULTIPURPOSE AND HE PROJECTS IN CWC

2.0 INTRODUCTION:

Planning and appraisal of hydro-electric projects is a highly specialised task that requires detailed analysis of various integrated operational studies such as hydrological studies, power potential studies & determination of installed capacity, design & layout of various components, legal issues etc. and preparation of detail project reports (DPRs). Traditionally, the hydropower development and project operation has been in Governmental domain and mostly as a part of multipurpose water resources project. With the changed hydro policy, private developers have also been associated with HE Projects.

2.0 PREPARATION OF DETAILED PROJECT REPORT OF HE PROJECTS

Hydro-electric projects are capital intensive involving high technology and relatively long gestation period. Due to their complex nature, a large amount of preparatory work is done by the project proponents before detailed project report (DPR) is submitted to CEA for clearance. Preparatory work covers detailed field investigations, planning, assessment of benefits, design & engineering studies, detailed cost estimates based on analysis, cost of inputs & equipment,

identification and tie up of inputs, project need, justification, economic and environment studies, safety aspects etc.

The DPRs of Hydro Electric Projects are prepared as per the "Guidelines for Preparation of Detailed Project Reports of Irrigation and Multipurpose Projects" issued by Government of India, Ministry of Water Resources in 2010 and "Guidelines for Formulation of Detailed Project Reports for Hydro Electric Schemes, Their Acceptance & Examination for Concurrence" issued by CEA in April 2012. The summary of guidelines for formulation of power projects is given at Annex-I. Broad aspects to be considered and covered in DPR include investigations, data collection & analysis, selection of scheme of development, assessment of benefits, project need & justification, design & engineering, environment & safety aspects, tie-up of inputs, analysis of costs, cost estimates and financial analysis etc.

Steps of reparation of DPR can be summarised as under:

a) Site Identification
b) Survey & Investigation
c) Project Planning and Project Optimisation Studies for determination of optimum Project Parameters
d) Assessment of power & energy benefits
e) Economic Evaluation
f) Preparation of Detailed Project Report

3.0 SUBMISSION OF DPR FOR CONCURRENCE UNDER SECTION 8 OF ELECTRICITY ACT, 2003

Section 8 of Electricity Act, 2003 provides that "any generating company intending to set up a hydro generating station shall prepare and submit to Authority for its concurrence a scheme estimated to involve a capital expenditure exceeding such sum as may be fixed by Central Government from time to time by notification. At present the Central Government have fixed the following cost limits for submission of DPRs for hydroelectric projects for concurrence of the Authority:

a) **Rs 2500 crores**, provided that-
    a) The **scheme is included in National Electric Plan** (NEP) as notified by CEA **and confirms to the capacity and type** as mentioned in NEP

b) The **site** for setting up the generating station **has been allotted through the transparent process of bidding** in accordance with the guidelines issued by Central Govt.

b) **Rs 500 crores for any other scheme** not covered by in Para (a) and (b) above.

- All schemes utilizing water of inter-State rivers irrespective of capital cost shall be submitted to the Central Electricity Authority for its concurrence.
- For private sector Hydro Electric Projects, the clearance from the SEB/ State Government would be required in the area of water availability, Rehabilitation & Resettlement (R&R) of displaced persons, land availability and environment & forest clearance. The Report duly accepted by SEB/State Government is to be submitted to CEA.

4.0 APPRAISAL OF HYDROELECTRIC PROJECTS

Techno - economic examination of detailed project reports of hydro - electric projects is an interactive and complex process and involves various disciplines like hydrology, civil design, electrical & mechanical design, geology etc. DPRs are examined in specialized units of CEA, CWC, GSI and CSMRS with a view to finalize the features of the project based on the optimal plan development of water resources and also considering techno-economic feasibility and requirements of system.

Techno - economic appraisal requires thorough examination of all studies & designs and costing to ensure Safety & Soundness of various structures as well as economic viability of the project. For this, project developers are required to submit DPRs after carrying out detailed investigations and technically sound various studies & designs.

It is point out that generally 70% - 75% of total cost of a project is related to civil works and, hence, civil design aspects require thorough examination for establishing economic viability of the project.

4.1 APPRAISAL PROCEDURE

CEA acts as single agency as far as clearance of techno-economic aspects of the projects is concerned. CEA coordinates the examination of DPRs with CWC and GSI on aspects pertaining to water availability, design and cost estimates of civil engineering works, inter-state/ international aspects and geological aspects. Appraisal of DPR in CWC, CSMRS and MoWR is co-ordinated by Project Appraisal Organization of CWC.

