Roadmap to 100 GW of Hydro Pumped Storage Projects (PSPs) by 2035-36

CENTRAL ELECTRICITY AUTHORITY

MINISTRY OF POWER

GOVERNMENT OF INDIA

JANUARY 2026

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घनश्याम प्रसाद
अध्यक्ष तथा पदेन सचिव भारत सरकार
GHANSHYAM PRASAD
Chairperson & Ex-officio Secretary
To the Government Of India

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Foreword

With the rapid growth of variable and intermittent renewable energy sources such as solar and wind, the Indian power system is witnessing increasing requirements for flexibility, balancing power, and long-duration energy storage to ensure reliable, resilient, and secure grid operation. In this context, Pumped Storage Projects (PSPs) have emerged as a critical enabler, offering proven, clean, and large-scale energy storage solutions that support renewable integration, provide grid inertia, and enhance overall system stability.

2. Thrust is on Capacity addition from RE generation Sources. It is projected that the non-fossil fuel based installed capacity is likely to increase to 500 GW by 2030, 701 GW by 2035 and 2187 GW by 2047 on the basis of Generation planning studies. Resource Adequacy Studies have been carried out by CEA for all the states till 2034-35 and it has been found that long term storage (6 Hrs.) would be required for integrating higher quantum of RE beyond 2030. In this regard, PSPs provide a comprehensive solution for meeting future storage capacity requirement at reasonable cost along with ensuring grid reliability by providing frequency regulation and voltage support, acting as a safety net for rapid changes in RE output and preventing blackouts.

3. As per Studies, the requirement of Storage Capacity on all-India basis is projected to increase to 62 GW by 2029-30; 161 GW by 2034-35 and 476 GW by 2046-47.Recognizing the strategic importance of PSPs, the Central Electricity Authority has prepared this report titled **"Roadmap to 100 GW of Hydro Pumped Storage Projects (PSPs) by 2035–36"**. The report presents a comprehensive assessment of the current status of pumped storage development in the country, key policies, regulatory, institutional, and infrastructural measures necessary to facilitate timely and viable development of 100 GW of PSPs by 2035-36 i.e. in next 10 years.

4. This report will serve as a useful reference for utilities, developers, and provide a structured framework for achieving the objective of **100 GW or more of pumped storage capacity by 2035–36**, thereby strengthening India's clean, secure, and sustainable energy future. I thank Member (Hydro), Chief Engineer (HPP&I), officers of Central Electricity Authority (CEA), and all the stakeholders i.e. the Hydro PSP developers, State Power utilities, the equipment manufacturers etc. for their sincere efforts in preparing this report.

(Ghanshyam Prasad)

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Roadmap to 100 GW of Hydro Pumped Storage Projects (PSPs) by 2035-36

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Introduction

1.1 Background

India is on the path towards a clean energy transition, guided by the Nationally Determined Contribution (NDC) targets, to reduce the emission intensity of its Gross Domestic Product (GDP) by 45% by 2030, get to 50% of installed capacity from non-fossil fuel sources creating a 2.5-3.0 Billion tonne carbon sink by 2030 and achieve net zero carbon emissions by 2070. It is noteworthy to mention that the target of achievement of 50% of installed capacity from non-fossil fuel sources has been achieved in July 2025 itself, five years earlier than stipulated target. Given this ongoing Energy Transition in the country, the development of PSPs is of paramount importance for providing greater inertia and balancing power to the grid.

India has accelerated the pace of energy transition, with a strong push towards a growing share of Variable and Intermittent Renewable Energy Sources (VRES) such as solar and wind in the energy mix.

While these sources are essential for a cleaner and more sustainable energy future, their variability creates challenges for maintaining a stable and reliable operation in the power system. Solar and wind generation fluctuate according to natural conditions, leading to a mismatch between generation and demand at different times of the day. This increases the need for solutions that can ensure steady and predictable power availability and support grid stability. To address these challenges, the power sector requires reliable options for energy storage and ancillary services, along with strong policy direction. Therefore, comprehensive and clear storage roadmap is needed to provide a structured path for future development and investment in storage technologies.

Among the various technologies capable of meeting the increasing need for storage and ancillary services, Pumped Storage Projects (PSPs) stand out as one of the most suitable and dependable options. PSPs are clean, domestically available, proven at large MW-scale, and widely accepted internationally. Their benefits extend well beyond storage and grid support. PSPs are environmentally friendly and safe and do not face disposal challenges, unlike some other storage technologies. They are green, long-lasting, and capable of providing large-scale flexibility required for integrating high levels of VRES. The promotion of PSPs is supported not only by their usefulness in balancing renewable energy and maintaining grid stability but also by their wider environmental advantages compared to other energy storage systems.

Panchamrit Climate Commitments:

The five major goals under India's Panchamrit climate commitments are: achieving 500 GW of non-fossil fuel energy capacity by 2030, meeting 50% of

installed capacity from non-fossil sources by 2030, reducing projected carbon emissions by 1 billion tonnes by 2030, lowering the carbon intensity of GDP by 45% (in comparison to 2005) and attaining net-zero emissions by 2070.

As on 31/12/2025 the India's total installed capacity has already crossed 500 GW. Out of 509.7 GW, 262.8 GW (51.6%) is from Non fossil fuel. The total installed renewable energy capacity is 254 GW with solar and wind contributing to 133 GW and 54 GW respectively.

Projection by 2035-36

Considering the projections of CEA, total installed capacity of PSPs is expected to reach ~87GW by 2033-34. The average capacity addition per year is going to be 9 GW per year. Accordingly, the installed PSP capacity is expected to cross 100 GW by 2035-36. This is based on present scenario. However, with increasing potential especially under off stream close loop PSP with gestation period of around 4 years, the commissioning may get accelerated during later years.

1.2 Perspectives

(a) Need for Flexible Generation

Flexible Energy Generation Assets that can supply both Base Load & Peaking Power efficiently and economically are the need of the hour and necessary to address the dynamically evolving energy needs of India. At present, Variable Renewable Energy Sources (VRE) such as wind and solar are being connected to the grid at a rapid pace owing to their low cost of installation and the thrust on sustainable and green energy. The energy supply from VREs cannot be regulated since they are dependent on the time of the day, seasons, and the vagaries of weather. Hence, there is an ever- increasing demand for Energy Storage Assets. PSPs, also known as the Water Battery, are best suited in the present scenario for addressing this demand and are an ideal complement to modern clean energy systems.

