

# FINANCIAL AND PRICING STRATEGIES FOR NEXT LEAP OF GROWTH OF HYDROPOWER IN INDIA

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## 1. INTRODUCTION

Electricity is a necessary resource for all facets of our life. It is the basic human requirement and backbone to the socio-economic development of a country. Hydroelectricity is one of the crucial and clean sources of power. It plays a vital role fulfilling the power requirements during peak time and in ensuring the stability of the grid in the longer run. Keeping in view the Hydropower as clean energy, many countries have adopted power generated from Hydro sources as the primary source of energy.

In India, after Thermal power, hydroelectricity is the second 2nd source of energy and is endowed with a capacity of 85000 MW with a 60% load factor, ranks 6th in the world in terms of Hydroelectric Potential. However, despite having abundant reserves as well as the fact that India has aggressively expanded the Power generation capacity as compared to the situation in the year 1997-98, the total installed capacity of hydropower is still lagging as compared to the global peers, and the proportion of installed hydropower capacity to the total installed power generation schemes in the country has witnessed a decline, with large hydropower accounting for only 11.18% of the total installed capacity down from 46% in the year 1966.

To date, only 46.51 GW of hydropower capacity is installed. A total of 1,45,000 MW has been identified to date and out of this 98,490 MW accounting for 67.92 % is still to be harnessed as of 31.01.2022. Despite having clear advantages and compulsion of increasing the Hydropower for achieving the load balancing requirements still the development of Hydro Power in India is lagging as compared to the global peers. Figure 1 shows the installed capacity of Hydropower in India as compared to other forms of power generation.

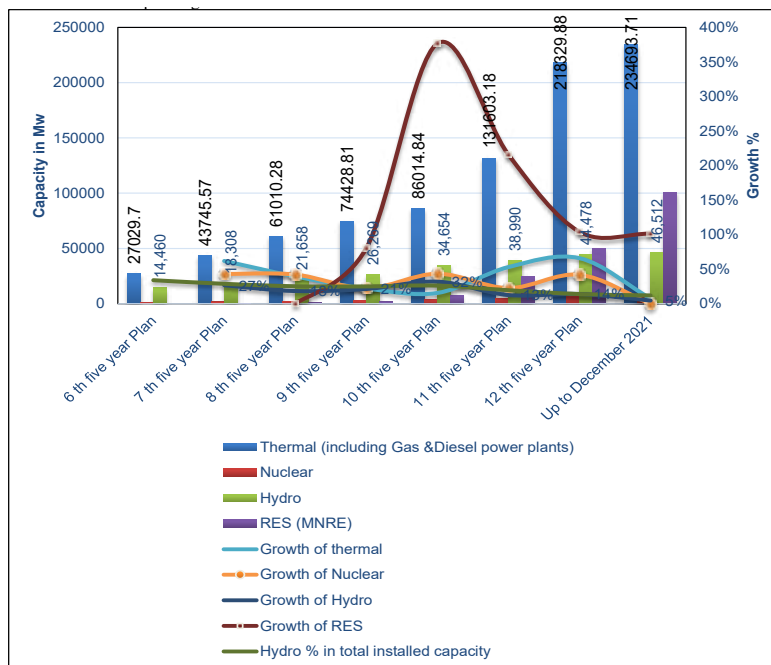
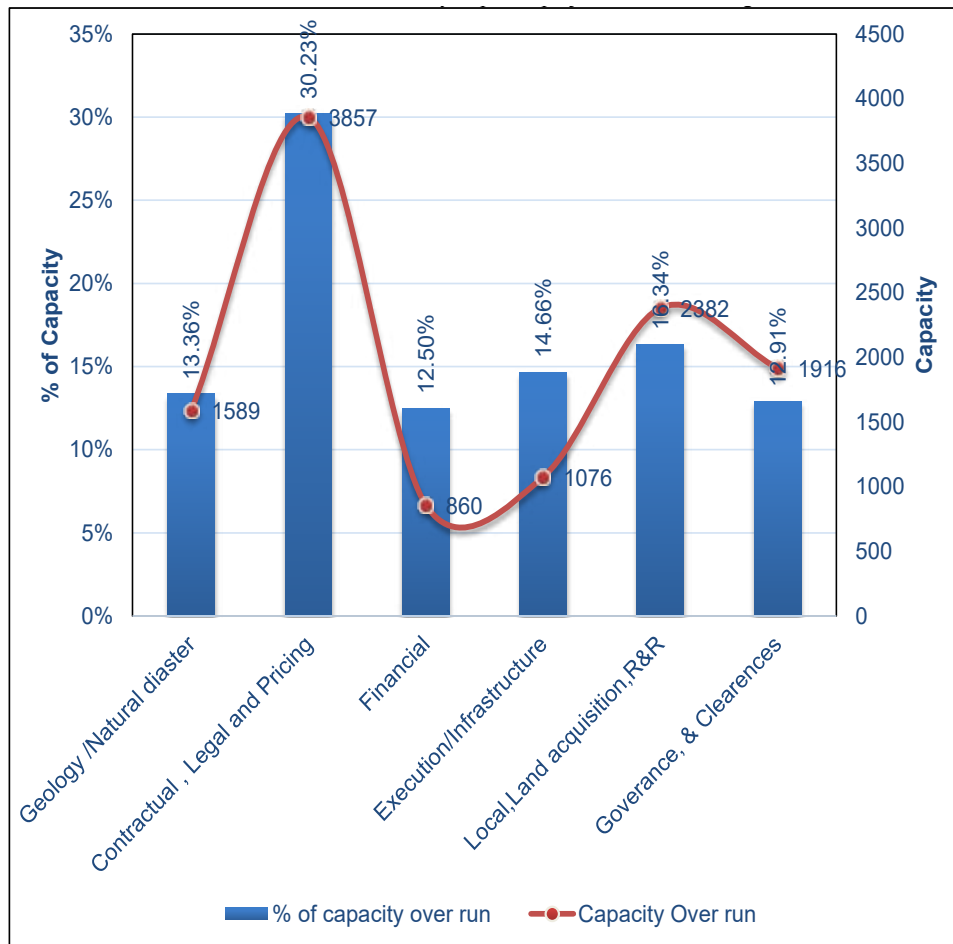


