

HYDRO POLICY FOR BOOSTING HYDRO POWER DEVELOPMENT

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1. INTRODUCTION

Hydropower is a clean, green and non-polluting source of energy. The growth of hydropower has seen many ups and downs. Hydropower began to be used for production of electricity by the end of 19th century. World’s first hydropower plant of capacity 12.5 kilowatts was developed on the Fox River in Appleton, Wisconsin, USA in Sept. 1882 and soon after development of hydropower in India also started with the commissioning of a 130 KW plant in Darjeeling in 1897. The growth of hydropower, world over, picked up momentum in the twentieth century with rapid innovations and changes in hydropower facility design.

2. At the time of Independence, the overall hydro capacity of India was 508 MW constituting about 37% of the total installed capacity in the country at that time. Upto 1960s, the increasing emphasis of the Govt. was on development of multi-purpose reservoir projects like Hirakund, Bhakhra, Damodar Valley projects etc. in order to have greater irrigation for better food security. This also led to significant development of hydro capacity and the share of Hydro in the overall system rose to almost 51%. The decadal capacity growth of hydropower became quite sluggish from 1970s and towards the end of 20th century. This was the time when concerns were expressed about the environmental and social impacts of hydropower development and hydropower projects began to be perceived as environment degrading which led to drying up of funds from international agencies and protests by NGOs against their development. Moreover after 1970s, environment clearance regime also became increasingly stringent due to world-wide focus on environmental, ecological and Rehabilitation & Resettlement (R&R) issues and activism against development of hydro projects by NGOs/ Environmental activists leading to slow-down of the sector.

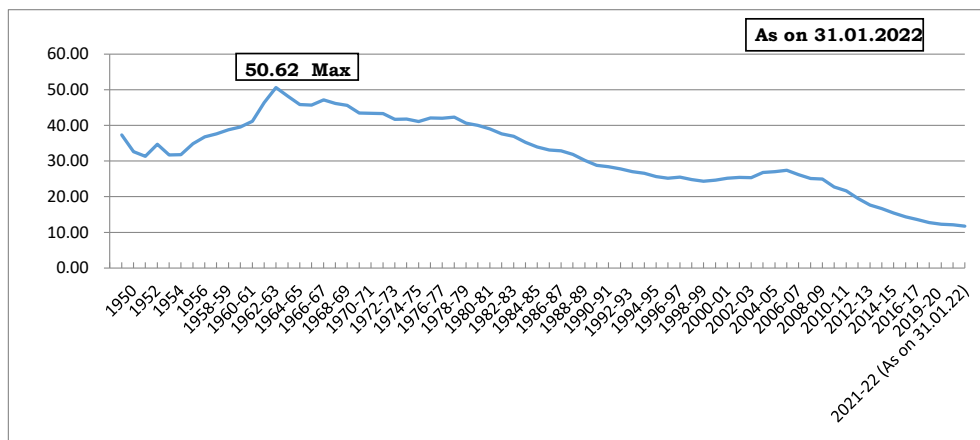


Fig. 1 : Rise and Decline of Hydro Power Share in India

In order to achieve quicker capacity additions to cater to large scale industrialization, the focus had shifted to the rapid development of thermal power in 1990s and as a result the share of Hydro Power in the Power Sector of India has progressively declined from a peak of about 51% in 1962-63 to about 12% now.

The beginning of the 21st century, has seen the world grappling with issues like increased global temperature on account of increased greenhouse gases being released into the atmosphere and consequently shifted focus on development of Renewables like Solar and Wind. With increasing global warming and huge peaking and balancing power demand in light of growing focus on renewable energy, there has been ever growing interest in hydropower development in the world and there is renewed thinking about hydropower projects especially the Pumped Storage Schemes for producing electricity.

3. PRESENT STATUS OF HYDRO POWER DEVELOPMENT IN INDIA

The identified Hydro Electric Potential of the country is 145320 MW (above 25 MW) out of which 41778.9 MW capacity has been developed, 11083.5 MW capacity is under construction and balance is yet to be developed. In addition to this, 8 Pumped Storage Schemes (PSS) (4745.6 MW) are under operation and 3 PSS (1580 MW) are under construction. The detailed status is given in Table 1 below.