PSPs provide the necessary scale of storage and have a long service life of around 100 years with periodic Renovation and Modernization after 40 years. Life of Dam is considered as 100 years. This is much more than any other energy storage technology presently available. This also results in a low cost of delivered energy over the life of the projects. PSPs are also non-polluting and are more environmentally friendly and account for over 95% of installed global energy storage capacity. It is estimated that pumped hydro projects worldwide store up to 9,000 Gigawatt hours (GWh) of electricity worldwide.

(b) Energy Transition Considerations:

Given the ongoing energy transitions in the country, the development of PSPs is of paramount importance for providing greater inertia and balancing power

to the grid as battery storage solutions are still being scaled up and are required for short duration storage needs in grid management, PSPs are a natural enabler for integrating greater amounts of wind and solar power. With its ability to store a large amount of energy, frequent starts/stops, and faster ramp ups/ramp-downs, PSPs are ideally suited to address the dynamic supply and demand. PSPs can also be used for peaking operation and improve the reliability of the power system.

(c) Ancillary Services Considerations:

Wind and Solar power have become one of the lowest-cost sources of renewable energy. However, their inherent variable, uncertain and intermittent nature presents a huge challenge for integrating large quantities of renewables, while maintaining grid stability. Curtailment of wind and solar power is already being witnessed in some areas although they presently cater to only around 25% of total energy needs. With the increasing presence of VREs, the need for curtailment will be more acute if there is insufficient storage in the grid. PSPs present a viable solution to the integration issues of large RE capacities. They are best equipped for peak load requirements. PSPs can store a large amount of energy during off-peak hours and discharge over longer period. Thus, PSPs would help reduce RE curtailment and improve the plant load factor of VREs.

(d) Temporal Considerations:

It is anticipated that with the increasing presence of VRE in the energy mix, the generation of wind and solar energy may be at its peak where the energy demand is the lowest. If the energy from these sources is not stored during off-peak hours in times to come, there will be an increasing need for large operating reserves from thermal power plants (typically high carbon coal and gas) to meet the peak demands of the country. PSPs provide an economical solution by off taking a large amount of energy from the grid during off-peak hours, increasing the load factor of other systems, and also providing additional capacity to meet the peak loads. Pumped hydro storage provides a dynamic response and offers critical backup during periods of excess demand along with maintaining grid stability. Without PSPs, full decarbonisation of the electricity sector will not be achievable at reasonable costs. Thus, PSPs provide 'green storage' and make VRES dispatchable by firming up the capacities.

(e) Supply Chain Consideration:

Although off late manufacturing units have been established in India for manufacturing of solar panels but for most of them, the input is intermediate product in supply chain say silicon Ingots, solar cells etc. The demand is high and imported solar panels even after paying customs duty and countervailing GST are cheaper than domestic produce. This inflated supply not only stress Foreign Exchange Reserves but in case of any Geopolitical event, may disrupt the supply chain altogether. Thus, in line with "Atmanirbhar" initiation wherein, thrust needs to be given on indigenous manufacturing like PSPs.

(f) There is growing reliance on longer-duration storage solution to accommodate rising demand, to effectively utilize surplus renewable energy generation and strengthen system stability across RE-rich states. The likely broader shift toward layer duration storage is driven by their ability to effectively utilize excess generation in solar hours while providing sufficiently long discharge capability to manage evening peaks and non-solar period demand.

Chapter 2
Pumped Storage Projects

Pumped Storage Projects are large-scale energy storage systems that use the gravitational potential of water to store and generate electricity. They operate by pumping water from a lower reservoir to an upper reservoir during periods of low electricity demand or surplus renewable generation, and releasing it back through turbines to produce power during peak demand. PSPs provide highly reliable, flexible and fast-responding balancing support to the grid, making them essential for integrating variable renewable energy sources such as solar and wind. With long life cycles, proven technology, and the ability to deliver gigawatt-scale, long-duration storage, PSPs play a critical role in ensuring grid stability, energy security, and efficient utilisation of existing power infrastructure.

2.1 Need for Pumped Storage Projects (PSPs):

Pumped Storage Projects (PSPs) are essential for ensuring the smooth integration of the rapidly growing share of renewable energy sources—particularly variable and intermittent solar and wind—into the national grid, alongside emerging technologies such as Electric Vehicles (EVs), thereby enabling a quality, reliable and secure power supply. Globally, PSPs account for over 95% of installed energy storage capacity, storing nearly 9,000 GWh of electricity, underscoring their proven effectiveness as large-scale storage solutions. They are capable of providing gigawatt-scale storage with long-duration discharge of up to about eight hours a day, and offer operational flexibility through frequent start–stop operations and fast ramping capabilities. With a long life cycle of around 100 years (with periodic R&M of electro-mechanical systems), PSPs remain a durable and sustainable asset. Being a clean and green technology with high domestic content, they contribute to *Atmanirbharta* in the energy sector. PSPs play a vital role in meeting peak demand, providing balancing and firm dispatchable power, and maximising utilisation of existing transmission and distribution infrastructure by deferring the need for additional investments.

2.2 Advantages of Pumped Storage Projects

(a) Ecologically friendly: PSPs would have minimal impact on the environment in their vicinity as they are mainly being developed as off the-river projects. All components of PSPs would be connected, operated, and maintained in an environmentally friendly manner. There are no residual environmental impacts in the case of PSPs.

(b) Atmanirbhar Bharat: The guidelines for the development of storage systems synchronize with the vision of Atmanirbhar Bharat. The PSPs primarily use indigenous technologies and domestically produced materials. Most of the electrical & mechanical parts of PSPs are also made

in India. Other alternate solutions to storage such as batteries are heavily import-dependent.

(c) Tested Technology: The PSPs operate on time-tested technology thereby infusing confidence in the lending institutions for a longer duration of loans Additionally, the cost of technologies involved in the construction has reduced rendering PSPs a viable proposition. The technological surety associated with PSPs has opened the possibility for the developers to claim a higher debt-equity ratio in the projects.