Fig. 1 : Installed capacity of hydropower as compared to other forms of power generation

As shown in Figure 1 the proportion of Hydropower in the installed Power generation capacity of the country come down to 11.18 % with still large capacity is to be executed and still, 67.92% of the total hydropower capacity accounting to 98,490 MW is either halted up or yet to be taken due to various issues.

**2. ISSUE OF HALTING UP HYDRO POWER PROJECTS**

Hydropower capacity accounting to 12,136 MW is still halt up in execution stage due to variety of reasons. The issues that cause the halting up of hydro projects include geological/hydrological issues, delays in land clearance, environmental concerns, rehabilitation and resettlement issues (R&R), land acquisition, the inadequate technical and financial capability of developers, etc. All these factors are resulting in a declining share of hydropower in India’s electricity mix. Factors attributed for time overrun/cost run for hydropower projects is shown in Figure 2.



**Fig. 2 :** Time run and Cost overrun evaluation of stalled Hydro Power Projects in India

Further, A SWOT analysis is made for the Hydro sector as per Figure 3 to evaluate the sector scenario and based on this evaluation it may be concluded that Financial, as well as Contractual & pricing aspects amounting for 42.50% of the delays and these aspects pose a threat to the growth of Hydropower since cost overrun/time overrun are leading to rising in tariff of Hydropower as compared to other forms of power generation.

It is imperative to create Hydropower generating assets with the lower tariff as well as to optimize the capacity of hydropower generating assets, the present paper presents the financial and pricing strategies required to be adopted for future growth of Hydropower in the country, based on evaluation of factors described in Figure 1 & 2.