Table 1 : Status of Hydro Power development in India as on 28.02.2022

	Conventional		Pumped Storage		Total
	Nos.	I.C. (MW)	Nos.	I.C. (MW)	I.C. (MW)
Identified Hydro Capacity as per Re-assessment Studies of 1987	592	145320	63	96529.6	241849.60
I. In operation	202	41778.9	8	4745.6	46524.5
II. Under construction	33	11083.5	3	1580	12663.5
III. Allotted for development					
(i) Cleared by CEA and yet to be taken up for construction	28	21768	1	1000	22768
(ii) Under Examination/scrutiny in CEA	2	956	1	1200	2156
(iii) DPRs appraised and returned	26	8077.1	0	0	8077.1
(iv) Under S&I	14	4295	17	16770	21065
Sub-total (i-iv)	70	35096.1	19	18970	54066.1
Total (I+II+III)	305	87958.5	30	25295.6	113254.1

Of the 36 projects under construction, 9 schemes aggregating to 1236 MW are stalled due to various reasons like financial constraints, Sub-judice matters and other issues like R&R, local issues etc.

4. ISSUES IMPACTING THE GROWTH OF HYDROPOWER IN INDIA:

Apart from the environment related issues, many other major issues plaguing the hydropower development in India include delays land acquisition and resettlement and rehabilitation, inadequate infrastructural facilities, law and order issues, etc. These issues are discussed below:

- (i) *Tariff based Competitive Bidding* : The performance of the private sector in hydropower has been dismal over the years with not a single project getting commissioned in NE Region in private sector since last Hydro Policy publication. The existing dispensation regarding exemption from tariff-based bidding up to August 2022, therefore, needs to be extended further owing to the fact that development of hydro power projects is fraught with a number of uncertainties.
- (ii) *Remote location & inadequate infrastructural facilities* : Hydro projects are located in remote, inaccessible, forested and often very inhospitable terrain. Developers are very often required to undertake infrastructure development for merely accessing the site and taking heavy machinery there. Despite the frequent landslides and slope failures often delay project implementation which in any case is slowed down by snowfall or prolonged monsoons.
- (iii) *Environment and Forest issues* : The delays in clearance process, multiple public hearings due to lack of single point clearance, requirements of free flows and e-flows retrospectively resulting in unviability of even ongoing projects and redesigning/ review of concurred schemes also resulting in significant delays. Obtaining environment forest and wildlife clearances can be very cumbersome and time-consuming.

- (iv) *Geology* : Most of the hydro sites now to be developed are located in the Himalayas, which are a very young range of mountains. Even with the best of geological investigations, occurrences of shear zones and underground lakes and streams can result into serious time and cost over-runs.
- (v) *Resettlement and Rehabilitation* : Large-scale shifting of people from their traditional habitations and livelihoods can, if not handle with the necessary sensitivity and commitment, lead to a lot of discontentment and unrest, and hostility to the project itself. Apart from other socio-political implications, this is one major potential source for time over-runs leading to cost over-runs.
- (vi) *Land Acquisition* : The process of land acquisition involves various stakeholders, such as State PWDs (responsible for preparation of DPRs for land acquisition), State Revenue Department (responsible for carrying out the actual land acquisition), Project Zones of the Ministry which (responsible for obtaining approval of Competent Authority) and Notifications for Land Acquisition. This process of land acquisition is very tedious, time consuming and generally lacks transparency, which leads to unforeseen delays. Further lack of proper ownership records, especially in NER, also results in significant delays in identification of land.

5. REVIVAL OF HYDROPOWER

In November, 2021, India made commitments at 26th Conference of the Parties (COP-26) held in Glasgow to have generation of about 500 GW by 2030 from renewable energy sources (Solar, Wind, Biomass, etc.) to meet the NDC (Nationally Determined Contribution) under COP-Paris agreement of reducing the emissions intensity of its GDP by 45% by 2030 from 2005 level and achieving 50% of electric power installed capacity from non-fossil fuel by 2030. In addition to this, India has also envisaged to carbon neutral by 2070. As a result, focus of capacity additions shifted to large scale development of non-polluting energy sources to meet the increasing energy appetite and this in turn has put spotlight on renewable sources of electricity such as solar and wind. The country has planned for huge capacity additions to the tune of 500 GW by 2030 from renewable sources of energy.