(d) Local developmental: The development of PSPs is highly capital intensive and involves the development of local transport infrastructure for the mobilization of men and materials. Local industries such as cement and steel also get impetus and drive job creation in the economy. This in turn will have a salutary effect on local area development. PSPs are an ideal investment for socio-economic and regional development considerations like infrastructure up-gradation and employment generation.

(e) Longer and reliable duration of storage: PSPs are generally designed for a longer duration of discharge of more than 6 hours to meet the peak demand or for compensating the variability in the grid due to VRES. Currently, Battery Energy Storage Systems are designed for up to 4 hours of discharge. The firm capacity of PSPs during peak hours is guaranteed.

(f) Inertia: For stability of the Grid, Resilience of Grid is of paramount importance and the same is dependent on Inertia. Inertia can be provided by a rotating mass. As thermal units will get retired on one side and VREs get increasingly added in the Grid and combined with slow pace of addition of Hydro Storage Projects, PSPs standout as ray of hope. Artificial inertia (synthetic/virtual inertia) by fast acting electronics has its limitations.

(g) Last but not the least, PSPs improve CUF of Solar Projects by utilising the excess solar energy in the Grid when Grid does not require it. Without PSPs, Solar Projects will increasingly see backdown in generation.

2.3 Types of PSPs:

Pumped Storage Schemes may be classified into following three types:

(a) **On-stream pumped storage scheme**- Both reservoirs are located on any river/ stream/ nallah.

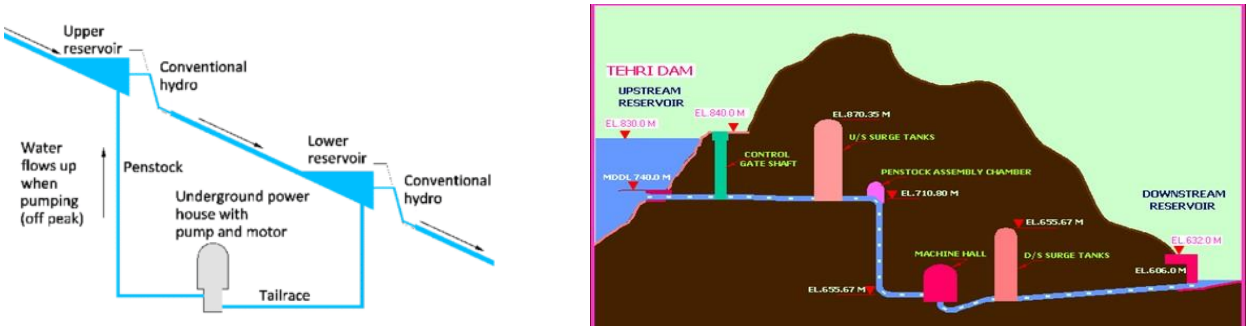

Fig.1-On-stream pumped storage scheme

(b) **Off-stream open loop pumped storage scheme**- One reservoir is located on river/ stream/ nallah. Other reservoir (off-stream reservoir) is not located on any river/ perennial stream/ perennial nallah. If off-stream reservoir is located on any non-perennial stream/ nallah, then

(i) Suitable provision shall be made for diversion of non-perennial stream/ nallah to its downstream and/or release of water of the non-perennial stream/ nallah to its downstream through body of dam/ barrage/ embankment etc.

(ii) The water of rainfall yield of self-catchment of the reservoir shall be released to downstream through body of dam/ barrage/ embankment etc.

(iii) The water for filling of reservoir/ recoupment of evaporation and re-circulation losses shall be met from a source other than the rainfall yield of catchment of non-perennial stream/ nallah

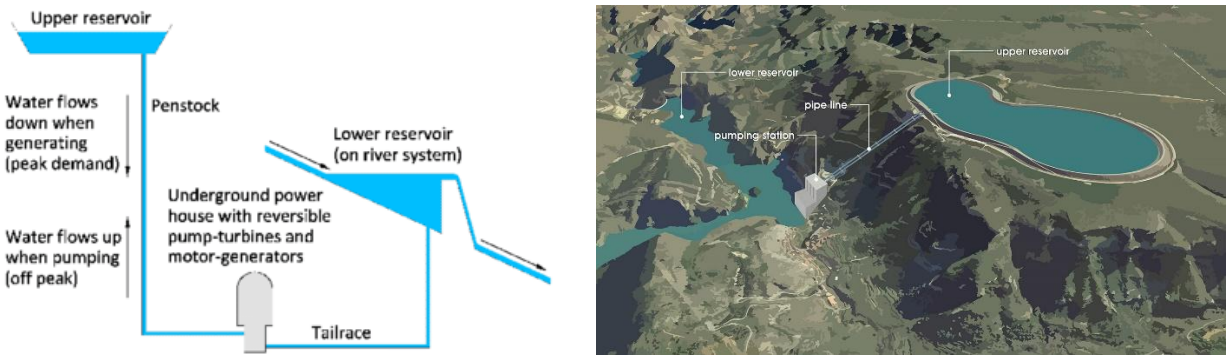

Fig.2- Off-stream open loop pumped storage scheme

(c) **Off-stream closed loop pumped storage scheme**- None of the reservoirs is located on any river/ perennial stream/ perennial nallah. If any reservoir is located on a non-perennial stream/ nallah, then

(i) Suitable provision shall be made for diversion of non-perennial stream/ nallah to its downstream and/or release of water of

the non-perennial stream/ nallah to its downstream through body of dam/ barrage/ embankment etc.

(ii) The water of rainfall yield of self-catchment of the reservoir shall be released to downstream through body of dam/ barrage/ embankment etc.