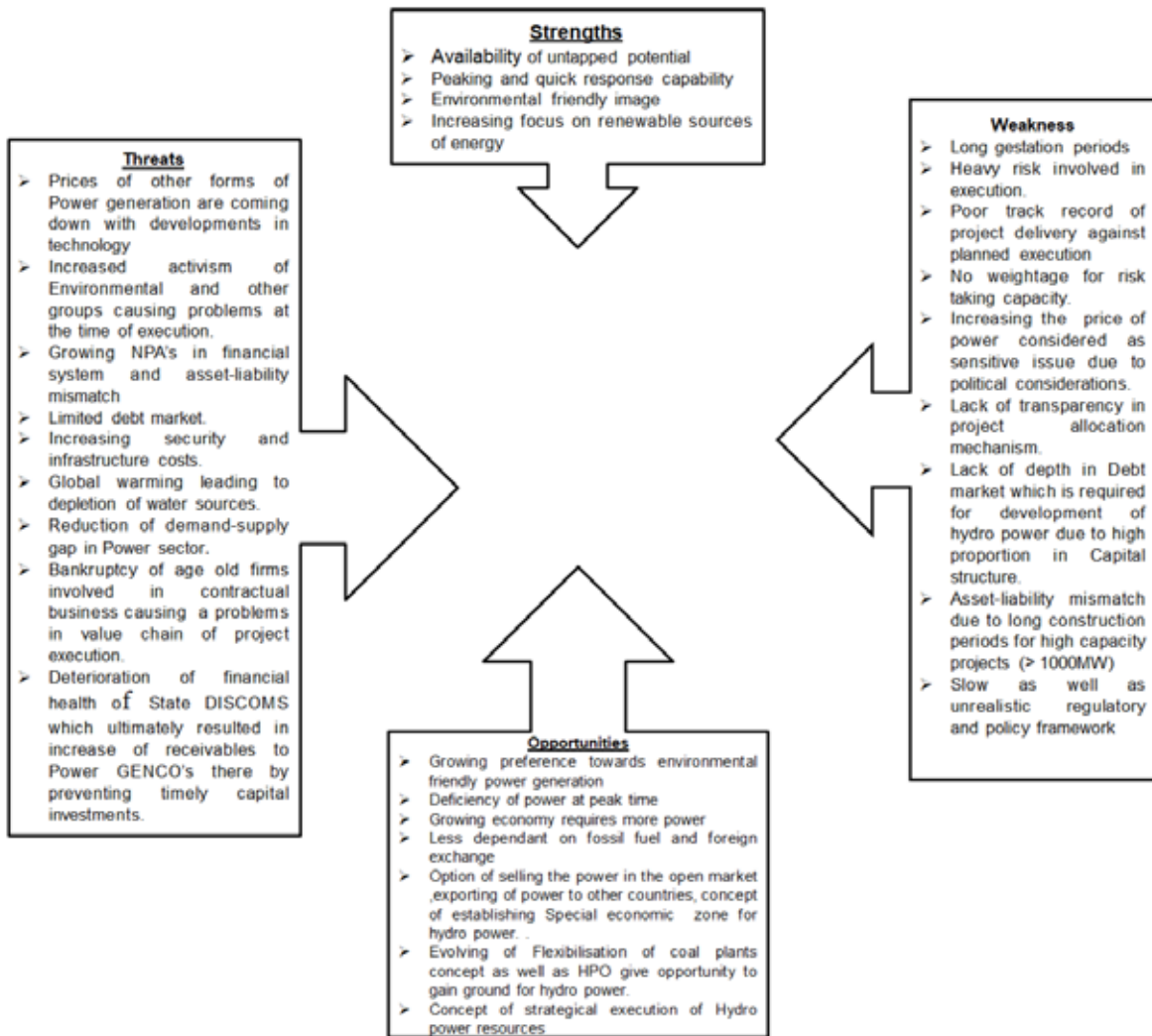


Fig. 3 : SWOT Analysis of Hydro Power in India

### 3. IMPORTANCE AND NECESSITY OF STRENGTHENING THE FINANCES FOR INCREASING THE FURTHER PROSPECTS

Execution of Hydropower Projects is characterized by capital investments predominantly debt in the capital structure (70-80% of the investment of the Project), blocking of capital for long period (ranging from years 7-20 years), uncertainty in execution, etc. In addition, ROE is limited as compared to the other capital-oriented sectors (Oil & Gas, Telecom, Infrastructure construction, etc.).

