Extracts from DPR evidencing the additionality argument of Hydrological barrier

6.02 Barrage

6.02.1 The Barrage is located across the Nethravathy River. The gated barrage crest level of the overflow section is fixed at EL 12.75m. The FRL is 17.80m. The design flood is 11500 cumecs computed on the basis of observed maximum floods by Gumel's Analysis. The detailed flood computation is included in the Appendix – 'Hydrology'. Since the reservoir area created by the construction of the Barrage is very small, and the depth of pondage being only about 7.00m separate wave height computations are not done. Further, the flood storage above FRL is marginal and as such no flood routing studies are done. The top of bridge slab, non-overflow blocks etc. are fixed on the above flood considerations. The total length of the barrage including the overflow section, the Intake and the non-over flow section is 629.309 m. The deepest river bed level at the barrage site is about EL 10.5 m and the deepest foundation level would be about EL 9.50m. Maximum height of the barrage upto crest level from the deepest foundation level is 3.25m. To pass the design discharge over the barrage, 34 nos. of radial crest gates of size 12.00m x 5.05 m have been proposed. Provision for four set up stop log gates (12.00m x 6.80m) has also been made to facilitate repairs and maintenance of radial gates. Trunion level for the radial gates has been fixed at EL 16.70 based on maximum tail water conditions. Top level of Power Block cum – intake structure is proposed at 19.70m on left bank to provide across to gate Hoist Bridge. The plan, L-section and the cross-sections of the Barrage are given vide **Drawing Nos. DG/PERLA/DPR/05 to 07.**

intake opening is at EL (-) 3.022 m. Elliptical shaped bell – mouth entry transition has been provided which will be rectangular in section.

The shape of the horizontal transition is

$$\frac{X^2}{4545^2} + \frac{Y^2}{1452.5^2} = 1$$

The vertical transition will be on top, at 60° to horizontal and conforming to a radius of 5.00m. A further transition from square to circular shape is proposed on the downstream of intake to match with the inlet of the Turbine. The size of the service gate provided is 4.545 m x 4.545 m. One set of stop log gate with 3 elements is proposed to serve for all the 5 vents. The height of the intake structure is 22.722 m. The intake structure plan, L-section and Cross-Section are shown in drawing No.DG/PERLA/DPR/05, 06 and 09.

6.04 Power House

6.04.1 It is proposed to house 5 generating units of 4.80 MW capacity each, in the surface power house with the provision of a service bay. The overall dimension of the power house excluding service bay and control room is 47.93m x 24.80 m outer to outer. The power house is located downstream of the Intake just abutting the same on the left bank. The Power House is proposed to be covered by galvalume sheet roofing supported on steel trusses. Plan and cross-section of the powerhouse are shown in **drawing No.DG/PERLA/DPR/08 & 09.**

6.04.2 The Machine hall / Generator Floor level is tentatively fixed at EL (-) 2.25 m. The draft tube floor level is kept at EL (-) 9.29 m. The service bay level is fixed at EL 18.00 m about 1.30 m above the HFL of the river near the power house, with an approach road from left bank. Provision has been made in the power house to accommodate control room cum – switchgear room, battery room, office etc. The DG room and toilet are proposed outside. A drainage sump (5.00m x 1.858 m) is proposed on right side of draft tube with bottom level at EL. (-) 11.00m.

6.04.3 Two sets of Stop log gates of size 6.83 m (W) x 4.27 m (H) in two elements are proposed to serve all the 5 vents of the Draft tube. The stop log will be operated with the help of a gantry crane.

6.04.4 The length of the tailrace pool is 64.26m and the width is varying from 41.83 m to 60.00 m. The bed level will be varying from the draft tube floor elevation of (-) 9.29 m to tail channel bed level of 6.775 m. The bed and sides will be lined with RCC M-20, A-20 and 200mm thick.