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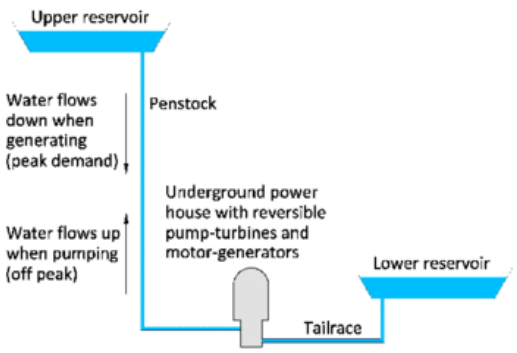


Fig.3-Off-stream closed loop pumped storage scheme

Efforts are being made to identify off-stream PSPs located away from rivers, for faster execution and minimal environmental impact. Off-stream Pumped Storage Projects offer several significant advantages, as they are located away from natural water bodies and river systems, thereby minimizing impacts on aquatic ecology and surrounding environment. With typically lower land-use conflicts, off-stream PSPs facilitate smoother project development and community acceptance. Additionally, their siting away from active river course leads to reduced issues of erosion and sedimentation, contributing to better long-term sustainability and operational reliability. As off stream closed loop PSPs are not on river, therefore design considerations for PMF/SPF and GLOF are normally not required.

A comparison of all three types is given below:

Aspect	**On-Stream (Open-Loop)**	**Off-Stream Open-Loop**	**Off-Stream Closed-Loop**
Aquatic Resources	Higher due to damming rivers, affecting water quality, quantity, and fish.	Similar to on-stream but lower if avoiding main channels; still impacts natural flows.	Lower overall; minimal ongoing river ties, though initial fill may affect sources.
Geology/Soils	Lower; often uses existing river dams.	Moderate; Generally, needs one new reservoir.	Moderate; Requires two reservoirs, more excavation.

Aspect	On-Stream (Open-Loop)	Off-Stream Open-Loop	Off-Stream Closed-Loop
Cost	Lower initial costs using natural features. (Cost may increase if the distance between reservoir is more or head between to reservoir is less)	Moderate costs.	Moderate due to construction of 2 reservoir but there is flexibility in location of reservoir.
Aquatic Ecology	Higher; daily pumping harms fish via entrainment.	Moderate; less river flow disruption.	Lowest; no continuous natural water ties.
Water Quality /Quantity	Higher ongoing impacts from river exchanges.	Similar to on-stream but reduced exposure.	Lower; periodic refill only, evaporation losses.
Groundwater Effects	Minimal unless seepage.	Low.	Very Low In India initial filling of PSP reservoirs and recoupment of evaporation losses using groundwater is generally not permitted. Instead, initial filling and subsequent makeup water requirements are typically met from surplus or excess water available during the monsoon season.
Flexibility/ Efficiency	Good ramp rates limited by fish protections.	Similar limitations.	Highest; unlimited ramping, >80% efficiency.
Gestation Period	Higher (Usually more than 4.5 years after start of construction, connection with both reservoir is a bit challenging task)	Moderate (Usually more than 4 years after start of construction)	Less (Usually less than 4 years after start of construction)

2.4 Advantages of Off Stream Closed loop PSP:

(a) Minimal environmental and social impact as off-stream closed-loop PSPs do not involve damming or diversion of natural rivers, thereby avoiding downstream flow alteration.
(b) Faster statutory clearances compared to conventional hydropower projects due to reduced impact on river ecology, aquatic life, and sediment transport.
(c) Lower rehabilitation and resettlement issues since reservoirs are generally located away from habitations and agricultural land.
(d) Reduced hydrological risk as project operation is independent of seasonal river inflows and monsoon variability.
(e) Greater operational flexibility, enabling reliable daily and weekly cycling to support renewable energy integration.

(f) Improved grid reliability through provision of peaking power, frequency regulation, spinning reserve, and black-start capability.
(g) Higher site availability across the country as projects can be developed wherever suitable topography and elevation difference exist.
(h) Enhanced water-use efficiency with limited makeup water requirement, mainly to compensate for evaporation losses.
(i) Better public acceptance due to minimal impact on river systems, forests, and biodiversity.
(j) Easier scalability and replication, supporting faster capacity addition to meet national energy-storage targets.
(k) In general, the gestation period of an Off Stream Closed Loop Pumped Storage Project is approximately 3.5 to 4 years, depending on site characteristics and project configuration.

Chapter 3
Requirement of PSP as per Resource Adequacy Plan

Ministry of Power has notified the Resource Adequacy (RA) Guidelines in June 2023. According to these Guidelines, Central Electricity Authority (CEA) is entrusted with the responsibility of preparing the Long-Term National Resource Adequacy Plan (LT-NRAP). Further, each Distribution Utility is required to carry out a Long-Term Distribution Licensee Resource Adequacy Plan (LT-DRAP) with a 10-year planning horizon, to reliably meet its peak electricity demand and electrical energy requirements. The LT-DRAP shall be prepared by the Distribution Licensees on an annual rolling basis, factoring in the already contracted capacity and optimising the requirement for additional capacity.

In the initial years, CEA is handholding the Distribution Utilities and is helping them in preparation of the Resource Adequacy Plan.

Section 3(4) of Electricity Act, 2003 stipulates that, the Central Electricity Authority (CEA) shall prepare a National Electricity Plan in accordance with the National Electricity Policy and notify such plan once in five years.

In view of large amount of Variable RE based generation likely to be integrated in the grid in the future, Energy storage technology is found to be useful in maintaining grid stability and reliability by storing excess generation over different time horizons (minutes, days, weeks) and meeting the peak demand which is not coincidental with the peak RE generation.

Storage has the ability to offer ancillary services (frequency control), enable peak saving and reduce reliance on fossil fuels, making renewables a reliable, primary power source. Storage is likely to play a crucial role for achieving the long-term vision of Viksit Bharat @ 2047 and Net Zero Target by 2070.
PSPs (Pumped Storage Projects) offer long duration storage (6 + hrs) with a long life, and provide grid stability (frequency regulation, spinning reserve, black start etc.).

3.1 Requirement of Storage in the Grid

Thrust is on Capacity addition from RE generation Sources. It is projected that the non-fossil fuel based installed capacity is likely to increase to 500 GW by 2030, 701 GW by 2035 and 2187 GW by 2047 on the basis of Generation planning studies. Resource Adequacy Studies have been carried out by CEA for all the states till 2034-35 and it has been found that long term storage (6 hrs) would be required for integrating higher quantum of RE beyond 2030. In this regard, PSPs provide a comprehensive solution for meeting future storage capacity requirement at reasonable cost along with ensuring grid reliability by providing frequency regulation and voltage support, acting as a safety net for rapid changes in RE output and preventing blackouts.