These developments have come as a boon for Hydro since the power generation from Wind and Solar Sources is intermittent and variable in nature and therefore, to secure the stability and security of the grid, there would be growing need for Energy Storage Plants to facilitate smooth integration of these renewables in the grid. The Pumped storage projects are, world-wide considered among the best options to facilitate the integration of these renewables to the grid with such storage constituting more than 95% of the Energy Storage plants, world over. Apart from Balancing power/Grid Stabilization and ancillary sources for improved frequency, Pumped Storage Plants absorb the off-peak energy in the system and play an important role in providing peaking power to the system and help in system stability. They also improve overall economy of power system operation and increase capacity utilization of thermal stations. Such factors are again pushing the world towards hydropower development.

Presently, a total of 73 no. of hydro schemes with an aggregate capacity of over 30000 MW (including 13 Pumped Storage Schemes of 12730 MW) have been envisaged for implementation in Central, State and Private Sector to provide benefits during the period 2019-20 to 2029-30 which include 12663.5 MW of hydro schemes under construction. Out of the above 73 schemes, 5 schemes with aggregate capacity of 1023 MW have since been commissioned. Further, the Pumped Storage Schemes covered under this capacity addition are either being developed using one/ both existing reservoirs or they are completely off the river closed loop type. Actually, the present thrust of the Government is to identify PSPs on existing Hydro reservoirs and 'Off- the river' PSPs for faster execution and minimal environmental impact. These off the river PSPs do not involve the issues like optimal development of the river basin or e-flow or inter-state issues, and do not have any complex civil structures like spillways, de-silting chambers etc. associated with conventional stations, as such, these projects can be accomplished quickly at relatively lesser costs.

6. RECENT POLICY INITIATIVES FOR INCREASING THE HYDROPOWER CAPACITY

The Government has taken several policy initiatives/measures to tap the hydro potential and to boost hydro power development in the country. The details are given below:

- (i) *National Electricity Policy, 2005* : It emphasize full development of the feasible hydro potential to facilitate economic development of States, particularly North Eastern States, Uttarakhand, Himachal Pradesh and Jammu & Kashmir. Full support of Central Government is extended for hydel development by offering the services of CPSUs like NHPC, NEEPCO, SJVNL, THDC etc. It recommends debt financing of longer tenure for comparatively larger capital investment hydel projects.

- (ii) *Hydro Power Policy- 2008*: It replaced the Hydro Power Policy, 1998. The key objective of the policy includes inducing private investment in Hydro power development, harnessing the balance hydro-electric potential, improving Resettlement & Rehabilitation, facilitating Financial Viability. Encouraging private sector participation not only increased competition, but also provided impetus to hydropower development through increased investments. R&R has been one of the key hindrance to the development of hydro power projects, and this policy tried to address this concern. The policy allowed project developers to ensure project viability by adopting the structure of power sale through a mix of PPA and trading route. While PPA shall ensure financial viability for the entire useful life of the project; trading shall enable project developers to earn good profits, particularly in the later stage when the cost of generation reduces.
- (iii) *National Rehabilitation & Resettlement Policy 2007* addresses the need to provide succor to the asset less rural poor, support the rehabilitation efforts of the resource poor sections, namely small and marginal farmers, SCs/STs and women who have been displaced. Besides, it seeks to provide a broad canvas for an effective dialogue between the Project Affected Families and the Administration for Resettlement & Rehabilitation to enable timely completion of project with a sense of definiteness as regards costs and adequate attention to the needs of the displaced persons. The rehabilitation grants and other monetary benefits proposed in the Policy are minimum and applicable to all project affected families. States where R&R package are higher than proposed in the Policy are free to adopt their own package.
- (iv) *Land Acquisition, Rehabilitation and Resettlement Act, 2013* : In the interest of speedy implementation of hydroelectric projects, the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013, provides more participation of local people in terms of Land acquisition and Rehabilitation & Resettlement. The Act, which was later on amended in 2015, replaced the century-old Land Acquisition Act, 1894 and proposed a unified legislation for acquisition of land and adequate rehabilitation mechanisms for all affected persons. The Act provided greater clarity in acquisition and R&R policies, which has been one of the key concerns for hydro power project developers. The Act requires the rehabilitation and resettlement to be completed six months prior to submergence of the lands acquired for hydro projects. This resulted in a time bound R&R activity, thereby avoiding the risk of delay. It ensures a humane, participative, informed and transparent process for land acquisition with the least disturbance to the owners of the land and other affected families, provide just and fair compensation to the affected families whose land has been acquired or proposed to be acquired or are affected by such acquisition, make adequate provisions for such affected persons for their rehabilitation and resettlement and ensured that affected persons become partners in development leading to an improvement in their post-acquisition social and economic status.
- (v) *National Tariff Policy (NTP), 2016* : One of the key objectives of the NTP 2016 included promotion of Hydroelectric Power generation including Pumped Storage Projects (PSP) to provide adequate peaking reserves, reliable grid operation and integration of variable renewable energy sources. The policy underlined norms for ancillary services. The policy gave rights to the CERC to introduce the norms and frameworks for ancillary services necessary to support grid operations, including the method of sharing of charges. The policy provided exemption to the hydropower sector from competitive bidding till 2022. The policy allowed hydro power projects to be awarded under cost-plus route, thereby assuring returns on investment for the project developers. It also has the provision for extending the Power Purchase Agreement of existing hydro power projects by another 15 years, beyond the actual duration of 35 years of the project.
- (vi) *Policy Measures to promote Hydro sector – March, 2019*: On 8th March 2019, the Government had approved a number of measures for promoting hydropower in the country which would be especially helpful for the projects under construction as well as the new hydro projects which are as under:
 - (a) Declaring Large Hydro Power (LHPs) (> 25 MW projects) as Renewable Energy source.
 - (b) Hydro Purchase Obligation (HPO) as a separate entity within Non-solar Renewable Purchase Obligation (RPO).
 - (c) Tariff rationalization measures for bringing down hydro power tariff and giving flexibility to decide trajectory of tariff in consultation with CERC and Discoms
 - (d) Budgetary Support for Flood Moderation/Storage Hydro Electric Projects (HEPs).
 - (e) Budgetary Support to Cost of Enabling Infrastructure, i.e. roads/bridges.
 - Rs. 1.5 crore per MW for projects upto 200 MW.
 - Rs. 1.0 crore per MW for projects above 200 MW.