For making the execution of Hydropower Projects successful, it requires an adequate supply of funds for timely execution, which is to be ensured by Bankers and Financial institutions. However, the crisis in the banking sector caused a tendency of risk aversion attitude in bankers & financial institutions in financing the risky Hydropower sector and these factors are a big drag on the prospects of Hydropower development in the country. Keeping in view the various problems faced by the Hydro sector for getting the finances, the present paper evaluated various options for bringing in improvements in the financial system of Hydropower.

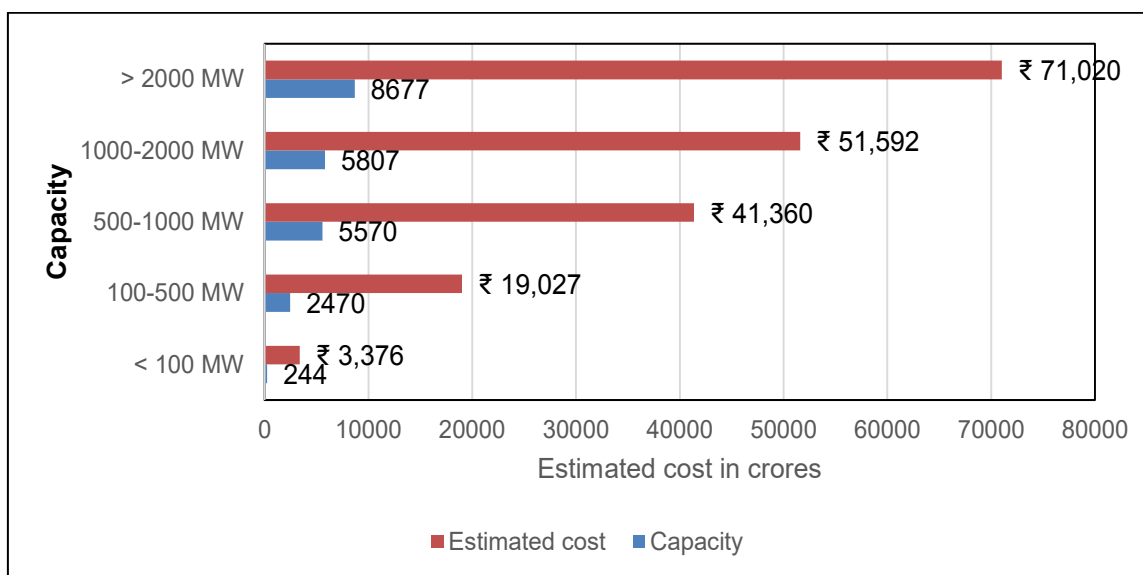
Broadly there are three elements for ensuring the smooth flow of funds from the financial system to Hydropower Project execution. The first one is ensuring the sharing of risk between financial institutions and most of the financial institutions are reluctant to supply a credit for the construction of Hydropower projects due to long gestation periods as well as the high amount of risk involved in the execution of Hydro Power Projects and the second element is the development of the vibrant bond market for the creation of long-term debt financing.

Initiatives taken in the financial front not only ensure smooth credit flow into the ecosystem but also help in reducing the reduction of tariffs in the long run which is the need of the hour. The third element is the creation of special investment fund to support the power developers in overcoming the liquidity concerns during the project execution. The following paragraphs give details of the arrangements required for ensuring the flow of funds to Hydro Power development.

**(a) Reassessment of Takeout financing system**

As mentioned in the previous paragraphs the total installed capacity of large Hydropower projects in India with a capacity greater than 25 MW as on date is only 46.51 GW, representing only 30% of the total potential. With most of the small and medium Hydropower schemes having already been developed/under development, the next step towards Hydropower development in the country is the systematic development of mega hydropower schemes.

The total capacity of Hydropower projects to be executed (after CEA clearance) is 22,768 MW and for ensuring the smooth development of these schemes, it requires the timely supply of credit from the financial system to the Hydropower sector. Figure 4 shows the anticipated cash flow required for the development of the Hydropower sector.



**Fig. 4 :** Capacity and Estimated cost of projects accorded by CEA

**(I) Assessment of the financial system in India**

Traditionally Financial institutions collect deposits from depositors for short/medium duration (3-5 years) and finance the long-term infrastructure projects (7-10 years). Due to inherent time variation arising between the maturity of the deposits and the delay in getting back the loans issued to Companies, Asset-Liability Mismatch popularly known as (ALM) arises in the books of accounts of Banks/financial institutions. The long construction periods (ranging from 7-20 years) and amount of risk involved in execution, makes Hydropower schemes are the most vulnerable for causing ALM due to lack of absorption capacity for bearing the risks (interest and liquidity risk) in the books of accounts of Banks/ Financial institutions.