As per Studies, the requirement of Storage Capacity on all-India basis is projected to increase to 62 GW by 2029-30; 161 GW by 2034-35 and 476 GW by 2046-47. Year-wise details are given below:

	2025-26	**2026-27**	**2027-28**	**2028-29**	**2029-30**	**2030-31**	**2031-32**	**2032-33**	**2033-34**	**2034-35**	**2046-47**
Projected Peak Electricity Demand (GW)	270	289	305	325	345	364	388	407	427	446	708
Projected Electrical Energy Requirement (BU)	1804	1929	2072	2227	2388	2546	2703	2874	3045	3215	5230
Requirement of Cumulative Installed Capacity of Energy Storage System (GW)	9	17	26	42	62	72	93	118	143	161	476
Capacity addition requirement of Energy Storage System (GW)		8	9	16	20	10	21	25	25	18	315
Likely PSP capacity addition (GW) as on 30.11.2025		2.92	1.16	6.35	13.5	21.19	8.8	13.74	11.8		

The capacity (GW/GWh) of Energy Storage Systems in the year 2026-27, 2029-30, 2031-32, 2034-35 and 2046-47 is given below:

Year	Capacity (GW/GWh)
2026-27	17/76
2029-30	62/290
2031-32	93/450
2034-35	161/768
2046-47	476/2687

Based on Resource Adequacy Plan for States till 2034-35, required installed capacity of Energy storage systems in major states is given below:

State	**Likely Installed Capacity of Energy Storage System in 2034-35 (MW)**
Andhra Pradesh	6570
Bihar	4770
Chhattisgarh	4794

State	Likely Installed Capacity of Energy Storage System in 2034-35 (MW)
DVC	5998
Delhi	1754
Gujarat	13532
Haryana	5307
Himachal Pradesh	1116
J&K and Ladakh	3666
Jharkhand	700
Karnataka	15752
Kerala	550
Madhya Pradesh	11493
Maharashtra	2844
Odisha	2825
Punjab	2812
Rajasthan	11323
Tamil Nadu	13581
Telangana	7917
Uttar Pradesh	25437
Uttarakhand	1416
West Bengal	5119
Total	**149276**

The storage requirement can be met either through Hydro PSP or BESS or a combination of both. BESS is suitable for short duration storage and PSPs are suitable for long duration storage. Based on the studies carried out by CEA, it has been found that long term storage (6 hrs) is required for integrating higher quantum of RE beyond 2030. Due to inherent long duration storage offered by PSPs, it is planned to prioritize commissioning of hydro PSPs to be used as Energy Storage System.

Long duration energy storage will be crucial for supply of RE RTC power to Commercial & Industrial (C&I) Consumers. PSP as energy storage system will also serve the purpose of providing long duration storage associated with RE RTC power.

Chapter 4
Potential and Status of Development of Pumped Storage

India has a very large potential for Pumped Storage Projects (PSPs) both on river and off-river schemes. Presently, India's pumped storage potential is about 267 GW, which includes 58 GW of on-stream PSPs and 209 GW of off-stream PSPs.

As on 31st December 2025, 10 Nos. of PSPs with installed capacity of 7 GW are in operation and 10 Nos. of PSPs with a total capacity of 12 GW are in the under-construction stage. Projects with DPRs concurred by CEA but yet to be started account for 9.6 GW. In the Survey & Investigation stage, 54 PSPs with a total installed capacity of 75 GW include 52 closed-loop PSPs designed exclusively for storage rather than river-dependent generation. This means the country has many suitable locations where PSPs can be built to store electricity on a large scale.

States like Andhra Pradesh, Maharashtra, Madhya Pradesh, Karnataka, Odisha, Uttar Pradesh etc. offer good sites for such projects. Developing PSPs in these regions will help improve grid reliability, provide steady power during peak hours, reduce wastage of renewable energy, and support India's growing energy needs in a clean and sustainable way.

The assessed Pumped Storage Project (PSP) potential in India has shown a sharp and continuous increase over recent years, rising from about 97,565.6 MW as on 31.12.2022 to 124,290.6 MW as on 31.12.2023, further to 183,330.6 MW as on 31.12.2024, and reaching 266,845.6 MW as on 31.12.2025. This significant year-on-year growth largely reflects the increasing identification of off-stream closed-loop PSPs, which are predominantly self-identified by developers based on evolving technical, topographical, and commercial considerations. As a result, the total PSP potential is inherently dynamic. The figures are therefore updated by CEA on a continuous basis, as and when new proposals are formally informed and submitted by developers.

The summary of status of the development of pumped storage project in the country as on 31.12.2025 is as follows:

	ON STREAM PSPs		**OFF STREAM PSPs**		**TOTAL PSPs**	
Category	**No. of projects**	**Capacity (MW)**	**No. of projects**	**Capacity (MW)**	**No. of projects**	**Capacity (MW)**
Potential*	**64**	**57826**	**184**	**209020**	**248**	**266846**

Installed Capacity #	9	5496	**1**	1680	10	**7176**
Under Construction #	4	4100	6	7520	10	**11620**
DPR concurred/appraised by CEA	1	1000	5	8580	6	**9580**
Under Examination	1	640	-	-	1	**640**
Under S&I	2	1500	52	73440	54	**74940**
Grand Total (Commissioned and under development projects)	**17**	**12736**	**64**	**91220**	**81**	**103956**

*Exploitable Potential is subject to change with time due to addition/deletion of project and change in Installed capacity of Projects. It is changing every month with new identified PSPs.

#Out of total four units (4 x 250 MW) three units of Tehri PSP (750MW) have been commissioned during June, July and December 2025 and therefore, one unit of Tehri PSP is under construction.