With regards HPO, the trajectory has been notified by MoP on 29.01.2021 and varies from 0.18% to 2.82% for the period of 2021-22 to 2029-30 respectively. The above HPO trajectory is to be trued up based on annual basis depending upon the

revised commissioning schedule of hydro Projects. Accordingly, any project which stands completed would be considered for HPO. In addition, the Guidelines for Budgetary Support to Cost of Enabling Infrastructure, i.e. roads/bridges have also been notified on 28.09.2021. As a result of these measures, the capital cost as well as the project tariff would be reduced in initial years, which would improve project viability & saleability.

As a result of these measures, the capital cost as well as the project tariff would be reduced in initial years which would improve project viability & saleability. These measures would also be particularly beneficial for development of hydro projects which are often located in remote and far-flung areas and requires development of extensive associated infrastructure such as roads, bridges etc. for transportation of heavy, large sized equipment & machinery to the project site.

7. OTHER MEASURES BY THE GOVT. TO REVIVE HYDRO

The Govt. has been striving to revive stalled hydro projects and to attract new investments in the sector. Earlier, 13 nos. of hydro-electric projects aggregating to 4706 MW (above 25 MW capacity) were stalled due to various reasons like financial constraints, sub-judice matter, local issues, etc. However, with persistent efforts of the Govt., some of the projects like Lower Subansiri (2000 MW) in Arunachal Pradesh, Teesta-VI (520 MW) and Rangit (120 MW) in Sikkim, Pakaldul (1000 MW) and Ratle (850 MW) in J&K and Kutehr (240 MW) in H.P. by JSW have moved ahead towards their active construction. A number of new projects have also been taken up like Kiru (624 MW) in J&K by CVPPL, Luhri Stage-I (210 MW) in H.P. and Naiwar Mori (60MW) in Uttarakhand by SJVN, Dibang (2880) in Arunachal Pradesh by SJVN etc.

At present, about 7 nos. of hydro-electric projects aggregating to 1257 MW (above 25 MW) with investments already incurred amounting to Rs 7831.9 Crores are stalled due to fund constraints. The Government is engaged in discussion with the concerned stakeholders of some of the projects for resolution/way forward. It may be mentioned that in the past project like Teesta-III (1200 MW) project in Sikkim, which was stalled for a long time, was revived with the efforts of the Govt. by way of increasing the equity stake of Govt. of Sikkim from 26% to 51% and which has since been commissioned successfully & in operation.