With Hydro Power projects like Dibang, Lower Siang, Etalin having capacity of more than 2000 MW as well HE Projects in the range of 1500-2000 MW like Sawalkot, Demwe Lower, etc. are expected to execute over the next few years and the construction period in these Projects is in the range of 10-20 years it will be difficult for Bankers/Financial institutions which provides debt in the traditional way of financing since such long construction periods creates an Asset-liability mismatch in the book of the accounts as explained above.

To prevent such mismatch it requires exploring the alternative mechanism for ensuring smooth credit flow to finance the construction of Hydro Electrical Projects. In addition to the recent debacle suffered by IL&FS Ltd, which is highly involved in the financing of infrastructure projects has suffered the debacle due to Asset-Liability Mismatch issues and the increasing threat of NPA’s in the financial system, now most of the Bankers and financial institutions are constrained to think twice before financing the Hydropower projects.

## (II) Introduction to Takeout Financing system

As explained above, Banks/Financial institutions/creditors have to take exposure of long gestation infrastructure projects, many of which have implementation issues, leading to probability of ALM for the banks/Financial institutions and for retarding such risks, implementation of Takeout financing system in projects of long duration is the best alternative that can be explored.

In this model financial institutions sanctions, medium-term loans for 5-7 years instead of financing for the whole duration of the project, and loan shall be taken out from the books of the Banks/financing institution within a pre-fixed period by another institution, thus restricting the possibility of arising ALM.

This model is working out very well in many countries. Recognizing the importance of Takeout financing system for the development of the infrastructure sector in the country, government has made a provision for the creation of Infrastructure Debt Funds (IDFs) by Banks and NBFCs, by setting aside a corpus from the union budget. The government has engaged India Infrastructure Finance Company Ltd (IIFCL) as a nodal agency for pushing the take-out financing system in the country. However, the work of IIFCL is mostly restricted to Government-sponsored schemes from the road sector. Figure 5 shows the comparison of Takeout financing system with the traditional financing model.

