Justification for Location of the Project in Forest Area

1. Standalone Pumped Storage Component of Saundatti I.R.E.P

Pumped Storage Project (PSP) is a type of hydroelectric energy storage. Pumped Storage Project (PSP) plays an important role for load balancing of electricity grids. It is a configuration of two water reservoirs at different elevations that can generate power (discharge) as water moves down through a turbine; this draws power as it pumps water (recharge) to the upper reservoir. PSH capabilities can be characterized as open loop-where there is an ongoing hydrologic connection to a natural body of water-or closed loop, where the reservoirs are not connected to an outside body of water.

Pumped-storage hydroelectricity allows energy from intermittent sources (such as solar, wind) and other renewables, or excess electricity from continuous base-load sources (such as coal or nuclear) to be saved for periods of higher demand. The reservoirs used with pumped storage are quite small when compared to conventional hydroelectric dams of similar power capacity, and generating periods are often less to meet the peak power requirement/power on demand. Pumped storage is the largest-capacity form of grid energy storage available in the country.

Considering the PSP scheme, the main requirement of PSP is the specialist nature of the site required, needing both geographical height and water availability. Suitable sites are therefore likely to be in hilly or mountainous regions which are invariably with forest cover and water source in proximity.

The optimized lay out of project has minimal impact on the environment and requires unavoidable minimum Forestland. As the Dam/Embankment can be planned only on the hill top which is forestland these necessarily require the diversion of forest land. However, only the unavoidable minimum forestland and site-specific Project components have been envisaged. Locations of all the components have been fixed after proper survey and investigations and after proper examination of available alternatives.

Accordingly, Saundatti PSP envisages construction of Upper reservoir (proposed) to be located on the flat / gradually sloping forest land on small hillock portion along with Intake Structure, Penstock / Pressure Shaft, Power House, Tail Race Outlet and Tail Race Channel and the Renuka Sagar reservoir (Existing) is under operation with a live storage capacity of 29.34 TMC and shall be utilized as Saundatti PSP Lower reservoir. The various alternatives considered for optimal Project layout is highlighted below:

2. Alternatives considered for locating the Project in Forest Area

The Standalone Pumped storage component of Saundatti IREP envisages construction of Upper reservoir (proposed) located in Saundatti Taluk of Belagavi District. The Renuka Sagar reservoir (Existing) is under operation with a live storage capacity of 29.34 TMC and utilized as Saundatti PSP Lower reservoir and is proposed for the live storage capacity of 1.00 TMC. Two alternative layouts for this scheme were studied.

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Alternative -1: Upper reservoir is located on adjacent hillock having gradually sloping surface and this scheme comprises of Intake Structure, Penstock / Pressure Shaft, Power House, Tail Race Outlet and Tail Race Channel

Alternative-2: Upper reservoir is located on the natural depression and this scheme comprises of Intake Structure, Head Race Tunnel, Surge Shaft, Penstock / Pressure Shaft, Power House, Tail Race Outlet and Tail Race Channel

Alternative-1

In Alternative -1, the Upper reservoir is proposed to be located on the flat / gradually sloping land wherein on one side a small hillock portion exists which has to be excavated up to the desired level. Considering this location, the area capacity calculation has been carried out and found that the location is suitable for creating the gross storage capacity of 1.03 TMC in which live storage capacity is 1 TMC and dead storage capacity is 0.03 TMC by keeping FRL and MDDL at EL 855.00m & EL 825.00m respectively. For creating this storage, it is proposed to construct rockfill embankment with maximum height of 38 for the length of 5177m. This layout of the scheme comprises the following components:

- Intake Structure
- Penstock / Pressure Shaft
- Power House
- Tail Race Outlet
- Tail Race Channel

With respect to the existing Renuka Sagar Lower reservoir FRL of EL 693.83m & MDDL of EL 623.93m, the rated head is arrived to 205.12m after considering the hydraulic losses. Accordingly, the installed capacity was arrived to 1260 MW with the storage capacity of 13734 MWH for 10.9 hours.

Alternative - 2

In Alternative -2, the Upper reservoir is proposed to be located on the natural depression. Considering this location, the area capacity calculation has been carried out and found that the location is suitable for creating the storage. The gross storage capacity is worked out to be 1.64 TMC in which the dead storage capacity is 0.494 TMC and the live storage capacity requirement is 1.146 TMC by keeping FRL and MDDL at EL 793.00m & EL 751.00m respectively. For creating this storage, it is proposed to construct rockfill embankment with the maximum height of 96m and for the length of 480m. This layout of the scheme comprises the following components:

- Intake Structure
- Head Race Tunnel
- Surge Shaft
- Penstock / Pressure Shaft
- Power House
- Tail Race Outlet

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- Tail Race Channel

With respect to the existing Renuka Sagar Lower reservoir FRL of EL 693.83m & MDDL of EL 623.93 m, the rated head is arrived to 146.02m after considering the hydraulic losses. Accordingly, the installed capacity was arrived to 1260 MW with the storage capacity of 11340 MWH for 8.0 hours.

Considering the above two alternatives, Alternative -1 has been selected based on the following reasons:

- The Gross Storage capacity has been optimized from 1.75 TMC to 1.03 TMC.
- Dead Storage reduces from 0.494 TMC to 0.03 TMC
- Storage Capacity Increased from 11340 MWH to 13734 MWH
- Except shifting of Upper Reservoir, all other project component locations remain same.
- Apart from increase in MWH, civil structures like HRT and Surge Shaft had been eliminated reducing the overall length of water conductor system.
- The total land requirement has been reduced from 228.97 ha to 213.70 Ha
- Forest land has been reduced from 169.97 ha to 160.40 ha.
- less vegetation in the Upper reservoir area compared to Alternative – 2 Upper reservoir location
- All the Project Affected Villages and the Project Affected Persons remains the same.

Accordingly, the layout for **Alternative -1** has been optimized and the proposed Scheme involves construction of Rockfill embankment of height 38 m for creation of Saundatti PSP Upper reservoir of 1.03 TMC gross capacity. Intake structure and trash rack for five numbers of independent penstocks in which one penstock will be bifurcated into two penstock as hydraulic short circuit to connect two units will be taking off from Saundatti PSP Upper reservoir. Surface Power House will be located at about 776m from the intake structure and shall be equipped with four vertical-axis reversible Francis type units composed each of a generator/motor and a pump/turbine having generating/pumping capacity of 252MW/303MW and two units of 126MW/170MW respectively.

MAP DEPICTING ALTERNATIVES EXAMINED FOR PROPOSED P.S.P