JUSTIFICATION FOR LOCATING TURGA PUMPED STORAGE PROJECT IN FOREST LAND AND DETAILS OF ALTERNATIVES EXAMINED

A. JUSTIFICATION FOR LOCATING THE PROJECT IN FOREST LAND

A closed loop Pumped Storage Project, like this one, is required to be located in an area with suitable Topographical condition which have the potential for constructing two (2) dams in the near vicinity with a considerable difference of elevation. The area should have sufficient rainfall characteristics as these projects are made through **rainfall harvesting on a large scale**. Pumped Storage Project cannot be located in plain areas. Location of this project was identified by Central Electricity Authority (CEA), Govt. of India, long back.

The project area is so identified that the existing facilities like water reservoir, dam, etc. of the Irrigation and Waterways Directorate, Government of West Bengal, can well be utilized for generation of 1768.94 MU of clean and green peak power annually at a viable cost economics. The project would generate maximum 1000 MW of Hydropower.

B. DETAILS OF ALTERNATIVES EXAMINED

- **BACKGROUND**

Studies are being made on optimum arrangement and type for major structures of the hydropower station such as dams and waterway system from technical and economical viewpoints on the basis of the site conditions such as topography, geology, etc., and finalized and optimized general layout for basic design of major structures composed of the hydropower station as well as cost estimation.

- **SELECTION OF OPTIMISED GENERAL LAYOUT**

I. LOWER DAM

Location:

Based on the topography of the Turga nala d/s of the upper dam the only suitable site available for lower dam axis which has the storage requirement of nearly 15 MCM is the existing Turga irrigation dam site. The Turga nala at this location enters in to plains and has suitable shape for reservoir. On the upstream of this axis the topography of the nala

does not offer any storage possibilities. Hence all the previous studies also chose the same site for lower dam. Accordingly, the existing Turga irrigation dam site is recommended for proposed lower dam.

Type of Lower dam:

During the course of study following two dam potential type were considered:

a) Rockfill with central clay core
b) Concrete gravity

a) ROCKFILL DAM WITH CENTRAL CLAY CORE:

Since the adjacent Purulia Pumped Storage Project has both the dams i.e. upper and lower as rockfill with clay core which is functioning successfully the obvious choice was that of the rockfill dam. In all the previous reports prepared by WBSEDCL, EDF & WAPCOS, the rockfill type lower dam was considered primarily on cost consideration. However, during the site visits of Interdisciplinary team of experts from CWC/GSI/WBSEDCL & WAPCOS following likely constraints were envisaged in opting rock-fill with earthen core and came into consideration.

Alternate-1 Rockfill dam shifted d/s of the existing Turga dam

Additional Land Requirement

As Rock-fill dam requires larger base width hence more land on the d/s would be required. In view of close proximity of private land just d/s of the existing dam, demarcation of the boundary of private land to know the possibility of encroachment of private land by the proposed higher dam was carried out. Approximately about 7 Acres of private land with 5(five) no of dwelling units (hutments of Schedule Tribe community) may fall within the dam body and will be needed to be acquired if rock-fill dam option is selected.

Shortage of Clay material in close vicinity

Based on the present level of investigation the total estimated quantity of clay available is about 10-12 Lac m^3. The tentative estimated quantity of clay required, if Upper, Lower and Lower saddle dam are considered Rockfill with clay core would be more than 15 Lac m^3. This will result in shortage of clay quantity of about 4-5 Lacm3. This may entail requirement of additional clay queries and subsequent problem of private land acquisition.

Alternate-2. If Rockfill dam axis at the same location of existing Turga dam

Possible loss of storage on U/S

The significant loss in storage will occur as huge quantities are required in case of rockfill dam and half of this quantity falls under the reservoir on U/S side. Accordingly, the revised area-capacity curve were developed for lower dam considering the reduction of dam volume and about 2.35 MCM loss corresponding to EL 315m is envisaged. In case if we desire to compensate this reduction than an additional 3m raising will be required for lower dam to compensate the loss of capacity from dam volume.

Hence it was decided that in view of above constraints the option of concrete type lower dam excluding the right saddle dam (which remains rockfill) may be studied .

b) CONCRETE GRAVITY DAM:

Since the selection of Concrete dam depends on various factors such as the depth of foundation rock .The availability of foundation rock at a shorter depth is of great importance in founding the concrete dam.