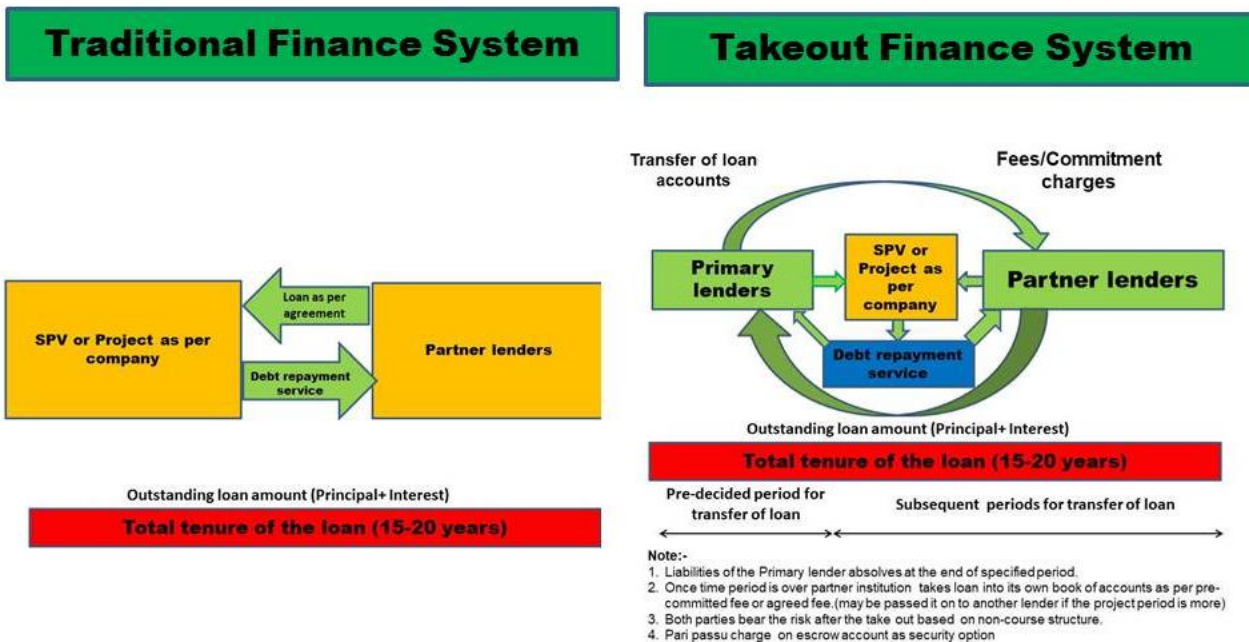


Fig. 5 : Comparison of Traditional and Takeout finance system

However, the concept has not taken off in a big way in due to several implementation issues like the requirement of regulators to set aside higher capital for their exposures, lack of synergies between the financial institutions in the ecosystem, measurement of Project risk, as well as poor coverage of risky sectors like Hydropower, etc. All these issues are required to be resolved for streamlining the implementation of the Take-out financing system.

- (b) Development of Well-articulated bond market and other means of finance: - For the execution of long-term infrastructure projects like hydropower, capital markets need to be deepened for providing long-term debt financing. Traditionally financing of Hydro projects involves the collection of debt from (around 70-80% of total investment in its capital structure) domestic financial institutions/Consortium of Banks/PFC as well as a collection of tax-free bonds from the open market/through private placements etc.

However, due to the entire gamut of issues ranging from accumulated NPA's in the banking system to liquidity constraints, not many innovations are taking place in the domestic debt market and it is severely hampering the expansion of the debt market in the country. Considering these factors it may not be wrong to conclude that the absence of a deep bond market is the major cause for the current crisis in the banking system, particularly with relevance to the Hydropower sector.

Further, due to lack of depth, the present financial system is not in a position to reduce the debt cost as the sources of debt are very much limited. As per the details given in Figure 4 an estimated amount of Rs.1,50,000-1,80,000 crore debt

(70-80 % of the approved cost + 15% price escalation over a while) is required for completion of Hydropower projects accorded by CEA and for smooth completion of these schemes it requires the development of vibrant debt financing. Expansion of the debt market can be achieved in two ways as explained below and Figure 6 represents the holistic review of various sources to be developed for deepening the debt market in the country.