The DPRs accepted for appraisal after a brief presentation of the project proposal. However, as a rule, the proposals at this stage are far from complete and developers generally request for acceptance of the DPR pending other works which they promise to complete during appraisal process. In the interest of the project, this is allowed by CWC and CEA. Thus the DPR gets significantly modified by the time appraisal process reaches mid-way and it is common for the developers to submit a revised DPR which eventually gets approved.

4.2 ASPECTS APPRAISED BY GSI

The geological aspects are appraised by Geological Survey of India. Geological investigations carried out by way of drilling & drifting are examined by GSI to ensure safe and sound placement of various civil structures. Examination of civil designs also depends upon the results of geological investigations. Hence, appraisal of geological investigations is one of the most important parts of technical examination process.

For acceptance of the DPR for detailed appraisal, the adequacy of the geological investigations is judged so that the location of main project components (dam/barrage. Power house) may be considered as almost final. From inadequate investigations, sometimes it is not possible to freeze the location of main components of the project. If DPR is accepted without proper investigation, future investigations may change the locations of main project components and thus the entire project planning/layout gets changed.

4.3 ASPECTS APPRAISED BY CWC

4.3.1 Hydrology:

CWC appraises the hydrological inputs and carry out hydrological studies as they play a vital role in the planning of hydroelectric projects and the design of various hydraulic structures. An over estimate of water availability may lead to larger investment and project may become costlier resulting in a higher installation. On the other hand, a lower estimate of water availability may result in wastage of some hydro potential and non-utilization of selected site optimally. Hydrological studies include assessment of quantities of available water at the project site and time variation, estimation of design flood, silt studies for estimation of life of the project etc.

Planning of HE Project is carried out based on 90 per cent dependability criteria. For determination of 90% dependable year, water availability in all the years for which hydrological data is available (say N year) is arranged in descending order and the (N+1) x 0.9^{th} year would represent the 90 per cent dependable year. The 90 per cent dependable year is thus, termed as the year in which the annual water availability has the probability of being equal to or exceed 90 per cent of the time on annual basis. For example, if inflow data is available for a period of 20 years (N=20), then, 90% Dependable year = (20+1)*0.9= 18.9 = 19^{th} year.

In addition to above, the impact of Glacial Lake Outburst Flood (GLOF) also needs to be assessed on a case to case basis and adequate safety measures needs to be provided.

4.3.2 Civil Design, Foundation Engineering & Dam Safety Aspects:

CWC has specialized formations to examine civil design, hydro-mechanical designs, foundation engineering aspects including dam safety aspects for various structures related with hydroelectric schemes. The related structures are dam/barrage, intake, desilting arrangement, water conductor system (tunnels & penstocks) & surge arrangement, power house & associated works, gates & valves etc. Appraisal of these structures include thorough examination of their location/placement at feasible site,

layout, soundness of designs as per established practice to ensure their safety as well as to optimize cost of the project.

These aspects are very important as a dam or an underground powerhouse, once built, cannot be modified in any significant way and improper design lead to complex rehabilitation measures involving costs comparable to the entire cost of the project. The time schedules proposed can also go haywire in the process.

4.3.3 Construction Machinery Aspect:

CWC carries out detailed planning and appraisal of the construction machinery and construction methodology, number of equipment required, use rate of equipment, unit rates of work etc. in order to have a realistic estimates of the cost of the project and the time required for construction.

4.3.4 Inter-State/ International Aspects:

CWC examines inter-State/ inter-national aspects related with a hydroelectric project in consultation with Ministry of Water Resources, if considered necessary and provides necessary suggestions to CEA.

4.3.5 Cost Estimates of Civil Works:

Before cost estimates of civil works are finalized by CWC, the project is evaluated from the angle of various aspects like hydrology, civil design, dams design, gates design, dam safety, foundation engineering, power plant engineering, barrage & canal design, construction machinery aspects etc. It is essential because the cost depends upon all the above mentioned aspects. A change in these may affect cost of the project.

Once all the aspects are finalized, the cost estimates included in DPR are verified. To verify the estimated cost of civil works, hourly use rates of equipment and analysis of rate of main works like excavation, concreting, RCC works, stripping, filling, grouting etc. are determined for each activity. Based on the construction designs finalized, the quantities of the items required are worked

out. Based on these, the estimated cost of civil works proposed in DPR is reviewed/ finalized.

4.4 ASPECTS APPRAISED BY CEA

4.4.1 Legal Aspects:

CEA examines and ensures whether the project authorities have complied with all the legal provisions as stipulated in Electricity Act 2003.