4.1 In-operation pumped storage projects:

As on 31.12.2025, 10 Nos. of pumped storage projects with aggregate installed capacity of 7175.6 MW are in-operation in the country. Details of these projects are given below:

S No	Projects	Developer	State	Type	Installed Capacity (MW)
1	Tehri (3 units commissioned out of 4 units)	THDC	Uttarakhand	On Stream	750
2	Ghatgar	MAHAGENCO	Maharashtra	On Stream	250
3	Purulia	WBSEDCL	West Bengal	Off Stream (Closed Loop)	900
4	Srisailam LBPH	TSGENCO	Telangana	On Stream	900

S No	Projects	Developer	State	Type	Installed Capacity (MW)
5	Kadamparai	TANGEDCO	Tamil Nadu	On Stream	400
6	Nagarjuna Sagar	TSGENCO	Telangana	On Stream	705.60
7	Bhira	TATA Power	Maharashtra	On Stream	150
8	Kadana #	GSECL	Gujarat	On Stream	240
9	Sardar Sarovar Project #	SSNNL	Gujarat	On Stream	1200
10	Pinnapuram	Greenko Ltd	Andhra pradesh	Off Stream (Closed Loop)	1680
Total					**7175.6**

Sardar Sarovar (1200 MW) & Kadana (240 MW) are not operational in pumping mode. As per the latest development of Sardar Sarovar, all the stakeholders have agreed to carry on the changes to operationalize this project in pumping mode. The pumping mode is expected to be operationalize by June, 2028.

4.2 Under-Construction Pumped Storage Projects:

As on 31.12.2025, 10 Nos. of pumped storage projects with aggregate installed capacity of 11620 MW are under-construction in the country. Details of these projects are given below:

S No	Projects	Developer	State	Type	Installed Capacity (MW)
1	Tehri (1 unit under construction out of 4 units)	THDC	Uttarakhand	On Stream	250
2	Kundah (Stage I,II&III)	TANGEDCO	Tamil Nadu	On Stream	500
3	Upper Sileru	APGENCO	Andhra Pradesh	On Stream	1350
4	Sharavathy	KPCL	Karnataka	On Stream	2000

S No	Projects	Developer	State	Type	Installed Capacity (MW)
5	Chitravathi	Adani Renewable Energy Forty-Two Limited	Andhra Pradesh	Off Stream (Open Loop)	500
6	Bhivpuri	TATA Power	Maharashtra	Off Stream (Open Loop)	1000
7	MP30 Gandhisagar	Greenko MP01 IREP Private Limited	Madhya Pradesh	Off Stream (Open Loop)	1920
8	Saundatti	Greenko KA01 IREP Private Limited	Karnataka	Off Stream (Open Loop)	1600
9	Gandikota	Adani Renewable Energy Fifty One Limited	Andhra Pradesh	Off Stream (Open Loop)	1000
10	Bhavali	JSW Energy PSP Two limited	Maharashtra	Off Stream (Open Loop)	1500
Total					**11620**

4.3 Pumped Storage Projects Concurred by CEA and yet to be taken up for construction

As on 31.12.2025, 6 Nos. of pumped storage projects with aggregated installed capacity of 9580 MW are concurred by CEA and yet to be taken up for construction. Details of these projects are given below:

S No	Projects	Developer	State	Type	Installed Capacity (MW)	Date of concurrence	Date of anticipated commissioning	Reasons for not taken under construction
1.	Turga	WBSEDCL	West Bengal	On Stream	1000	05.10.16	Jan'2032	Award of contract packages is under progress.
2.	Kandhaura	JSW Energy PSP Six ltd	Uttar Pradesh	Off Stream (Closed loop)	1680	13.06.2025	Oct'2029	EC recommended by EAC in meeting held on 30.07.2025.

S No	Projects	Developer	State	Type	Installed Capacity (MW)	Date of concurrence	Date of anticipated commissioning	Reasons for not taken under construction
								FC yet to be obtained.
3.	Upper Indravati	OHPC	Odisha	Off Stream (Open loop)	600	19.08.24	Dec'2032	EC&FC yet to be obtained.
4.	Shirwata	Tata Power	Maharashtra	Off Stream (Open loop)	1800	07.09.2025	Jul'2030	EC recommended by EAC in meeting held on 26.09.2025. FC yet to be obtained.
5.	Pane	JSW Energy	Maharashtra	Off Stream (Open loop)	1500	18.09.2025	Jul'2030	EC&FC yet to be obtained.
6.	Karjat (Saidongar -1)	Torrent Power	Maharashtra	Off Stream (Open loop)	3000	09.01.2026	Nov' 2030	EC&FC yet to be obtained.
Total					**9580**			

4.4 Pumped Storage Projects under examination in CEA

The Indira Sagar PSP (640 MW) in Madhya Pradesh is proposed as a on-stream project utilizing the existing Indira Sagar Dam reservoir as the upper reservoir and Omkareshwar Dam as the lower reservoir and is presently under examination in CEA and shall be taken up for concurrence after examination.

4.5 Pumped Storage Projects under Survey and Investigation:

As on 31.12.2025, 54 Nos. of pumped storage projects with aggregate installed capacity of 74940 MW are under Survey and Investigation in the country. Details of these projects are given below:

S.No.	Project	State	Installed Capacity (MW)	Type	Agency
1	Vempalli	Andhra Pradesh	1500	Off Stream (Closed)	JSW Energy
2	Kamalapadu	Andhra Pradesh	950	Off Stream (Closed)	APGENCO

S.No.	Project	State	Installed Capacity (MW)	Type	Agency
3	Rayavaram	Andhra Pradesh	1500	Off Stream (Closed)	APGENCO & ONGC
4	Gadikota	Andhra Pradesh	1200	Off Stream (Closed)	APGENCO & NHPC
5	Pedakota	Andhra Pradesh	1800	Off Stream (Closed)	Adani Green
6	Raiwada	Andhra Pradesh	900	Off Stream (Closed)	Adani Green
7	Gujjili	Andhra Pradesh	2400	Off Stream (Closed)	NECL
8	Chittamvalasa	Andhra Pradesh	1800	Off Stream (Closed)	NECL
9	Howraghat	Assam	1500	Off Stream (Closed)	Adani Green
10	Moti Hojai	Assam	1200	Off Stream (Closed)	Adani Green
11	Bilaspur	Chhattisgarh	1000	Off Stream (Closed)	Jindal Renewables
12	Hasdeo bango	Chhattisgarh	800	Off Stream (Open)	CSPGCL
13	Sikaser	Chhattisgarh	1200	Off Stream (Open)	CSPGCL
14	Rouni	Chhattisgarh	2100	Off Stream (Open)	CSPGCL
15	Dangari	Chhattisgarh	1400	Off Stream (Open)	CSPGCL
16	Motaraypura	Gujarat	1000	Off Stream (Open)	GSECL
17	Dharoi	Gujarat	1250	Off Stream (Open)	GSECL
18	Serula	Gujarat	960	Off Stream (Closed)	GSECL
19	Juni kayaliwel	Gujarat	300	Off Stream (Closed)	GSECL
20	Amalpada	Gujarat	300	Off Stream (Closed)	GSECL
21	Juni Bavli	Gujarat	450	Off Stream (Open)	GSECL
22	Satkashi	Gujarat	330	Off Stream (Closed)	GSECL

