LARGE HYDROELECTRIC POWER STATIONS

As per the Central Electricity Authority (CEA), India has nearly 1, 50, 000 MW of economically exploitable large hydro potential. This is available mainly in the Brahmaputra, Indus and Ganga river basins, at a load factor of 60% or lower. Of this, around 39, 416 MW[1] is currently installed. Large hydro projects, however, are accompanied by significant ecological impacts and displacement of local population and livelihoods, which limits its viability to account for a major share of the electricity generation mix in the long run. This is taken into account in developing the pessimistic pathways. In addition to large hydro, pumped hydro storage schemes, utilize off-peak electricity from intermittent sources to pump water from a river or lower reservoir, to a higher reservoir to allow its usage during peak times. This provides flexibility in dispatch, and can be of value in balancing the intermittency that would be introduced into the electricity generation mix by increased penetration of other RE sources such as wind and solar. Nearly 94, 000 MW is estimated to be available from pumped hydro schemes, across 56 sites. At present, 9 schemes with an aggregate installed capacity of 41 GW exist in India, out of which 2600 MW is operated in pumping mode. Additionally, 1080 MW is under construction[2]. For the purpose of presenting the trajectories, the capacity added through pumped hydro schemes have not been accounted for, as their usage is dependent on a systems-level analysis of the extent of RE penetration in the grid.

Level 1

In this pessimistic trajectory, it is assumed that the current plants continue to operate with scheduled maintenance efforts through the period of analysis. Due to unresolved constraints on issues of large-scale ecological damage, resettlement and rehabilitation, only plants which have been commissioned and expected to yield likely benefits during the 12th plan are accounted for in capacity addition till 2017. No new construction is assumed after this, and installed capacity increases to 49 GW in 2047. No new pumped hydro schemes are completed.

Level 2

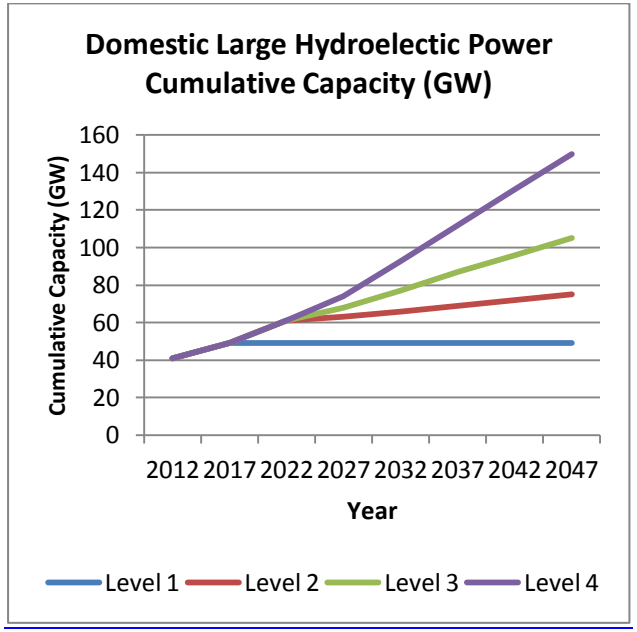
With the aim to accelerate hydro power development in India, the Ministry of Power (MoP) introduced the National Policy on Hydropower Development in 1998. Through various measures, the Government of India (GoI) aims to realize 100% hydropower potential of the country by 2025 – 26. To this effect, CEA has undertaken feasibility and ranking studies in order to determine the feasible completion of hydro projects that are under development, in the 12th and 13th plans. Large hydro: As per estimates provided by CEA and the Working Group on Power for 12th FYP[3], it is assumed that up to 9, 204 MW of large hydro schemes would yield benefits in the 12th plan, and 12, 000 MW in the 13th plan (2047 Installed capacity: 75 GW). Pumped hydro schemes which are under construction are completed.

Level 3

In addition to achievement of govt. plans, Level 3 includes the benefits from completion of R&M and Life Extension (LE) efforts. This results in additional capacity of 4, 064 MW across 12th FYP, assumed to continue over the 13th Plan. Beyond the 13th Plan, past trends in capacity additions are expected to continue till 2047 (2047 Installed capacity: 105 GW). In addition to the previous levels, Pumped Hydro Schemes under survey and investigation are completed.

Level 4

In this optimistic scenario, technology advancements are assumed to result in exploitation of full potential of large hydro. Advances in technology development, and R&D efforts in de-silting, integration of regional grids, forecasting etc. are assumed to take place. Benefits from advances in R&M and LE are assumed to increase to 20, 000 MW per FYP for the period of analysis, to reach up to 150 GW (100% of potential) by 2047. As indicated by various studies, preferable capacity of pumped storage installation for a thermal dominant power system is assumed to be 5% of the total installed capacity (2047 Installed capacity dependent on total installed capacity from other sources).



Note: Please see detailed documentation for references.