4.4.2 Justification of the Project:

CEA carry out studies and forecasts the 'Power Supply Position' with and without the proposed project and examines the need/ justification of the project from system demand point of view. Necessary inputs/ information regarding future system demand in both peak demand and energy requirement for these studies are provided by Electric Power Survey Report published by CEA

4.4.3 Hydro Power Planning Aspects:

CEA examines the general layout of the hydro scheme as proposed by the project authorities and suggest modification, if any. CEA also examines the power potential studies carried out by the project authorities for all the years for which hydrological data is available, proposed installed capacity & unit size etc. CEA also examines the basin development and how the project proposal fits into it.

4.4.4 Designs Aspects of E & M Works:

CEA examines design aspects pertaining to various electrical/ mechanical equipment of the power house and switchyard i.e. turbine or pump/turbine (for Pump Storage Schemes), generator or motor/generator (for Pump Storage Schemes), main step-up transformer with cooling water arrangement, switch-yard equipment (conventional or gas insulated switch gear), control and protection equipment, electrical and mechanical equipment for auxiliaries and power house and switchyard layouts, single line relaying and metering scheme and aspects relating to transportation etc. as mentioned in the DPR.

4.4.5 Cost of Electro- Mechanical Works:

For E & M Works, estimated cost is verified by CEA based on cost data of similar equipment available in CEA.

4.4.6 Evacuation of Power:

CEA examines the adequacy of power evacuation system proposed by the project authorities to evacuate the power generated by the project and suggests necessary modifications.

4.4.7 Construction Programme:

CEA examines activity-wise, item-wise and year-wise targets/ schedule of construction for each of the major components of the project, which are based on detailed Bar/PERT Chart. The completion cost of the scheme is worked out based on detailed construction programme.

4.4.8 Financial and Commercial Aspects:

Financial and commercial aspects of a hydro-electric projects are examined by CEA which includes examination of financial package, calculation of interest during construction based on different financial packages, year-wise tariff calculation for the entire life of the project, levellised tariff calculation etc.

4.5 ASPECTS APPRAISED BY CSMRS

Availability of construction materials and its soundness for use is examined by CSMRS. Rock aggregate, sand, clay etc. are some of the natural materials which are used for construction of the project. These materials having sound quality, proven by different tests shall be available in the vicinity of the project area. Moreover, sufficient quantities to meet the project requirement shall be available. Otherwise, transporting these materials from far areas would have significant implications on the cost of the project. In Himalayan terrain, availability of non-reactive aggregates (for dam concrete) or clay (for earthen core) is usually a constraint and insufficient investigations and assessments always leave the appraisal of the cost conditional.

5.0 TECHNO ECONOMIC CONCURRANCE (TEC) OF CEA

After CEA is satisfied about the technical and economic viability of the project and if necessary inputs/ clearances for the scheme are tied up, it accords TEC to the proposal as proposed or subject to some conditions as an interim step prior to its concurrence. The intimation regarding according of TEC for hydroelectric projects are given to the Project Authorities, Ministry of Power, Planning Commission and other

Government Departments for further action to obtain investment sanction/ approval.

CEA also examine the final financial package submitted by the project authorities and accord its approval.

6.0 ISSUES RELATED WITH TECHNO-ECONOMIC APPRAISAL OF HYDRO SCHEMES

i) Often it is found that the DPR submitted by the Project Authorities lack details required for proper examination and finalization of the project features. Some DPRs lack proper surveys and investigations studies, hydrological data/ studies, design details, proper power potential studies, proper evaluation of quantities of civil works, detailed cost estimates etc.

ii) During the course of examination when deficiencies involving data/ investigation etc. are found, back references are made to the project authorities for obtaining complete information and it normally takes some time for them to attend to such observations. In case the DPRs of hydroelectric projects are prepared as per the guidelines of CWC and various quarries/ clarifications raised by CEA/ CWC/ GSI are replied promptly by the Project Authorities, a scheme could be accorded TEC by CEA within a short period after the receipt of DPR.

iii) In order to cut short the time of clearance from CEA, the revised procedure for examination of project reports & its time frame for Hydro Projects have been finalised and procedure have been made interactive. CEA has drawn up a time bound procedure for processing of DPR so as to complete the examination of DPR in a period of 3 months or less as per the time schedules. This will be possible only when the project report is complete with all the details and all the requisite clearances are available at the time of submission/ registration of DPR in CEA. The project developers are required to strictly adhere to the time schedules for furnishing clarifications and attending to Standing Projects Appraisal Committee and TEC meetings in CEA.