

# VARIABLE RENEWABLE ENERGY INTEGRATION

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# CHALLENGES OF INTEGRATING LARGE SCALE RE

## Major Concern

### Intermittency Issue

- **Non-Controllable Variability**
- Predictability Error

### Technical Challenges

- **Ramping/Balancing Issues to minimize the RE curtailment**
- **Power Quality Concern**
- **Reactive Power Support**

### Commercial Challenges

- Existing Deviation Charges Mechanism
- Low utilization factor for Green Energy Corridor

## ROLE OF HYDROPOWER

- At present the peak demand is of the order of 162 GW, out of which 32 GW is met through Hydro in the high flow season. During low flow season, storage / pondage hydro power stations contributes about 20 GW.
- NHPC has 13 nos. Pondage / Storage Power stations, connected to the Grid, with Capacity of 3528 MW. All these power plants provides full capacity as peak support to the Grid.
- The current balancing requirement is being largely met through the existing Hydro storage/ pondage power plants. Going forward with large scale RE integration (175 GW) by 2021-22, it is envisaged that balancing power requirement shall be around 60 GW. Further, there would be fast ramping up requirements of order of 210 MW/min and 290MW/min during evening hours from 4 PM-6 PM and 6PM-8PM respectively to supplement solar power and peak requirement.
- Therefore, to meet the balancing power requirement in 2021-22, hydro power plants including pump storage schemes shall be required.
- The development of pump storage, particularly in areas with concentrated wind and solar generation, would significantly improve grid reliability and ensure smoother integration of renewable energy source with least curtailment.

# **HYDRO POWER PLANT HAS MANY ADVANTAGES AND IS BEST SUITED SOLUTION FOR GRID BALANCING**

- Provides MVAR needed for voltage stability of the grid.
- Hydro Unit has more inertia and most suited for grid stability during transients faults.
- Quick start – stop capability.
- Highest ramping rate (typically 100 MW/min) in real time among all other sources of generation.
- Spinning reserve.
- Primary frequency response and regulation.
- The role of Pumped storage hydropower plants is two-fold – they balance the grid for demand driven fluctuations and generation driven fluctuations.
- Hydro power is needed by the Grid operators in order to manage transmission system restoration in case of partial or complete black out of grid.
- Hydro has a very low price per megawatt hour in comparison to the battery costs over complete life cycle.

Moreover, Hydro projects lead to development of infrastructure in remote areas and also built a lot of social infrastructure like – employment generation, water security, healthcare benefits, improved education facilities, etc.

## ELECTRICITY MARKET CHANGES REQUIRED TO ENHANCE RESERVES & HYDRO POWER

- Early implementation of the **Time of Day (TOD) Tariff mechanism**, which was notified in Tariff Policy 2016, can be very effective way to manage demand and **shift evening peak to afternoon when solar generation is maximum**. Also it will support the viability of PSP scheme.
- **Ancillary services provided by Hydro Power** like – MVAR injection/absorption, Black Start Capability, High Ramping Up/Down Rate, Frequent Start/Stop, etc. should be **incentivized and paid additionally**.
- **Spinning Reserves:** The need for spinning reserves has been recognized by the CERC in its order dated 13<sup>th</sup> Oct 2015 in the matter of “Roadmap to operationalize reserves in the country”. **4000 MW** of Primary reserves, **3623 MW** of Secondary reserves and **5218 MW** of Tertiary reserves has been earmarked by CERC to take care of Primary, Secondary and Tertiary frequency response.

## POLICY INTERVENTION REQUIRED TO ENHANCE RESERVES & HYDRO POWER

- Although the benefits of storage/pondage hydropower for load balancing, peak load management and other various Auxiliary services are known, the market structure and regulatory frame work for its development are not conducive. Hydro power project face severe delays in obtaining clearances and getting rehabilitation and resettlement issues. The projects also witness huge cost and time overruns which dent project economics.

### ***POLICY INTERVENTION REQUIRED***

- **Various Statutory Clearances** from Central/State Government departments is required in a time-bound manner to address the time & cost over run issues.
- **New HYDRO POLICY:** Early notification will give impetus to investment in Hydropower development

# POLICY INTERVENTION REQUIRED TO ENHANCE RESERVES & HYDRO POWER

## *Expectations from New Hydro Policy*

- Benefits afforded to Solar/ RE must be extended to Hydro.
- Enabling Infrastructure cost to be borne by respective sectors.
- Apportioning the Flood Moderation Cost.
- Interest subvention or providing long tenure cheaper loan.
- Extended Depreciation period.
- Enabling environment is required to be provided by the States by reviewing their respective Hydro Policy.

*In sum, incentivizing the development of hydro power will go a long way in ensuring 24 x 7 reliable and quality power supply in the country, while accommodating the large scale integration*

**THANK YOU**

