

Electrical Energy Storage

The main driving force for grid connected storage systems in the Indian power sector, is the increasing share of renewable energy which require storage to handle the supply variability. India will keep on facing power shortage as demand is increasing at much faster rate compared to supply. A hybrid solution of storage and renewable can help India in solving the problem. The dependence on storage is much because there is hardly any capacity market in India either. The large RE targets for India will depend a lot on storage capacity. This lever examines scenarios of exploitation of the available pumped storage capacity and battery solutions. Coupled with the Lawrence Berkeley Lab analysis (separate), the user can infer as to the feasible levels of RE, under different demand/supply conditions.

LEVEL 1

Renewable share (capacity) in total energy mix in India is 13.1% (36GW) of total installed capacity as on March, 2015 and this is expected to increase to 63 GW by 2022 and 140 GW by 2047. With limited investments in research and development of low cost and efficient battery technologies, the cost of batteries remain high resulting in less commercialization, poor adoption of battery storage. Pumped storage hydro power continues to dominate the energy storage in India. Total grid connected storage in India will be 5GW by 2022 growing to 8GW by 2032 and 10GW by 2042 and 15GW by 2047.

LEVEL 2

Renewable share in total energy mix in India is expected to increase to 96 GW by 2022 and 491 GW by 2047. V2G (Vehicle to Grid) technologies will be maturing to offer storage solutions as large fleet of connected EV's (Electrical Vehicle's) will operate in VPP (Virtual Power Plant) mode. More share of pump storage will be developed. Various storage technologies on pilot basis will be employed in test beds at various parts of India. Hybrid solution of solar and batteries will be employed. Though the development of storage market will be in rising trend but it will be at slower pace. Total grid connected storage in India will be 20GW by 2022, growing to 35GW by 2032, 55GW by 2042 and 75GW by 2047.

LEVEL 3

Renewable share in total energy mix in India is expected to increase to 116 GW by 2022 and 823 GW by 2047. In addition to new technologies envisaged for level 2, partnership between India and other countries for smart grids and energy storage technologies will emerge and brings out some new and low cost batteries with higher performance parameters. Wind farms uses CAES (compressed air energy storage) for storage of energy during off peak hours, solar panel uses molten salt batteries. Opportunities for new project development and manufacturing emerges in India. Telecom sector will also take a lead in replacing their diesel generators with hybrid solution of solar and batteries. Total grid connected storage in India will be 25GW by 2022, 40GW by 2032, 80GW by 2042 and 100GW by 2047.

LEVEL 4

Renewable share in total energy mix in India is expected to increase to 206 GW by 2022 and 1530 GW by 2047. India will attain its potential of 20 GW by 2020. As per India Smart Grid roadmap, micro grids will be implemented in 10,000 villages and 100 smart cities till 2027, batteries will play a major role in these deployment. Wind mills will be integrated with hydro pump storage systems to operate them. India will follow IEA breakthrough scenario and total grid connected storage in India will be 40GW by 2022, growing to 60GW by 2032, 100GW by 2042 and 130GW by 2047.