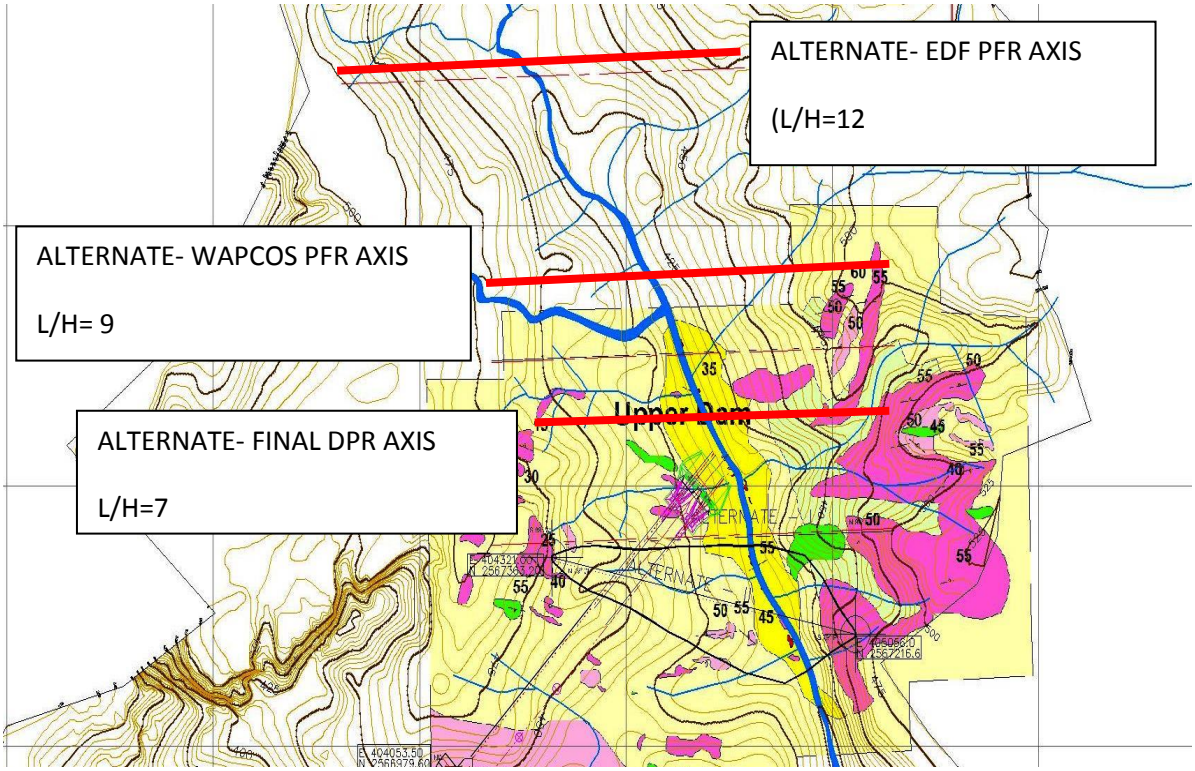
Based on the subsurface investigation it is evident that suitable foundation grade rock is available at shallow depth in the range of 5-10m only except few blocks near the spillway location where it is in the range of 15m. Hence, the competent foundation rock is available at shallow depth. In addition, the required base width of the concrete dam is less hence there is no possibility of any encroachment of private land d/s.

CONCLUSION FOR SELECTION OF LOWER DAM

As discussed above the various considerations are in general, favorable to Concrete Dam in comparison to Rockfill Dam. From geological point of view both the dam type are on similar ground. However, from construction material availability consideration concrete dam is better placed. From land requirement consideration concrete dam has an edge over Rockfill Dam in this case. Though, from cost consideration Rockfill Dam is a better option. On the basis of above studies concrete dam option has been finally preferred to a Rockfill Dam with clay core alternative.

II. UPPER DAM

Following three alternative dam axis were considered.



The EDF PFR axis was not considered as the length/head ratio is 12 which is prohibitive for any pumped storage project. The WAPCOS PFR axis was slightly better as it has L/H ratio of 9. However this is still considered on higher side. The dam axis in WAPCOS PFR was shifted about 500m d/s during the first visit of the Interdisciplinary team of experts of CEA, CWC and GSI in December2012. Subsequently, GSI carried out the mapping and prepared the report on this section. However, subsequent to further examination and site visit of GSI it was suggested that dam axis at right bank may be kept same but the left bank location may be further shifted by another 50-60m d/s to avoid deep nalas on left bank. Another location at about 200m d/s on left bank was also discussed.

On examination it was felt that the right bank location on all the three alternatives is same and is suitable. The left bank at the first location at which the GSI report has been prepared may not be suitable as a Nala is present there. About 50-60m d/s location appears to be better comparative alternative. The third location about 200m d/s from first is also not suitable as two nalas are present there. Moreover going down would further enhance the dead storage which is undesirable.

After much deliberation it was decided that the upper dam axis may be shifted about 50-60m d/s on left bank from the location as shown in earlier GSI report.