Certain other measures taken in the past few years to give a boost to the development of hydro power sector, are mentioned below:

- (a) Waiver/ reduction in transmission charges for PSPs commissioned up to 30.06.2025 have been notified by Govt. vide MoP order dated 21.06.2021.
- (b) Scheme for bundling of Hydro Power with Renewable Energy has been notified vide MoP order dated 15.11.2021.
- (c) Ministry of Power on 22.12.2021 has identified hydropower projects for implementation by CPSUs like NEEPCO, NHPC, SJVN and THDC in Arunachal Pradesh, where most of the hydropower potential in NER is concentrated. A total of 29 hydropower projects aggregating to 32415 MW have been identified for allocation to aforesaid CPSUs. An evaluation committee for the same has also been constituted for faster allocation and henceforth, execution of these hydropower projects.
- (d) Dispute Avoidance Mechanism through Independent Engineer has been introduced in CPSUs to minimize/ resolve issues in under construction projects at inception stage itself and a Panel of Independent Engineers issued.
- (e) Issuance of Guidelines by MoP for reducing the incidence of Time and Cost Overrun
- (f) On the advice of Central Government, some hydro rich State Governments have also made efforts to push the sector by deferment/ staggering the free power during the initial years in order to reduce the tariff during the initial years and other measures like allotting projects for longer period of 70 years, 50% reimbursement of State GST and booking of Local Area Development. Fund (LADF) to any head other than project cost to bring down Tariff etc.
- (g) A Consultation Process has been evolved for Fast Tracking of S&I activities and preparation of Quality DPRs. DPRs of 12 nos. of HEPs with aggregate installed capacity of 5758 MW have so far been prepared in consultation with appraising agencies. In addition, Time bound appraisal norms have been evolved for examination of DPRs in CEA within a period of 150 working days.

8. WAY FORWARD

As discussed above, the major challenge faced by the government is to make hydro power development economically viable and commercially salable. The current issues affecting the sector include geological surprises, absence of long term cheap funding, R&R issues, localized law & order issues, inaccessibility due to project sites located at far flung areas, pooling station located far-off from the project to evacuate power etc. add to the capitalized cost of the project and make the tariff unviable. There is urgent requirement for interventions in order to make hydropower sector attractive for project developers

both in public and private sector in order to give push to exploitation of huge hydro-electric potential in the country especially in the North and North Eastern Regions and suggest directions for speedy implementation of hydro projects in the country.

Some of the broad outline of the measures proposed in the New Hydro Policy are as under:

- (a) Increasing duration of the loan repayment and Refinancing of the Loan
- (b) Staggering of Free Power to Home State and Allocating risk and responsibility with States
- (c) Return on Equity : Presently, Return on Equity (RoE) for storage as well as RoR with Pondage Projects/ Power Stations is pegged at 16.5% while it is 15.5% for purely RoR schemes. Due to relatively higher initial tariff of hydro projects, the RoE could be lowered to 14% for storage as well RoR with Pondage and pumped storage Projects and 12% for purely RoR schemes.

The impact of various interventions on hydro power tariff is summarized in the table as under:

Tariff Scenarios:

S. No.	Scenario	1st Year Tariff	Lev. Tariff	Impact
1	Base case (18 yrs loan repayment)	7.30	6.97	
2	Loan repayment 25 Years	6.90	6.93	40p
3	Reducing O&M base rate-3%	7.14	6.67	16p
4	Staggering of free power	6.76	6.68	54p
4	Reduced RoE of 14%	6.92	6.58	38p
6	Combined Impact (2 to 5)	5.72	6.00	148p

Assumptions (Base Case Scenario):

Total Capital Cost (Including IDC) -	10 Rs Cr/MW
CUF	- 35%
D/E ratio	- 70:30
RoE	- 16.5%
Interest on loan	- 8%
Life of the project	- 40 Years
Interest on WC	- 10.5%
Base O&M exp	- 3.5%
O&M Exp (escalation)	- 4.77%
Free Power	- (12+1)%

- (d) Relaxed Environment & Forest Norms especially for Off-the river PSPs and the PSPs on existing reservoirs.
- (e) Reviving Private Investment through PPP route and VGF Support Scheme of Ministry of Finance especially for Pumped Storage Projects
- (f) Monetization of intangible benefits of Hydropower like peaking power, fast ramping, black tart capability, frequency support, reactive power management, spinning reserves, emission reduction etc.
- (g) Support for DPR Preparation (Central Govt. Funding)
- (h) Basin-wise development of Projects to facilitate ease of evacuation
- (i) Equity Participation by States
- (j) Participation of PAF in the development of HEP