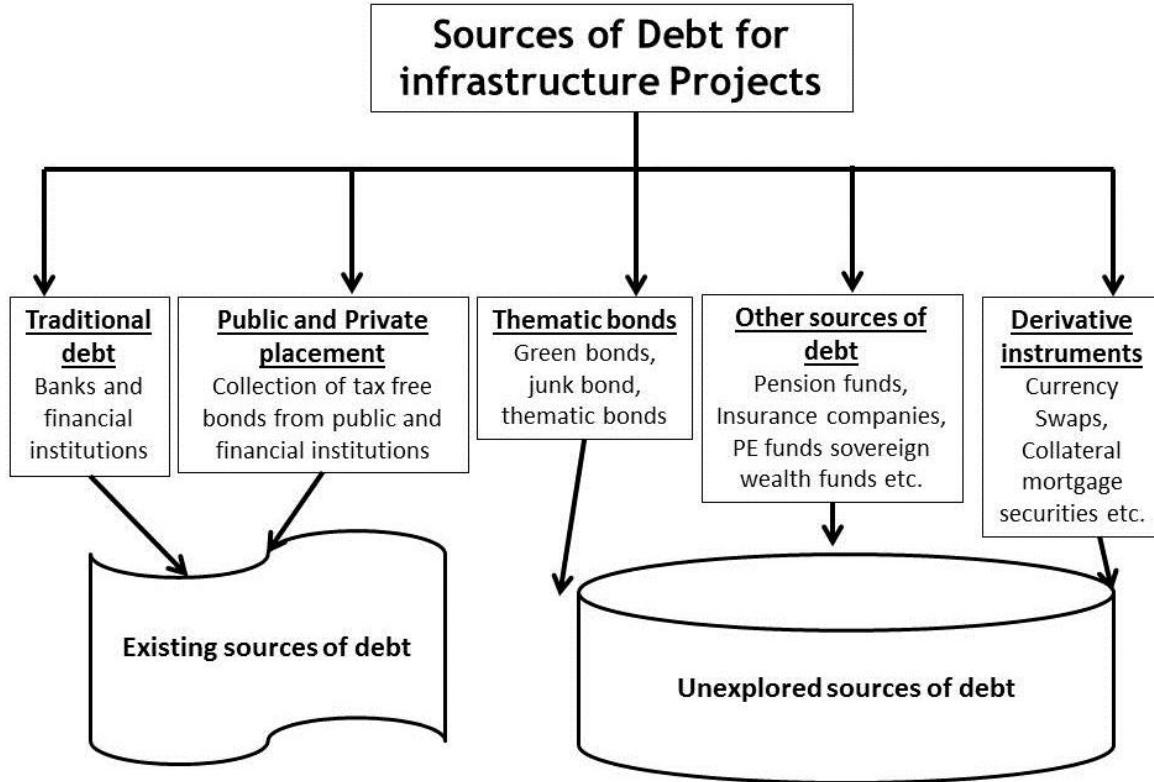


Fig. 6 : Sources for deepening debt market for Long term infrastructure

- Development of well-articulated bond market by allowing innovations in the bond market (Green bonds, junk bonds, thematic bonds, hybrid instruments, etc.). Such measures not only help in deepening the means of finances but also help in reducing the financial cost which is the need of the hour for reducing the tariff of Hydropower Projects.
  - Design of mechanisms for effective utilization of public funds/private capital, especially from relatively untapped sources such as Pension funds, Insurance companies, Private equity funds, sovereign wealth funds, etc. and, design of mechanisms for sourcing the debt from derivative instruments. As explained in the previous paragraphs Indian debt market mainly depends on the traditional means of financing and the development of mechanisms for the utilization of funds from unconventional sources shall have a long-lasting effect on the fortunes of the Hydropower sector in India.
- (c) Establishing of Investment fund: - As explained in Figure 2 and the analysis made in Figure 3, the weak finances of the Project developers as well as contractors are derailing the progress of the Hydropower development in the country. With uncertainties and risks in the value chain looming around, financing of the Projects has dried up over the last few years. Lack of availability of the funds in the later stages of project execution not only leads to cost overrun/time overrun but also leading to the occurrence of NPA's in the financial system thereby leading to the development of risk aversion among these institutions thereby leading to disruption of the entire value chain in the system.

Further, cost overrun/time overrun is also leading to an increase in the tariff of the project which ultimately leads to poor off take of power generation due to the high tariff of power. Despite measures from the Government like early referring of the NPA cases to NCLT and infusion of Budgetary support from the Government on a case-to-case basis still, it requires some more measures like a scheme for immediate provision of providing the funds for the deserved Power developers as well as contractors.

For ensuring the liquidity required for working of the Hydro projects as the schedule in the construction stage, it requires setting up a development fund to provide capital support in the form of interest subvention. The fund shall be pooled in the lines of the power system development fund or various funds created by the government for different sectors like the COVID fund created for the MSME sector.

#### 4. PRICING ISSUES

With the technological advances, better construction methods, availability of cheap fuel sources as well as increasing private sector participation after the introduction of the Electricity act, 2003 prices of electricity have come down over the last decade. The hydropower sector has made up a remarkable shift in terms of Plant capacity and reduction of price. Despite these improvements still it needs to make further improvements for bringing hydropower on par with other forms of power generation.

Long construction periods and delays in cash inflow result in higher finance charges thereby contributing to unattractive tariffs. At present, the hydropower tariff is more expensive as compared to other forms of power generation. Due to these factors, DISCOMS are reluctant to sign Power Purchase Agreements (PPAs) for hydropower, particularly, in the initial years. Figure 7 shows the tariff and Plant size comparison of different forms of power generation in India. With the saddling of risks involved in the execution of Hydro Power projects as well as risk aversion developed in Project developers and Banks/Financial institutions, it requires holistic changes in the pricing mechanism to make the Hydro Power execution more vibrant.