S.No.	Project	State	Installed Capacity (MW)	Type	Agency
23	Ukai	Gujarat	1600	Off Stream (Closed)	Greenko
24	Narihalla	Karnataka	300	Off Stream (Open)	JSW Energy
25	Koyna Nivakane	Maharashtra	2700	Off Stream (Closed)	Adani Green
26	Kamod	Maharashtra	2000	Off Stream (Closed)	Megha Engineering
27	Ghosla	Maharashtra	2000	Off Stream (Closed)	Megha Engineering
28	Nayagaon	Maharashtra	2000	Off Stream (Closed)	Greenko
29	Pawana Falyan	Maharashtra	2400	Off Stream (Closed)	Avaada
30	Warasgaon warangi	Maharashtra	1500	Off Stream (Closed)	Adani Green
31	Adnadi	Maharashtra	1500	Off Stream (Closed)	Adani Green
32	Kumbhe	Maharashtra	1100	Off Stream (Open)	NTPC
33	Malshej Ghat	Maharashtra	1200	Off Stream (Closed)	THDC
34	Malshej Ghat Bhorande	Maharashtra	1500	Off Stream (Closed)	Adani Green
35	Kalu	Maharashtra	1800	Off Stream (Closed)	NHPC
36	Tarali	Maharashtra	1500	Off Stream (Open)	Adani Green
37	Maval (Saidongar -2)	Maharashtra	1200	Off Stream (Open)	Torrent Power
38	Savitri	Maharashtra	2400	Off Stream (Open)	NHPC
39	Upper Kolab	Odisha	600	Off Stream (Open)	OHPCL
40	Balimela	Odisha	500	On Stream	OHPCL

S.No.	Project	State	Installed Capacity (MW)	Type	Agency
41	Masinta	Odisha	1000	Off Stream (Closed)	NHPC
42	Shahpur	Rajasthan	1800	Off Stream (Closed)	Greenko
43	Sirohi	Rajasthan	1200	Off Stream (Closed)	JSW Energy
44	Brahmani	Rajasthan	600	Off Stream (Closed)	ACME Urja Two Private Limited
45	Sukhpura Off-Stream	Rajasthan	2560	Off Stream (Closed)	Greenko
46	Upper Bhavani	Tamil Nadu	1000	On Stream	NTECL
47	Longtarai	Tripura	800	Off Stream (Closed)	NHPC
48	Jhariya	Uttar Pradesh	1620	Off Stream (Closed)	Jhariya AnantUrja
49	UP01	Uttar Pradesh	3660	Off Stream (Closed)	Greenko
50	Chichlik	Uttar Pradesh	1560	Off Stream (Closed)	Avaada
51	Musakhand	Uttar Pradesh	600	Off Stream (Closed)	ACME Urja Two Private Limited
52	Shoma	Uttar Pradesh	2400	Off Stream (Closed)	Torrent Power
53	Panaura	Uttar Pradesh	1500	Off Stream (Closed)	Adani Green
54	Kalu Patti	Uttar Pradesh	1000	Off Stream (Closed)	Renew Hydro
Total (Under S&I)			**74940**		

Abbreviations: NTECL: NTPC Tamilnadu Energy Company Limited, CSPGCL: Chhattisgarh State Power Generation Company Limited, NHPC: National Hydroelectric Power Corporation, GSECL: Gujarat State Electricity Corporation Limited, THDC: Tehri Hydro Development Corporation of India, OHPCL: Odisha Hydro Power Corporation Limited, APGENCO: Andhra Pradesh Power Generation Corporation Limited, NECL: Navayuga Engineering Company Limited

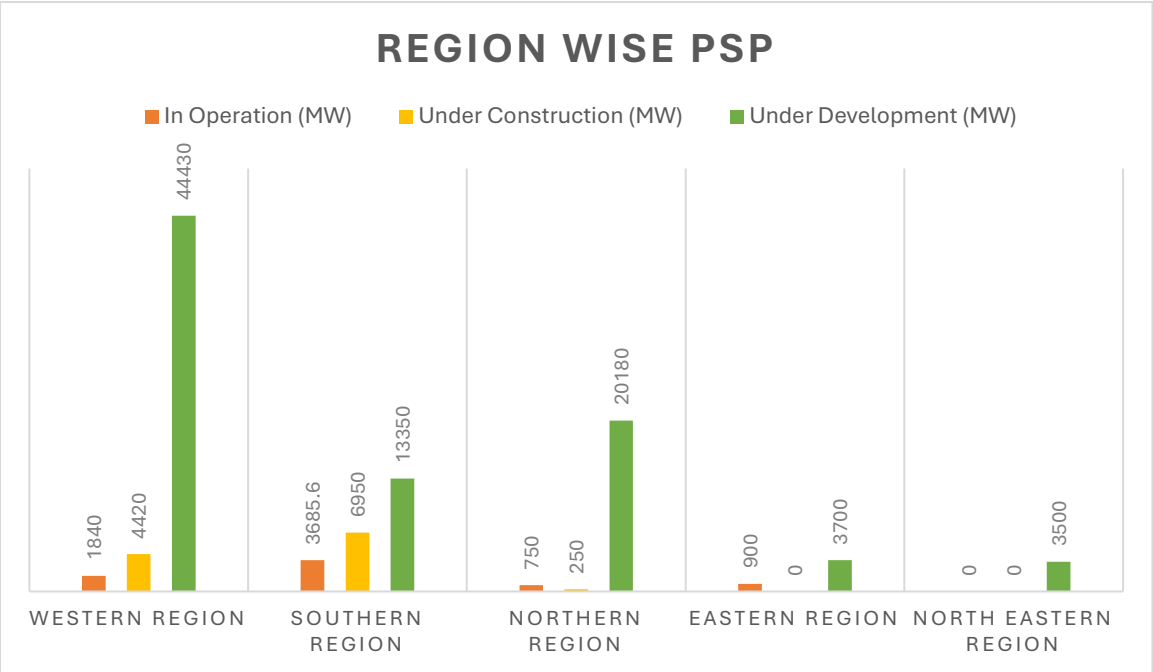
4.6 Region-wise and State-wise Pumped Storage Project

