Hydropower sector in India – The way ahead

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Hydropower plants often help regulate river flows and operate by storing volumes of floodwater and controlling the timing of discharge. Apart from producing electricity, hydropower plants provide social and environmental benefits such as water for drinking and irrigation purposes, water for fish breeding and recreational purposes. Hydropower plants play a vital role in the overall energy mix as they help maintain grid frequency within the stipulated range, they provide spinning reserves – additional power supply that can be made available to the transmission system within a few seconds in case of blackout, they are capable of black-start – capability to run at zero load and take just a few minutes to start and ramp up as compared to hours taken by thermal power plants.
of 303.08 GW is dominated by thermal power with around 70% of share. Hydro with an installed capacity of 42.78 GW has a share of around 14% reducing from around 46% share in 1966. The growth in the hydropower asset based in India has not kept pace with the growth of thermal power asset base. This has resulted in a skewed generation mix and increased the risks to the Indian economy, associated with higher exposure to thermal power such as variation in the availability of thermal fuels (coal, gas, naphtha etc) as well as price variation of the thermal fuel. India despite being endowed with huge hydropower potential of 148 GW has not been able to harness the potential to the maximum extent possible.

**Comparison with developed and developing economies**

A comparison with some of the world’s developed and developing nations shows that India lags far behind in terms of developing hydropower assets and balancing the generation capacity mix.

The skewed development of hydropower in India vis-à-vis the other sources as well as the untapped potential of hydropower in India implies a serious need to accelerate the pace of development of hydropower assets in India. This requires policy and regulatory interventions to incentivise setting up new hydropower assets, as well as reduce/eliminate the several challenges faced by hydropower developers in India. The Union Government is set to announce a comprehensive policy to promote hydropower generation. In this context we analyse the issues and challenges faced as well as success enablers for hydropower projects in India.

**Issues and challenges**

1. Problems arising in land availability and land acquisition for hydropower projects in India are causing suspension and delays in construction activities. The Land Acquisition Act, which came into effect from January 2014 attempts to address some of the social inequities during land acquisition phase yet some issues persist which can delay the process of land acquisition or lead of exploitation of provisions to acquire land.

2. Development and planning of hydropower projects in India is generally project oriented and not based on any basin development plan. A large number of hydropower projects with common river systems between adjoining states are held up due to lack of interstate agreements and disputes on sharing of water.

3. Hydropower projects the world-over are site specific and may adversely impact the environment in many ways such as affecting the natural river system and changing the river course, thereby impacting the biodiversity, flora and fauna.

Large storage-based hydropower projects lead to submergence of large tracts of land encompassing
villages, forests and biodiversity areas. They result in relocation of people and disturbance in downstream irrigation activity. These factors have resulted in a negative public perception of hydropower projects, resulting in sustained opposition to hydropower projects leading to time and cost overrun of projects.

4. Hydropower projects are capital intensive in nature and require high upfront costs to address greater complexities in design, engineering, social and environmental impact mitigation. These complexities and technical challenges often lead to time and cost overruns thus increasing the uncertainty of cash inflows, resulting in high risk premiums on financing charges.

5. The features of hydropower projects are site specific and depend on geology, topography and hydrology of the site. The construction time for hydropower projects is greatly influenced by the unpredictable nature of geological and climatic conditions, geological surprises which impact accessibility and favourable working conditions at the site.

6. The current structure of the Indian power market does not allow the differential pricing of peak and off-peak power. The volume of the short term market, which allows different instruments for peak and off-peak supply, is very low. Although the amendment to the Tariff Policy has allowed differential pricing, the implementation impact is yet to be tested.

**Success enablers for hydropower projects in India**

1. The government both at the state and central level shall work together to approach sustainable development of hydropower in an efficient and coordinated manner. The governments shall sensitise the population getting impacted due to hydropower projects and aid developers in smooth acquisition of land.
2. A holistic plan for hydropower project development needs to be prepared instead of a project-oriented specific plan. The plan shall lay out the integrated river basin development with all the adjoining states involved in its preparation and finalisation.
3. A structured mechanism needs to be developed for balancing benefits from hydropower projects and transferring economic rents from projects to the government, which should ultimately be passed on to the affected stakeholders.
4. Considering the importance of hydropower in the country's energy mix and its capital intensive nature, hydropower projects need specialised and dedicated funds to secure their long term financing. The central government may create a special dedicated fund for hydropower projects or use the clean energy fund to provide loans to hydropower projects at lower rates of interest. Other fiscal incentives such as viability gap funding (VGF), tax holidays, Value Added Tax (VAT) exemptions, exemption of customs duty on equipment etc, may help in making hydropower projects bankable in India.

5. The regulator both at the centre and state level need to come up with differentiated peak and off-peak tariffs to incentivise hydropower projects, given its potential to meet peak demand. Hydropower plants are generally better placed to provide ancillary services to the grid and offer better system reliability. The implementation of the ancillary service market must be guided by an efficient commercial mechanism based on an enabling regulatory framework to encourage the generation of plants for maintaining grid reliability. It will also help hydropower plants to monetise their capabilities to provide reactive power compensation, voltage stabilisation, etc, given a hydropower plant's ability to ramp-up and ramp-down in a very short time.

6. Other measures to promote the development of hydropower sector in India include, compulsory hydropower purchasing obligation for distribution companies, recognition of hydropower as a renewable energy source, certainty on power purchase by the discoms (assured PPA) and standardised Power Purchase Agreements for hydropower projects.

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