The following paragraphs give a glance at pricing measures to be adopted in this regard: -

##### (a) Pricing mechanism based on differentiation of load factor

Hydropower plants which are best suited for meeting peaking power demand and are intended to operate in the medium to upper range of the load curve while thermal plants operate near the baseload. This makes it misleading to compare generation costs between the two as the value of peak generation is significantly higher than the baseload generation. However, demarcation of pricing between peak and off-peak is still not developed in India and as such, it is leading to discouraging the investments in hydropower.

Even though the peak demand-supply gap is slowly reducing in the medium term, for ensuring the long-term stability of the grid differential pricing mechanism is required to be adopted. For adaptation of this methodology, Tariff fixation needs to be done based on the quality of energy supplied, reflected by the position hydropower occupies in the load duration curve etc. Such differentiation of the pricing between peak and off-peak shall help in creating a level playing field for developers operating in the different forms of power generation.

Further, adaptation to this model is expected to encourage taking up more mega Hydro Power projects, and taking up such mega projects would help the Hydropower players to scaling up the costs of power generation. In addition, this will also help in filling the void in adopting the Evolving of Flexibilisation of coal plants with Hydro plants which ultimately helps in achieving the desired objective of reducing the carbon emissions as being committed by India in various International climatic forums.

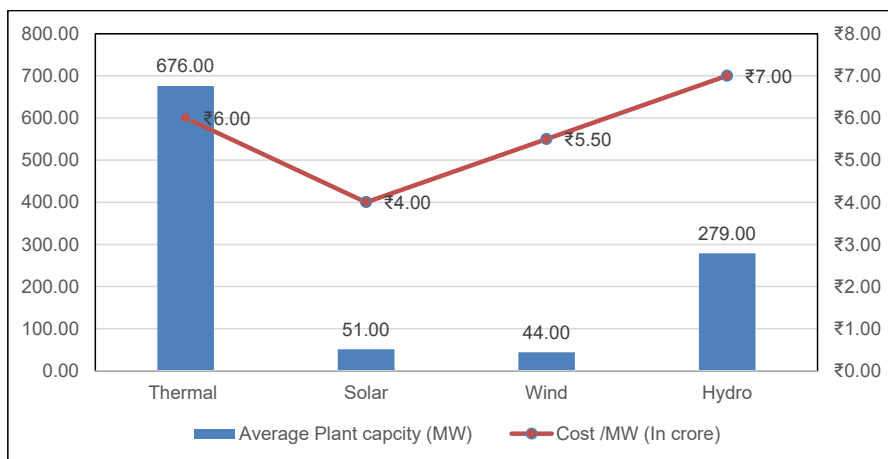


Fig. 7 : Tariff comparison of different forms of power generation in India

- (b) Introduction of risk and green parameter in the pricing of power: - Generally Hydropower schemes involve a higher amount of risk but are environmentally friendly. However, neither of these factors is giving weightage in the pricing formula adopted in the Indian context, and exclusion of these factors in the pricing of final electricity produced discourages the power developers from taking up hydropower projects which involve a significant amount of risk as compared to other forms of power generation.

Inclusion of the pricing mechanisms based on the risk/environmental factors shall not only help the power developers to optimize the cost of Power but also help in encouraging the development of more hydro schemes which thereby helps in scaling up the costs of power generation.

## 5. CONCLUSIONS

Hydropower projects are ideal to meet peak load compared to thermal power plants but despite this advantage, still nearly 100 GW of electricity potential in India's rivers lying untapped because of high tariffs. Despite having clear advantages and requirements for balancing Power, Hydropower continues to languish. To change this scenario, requires paying attention to various issues, particularly at the financing as well as pricing front.

As India continues to ramp up capacity, it is imperative to create generation assets with the lowest unit cost by optimizing plant capacities. The hydro sector inherently poses many challenges primarily on account of risk associated with implementation, which can be mitigated with timely involvement of government through better policymaking as mapped in the present paper.

These measures will not only help in removing the obstacles faced by the hydro sector but also restores the investors' confidence to invest in the hydro sector, thereby making the country power surplus during the peak periods of the day, and ultimate objective of increasing the share of clean/green energy in the overall energy mix and the declining marginal cost for capacity, provides opportunities for replacing existing capacity with newer capacities that are more efficient.

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