6.05 Tail channel

6.05.1 The width of tail channel provided to accommodate the maximum discharge of about 392 cumecs is 60.00m. The maximum tail water level would be EL 9.60m near the Power House for the maximum discharge through the units. However, the HFL near the Power House would be 16.70m for the designed flood for the barrage. The bed level of the tail channel after the tailrace pool is at EL 6.775 m and would be sloping down at about 1 in 2500. The tail channel is proposed to be lined with RCC M-15, A-40 for a length of about 100

m. The side slopes are 1 in 8 in rock and 1 in 1 soft strata. The section provided is adequate to cater even for discharge of about 320 cumecs. The minimum tail water level for 25% of one unit design discharge worked out is EL 7.40 m. The length of tail channel beyond the power house including the tail pool and in the river bed is about 2077m. The tail channel is located almost in the left side of the river reach from economical considerations. A small masonry wall of about 0.50m height is proposed along the edges of the tail channel to serve as a silt arrestor wall. A silt trap is proposed at the beginning of tail channel to arrest the flow of silt into the tailrace pool due to return currents. Downstream of Tail Channel confluence, the river section is proposed to be re-graded by knocking off the protruding boulders for a length of about 220m to facilitate discharging the flows without resulting in increased tail water levels. The plan and cross – section of Tail Channel is shown in **drawing nos. DG/PERLA/DPR/10 & 11.**

6.06 Outdoor Yard

6.06.1 The dimension of the ODY will be about 64m x 67m for accommodating four transformer bays, four unit bays and two line bays for power evacuation. It is proposed to locate the ODY near the powerhouse.

6.07 Access roads to Various Components

6.07.1 The existing village road from Pane – Mangalore – BC Road will be upgraded to all weather asphalt road. The distance from Pane – Mangalore to the barrage site is about 8.00 km. A typical cross-section of the road is show in **drawing no. DG/PERLA/DPR/12.**

CHAPTER – 5

Power Studies

5.00 Power Studies

5.01 Available Flows for Power Generation

5.01.01 Based on the available stream gauging data of the Nethravathi river the average inflows at the Barrage site for a period of 20 years i.e. 1975 and from 1980 to 1998 and the corresponding flow duration period and as well as for an average year, flows have been determined. The details are shown and explained in the Hydrology Report separately enclosed as **Volume – II.** The flow duration table and flow duration curve are shown at **Annexure 3 & 4** respectively.

5.01.02 It can be seen from the flow duration relationship that the average flow varies from 0.00 cumecs to over 3800 cumecs excluding flash floods of very high magnitude, which occur for a very short duration. It is observed that a flow of 392 cumecs is available for a duration of about 26.3% of the year (about 96 days), which occurs during the monsoon period and is considered to be the optimum flow for power generation from the point of economical operation. A flow of 451 cumecs is available for about 24 % of time (89days). The flow in excess of about 451 cumecs is in the form of occasional flash floods scattered over the period from June to September. It is not economically feasible to harness these higher inflows for power

generation unless a dam with adequate storage capacity and of sufficient height is built, which is not feasible in these areas due to increase in submergence of agricultural lands and houses and also that it may not be acceptable from environmental considerations. The average annual yield is projected at about 11476.00 Mcum. It is considered feasible to utilise a design discharge of around 78.47 cumecs per unit. On an average utilisation is about 39.80%.

5.02 Head Available for Power

5.02.01 The FRL of Barrage is fixed at EL+ 17.80m. The tail water level in the tailrace channel downstream of the powerhouse while passing the design discharge through the units will be about EL+ 9.80 m. The turbine centre line is fixed at (-) 0.75 m. The gross head available for power generation would be 8.00m. The loss of head through trash rack, intake, conduit gates, draft tube etc, would be about 0.692m. Thus, the net head for Power Generation works out to about 7.31 m.

5.03 Power Potential and Installed Capacity

5.03.01 Various alternatives of installation at the proposed power station, to arrive at the optimum installation viz., the size and number of units to be installed, have been studied. The results of the study indicating the details of energy generation, plant load factor achieved for different combination of installed capacities, are shown in **Annexure. 8.**