Summary of Region-wise and State-wise Pumped Storage Project development in the country is given below:

Region/ State	Pumped Storage Projects Potential	In Operation	Under Construction	Concurred by CEA and yet to be taken up for construction	Under Examination in CEA	Under S&I / DPR Preparation
	(MW)	(MW)	(MW)	(MW)	(MW)	(MW)
NORTHERN REGION						
Himachal Pradesh	7260.0	-	-	-	-	-
Rajasthan	12560.0	-	-	-	-	6160
Uttarakhand	2000.00	750	250	-	-	-
Uttar Pradesh	17620.0	-	-	1680	-	12340
Sub Total (NR)	**39440.00**	**750**	**250**	**1680**	**0.00**	**18500**
WESTERN REGION						
Madhya Pradesh	11060.0	-	1920	-	640	-
Chhattisgarh	13600.0	-	-	-	-	6500
Gujarat	11930.0	1440	-	-	-	6190
Maharashtra	56355.0	400	2500	6300	-	24800
Sub total (WR)	**92945.0**	**1840**	**4420**	**6300.0**	**640**	**37490**
SOUTHERN REGION						
Andhra Pradesh	32750.0	1680	2850	-	-	12050
Telangana	8755.6	1605.6	-	-	-	-
Karnataka	7600.0	-	3600	-	-	300
Tamil Nadu	21300.0	400	500	-	-	1000
Sub Total (SR)	**71605.6**	**3685.6**	**6950**	**0**	**0**	**13350**
EASTERN REGION						
Jharkhand	1500.0	-	-	-	-	-
Odisha	41525.00	-	-	600	-	2100

Region/ State	Pumped Storage Projects Potential	In Operation	Under Construction	Concurred by CEA and yet to be taken up for construction	Under Examination in CEA	Under S&I / DPR Preparation
	(MW)	(MW)	(MW)	(MW)	(MW)	(MW)
West Bengal	5500.0	900	-	1000	-	-
Bihar	3400	-	-	-	-	-
Sub Total (ER)	**51925**	**900**	**0**	**1600**	**0**	**2100**
NORTH EASTERN REGION						
Tripura	800.0	-	-	-	-	800
Assam	3920.0	-	-	-	-	2700
Arunachal Pradesh	660.0	-	-	-	-	-
Mizoram	5550.0	-	-	-	-	-
Sub Total (NER)	**10930.0**	**0**	**0**	**0**	**0**	**3500**
ALL INDIA	**266845.6**	**7175.6**	**11620.00**	**9580.00**	**640.00**	**74940**

India's pumped-storage potential varies widely across states, with the Western and Southern regions contributing the most significant shares. As shown in the table below:



In the **Northern Region**, in Uttarakhand, 3 units of Tehri PSP (250 MW each) are already operational and another one unit (250 MW) is under construction and is likely to be commissioned by Feb'2026. Uttar Pradesh having a very large potential of 17,620 MW, shows activity mainly in off-stream, closed-loop systems, with 1,680 MW already concurred by CEA and 12,340 MW under Survey & Investigation and also indicating strong interest from private developers. Rajasthan, with a potential of 12,560 MW and projects with 6,160 MW under S&I, is showing that off stream PSP development in the state is still in an early planning stage. Himachal Pradesh shows 7,260 MW of potential but no projects are in under development category.

In the **Western Region**, Maharashtra has the highest potential in the country at 56,355 MW and projects are under various stages of development. 2 projects namely Bhira (150 MW) and Ghatgar (250 MW) are operational. The state has 2500 MW under construction namely Bhivpuri (1000 MW) and Bhavali (1500 MW). Projects with total installed capacity of 6300 MW are concurred by CEA and 24,800 MW capacity is under S&I category. This reflects Maharashtra's aggressive adoption of PSPs, supported by plateau terrain suitable for off-stream reservoirs and strong involvement from private developers. Gujarat, with a potential of 11,930 MW and 6,190 MW capacity under S&I. In Madhya Pradesh MP30 Gandhisagar PSP (1920 MW) is under-construction and the 640 MW Indira Sagar PSP is under examination. Chhattisgarh has 13,600 MW potential and 6500 MW is under S&I reflects state-driven planning through CSPGCL.

The **Southern Region** shows active PSP development. Andhra Pradesh, with 32,750 MW of potential, has 1,680 MW operational, 2,850 MW under construction and 12,050 MW under S&I, making it one of India's leading PSP states. Karnataka, with 7,600 MW potential, has 3,600 MW under construction. Tamil Nadu shows 21,300 MW potential, with 400 MW operational, 500 MW under construction and 1,000 MW under S&I, aligning with its longer hydropower history and emerging interest in off-stream systems. Telangana has 8755.6 MW of potential and 1,605.6 MW operational, but new development is limited.

In the **Eastern Region**, Odisha has potential at 41,525 MW out of which 600 MW concurred by CEA and 2,100 MW under S&I. West Bengal, with 5,500 MW potential, has 900 MW operational and 1,000 MW concurred by CEA, reflecting stable but moderate progress. Jharkhand and Bihar show PSP potential but have no projects at any stage.

In the **North-Eastern Region**, overall potential stands at 10,930 MW, with most PSP activity still confined to preliminary investigation. Tripura has 800 MW under S&I, while Assam has 2,700 MW under S&I, indicating early-stage exploration of off-stream projects. Arunachal Pradesh and Mizoram show PSP potential but have no projects under development or investigation, likely due to remoteness and challenging terrain.

Overall, the state-wise data shows that PSP development is most advanced in Maharashtra, Andhra Pradesh, Gujarat and Karnataka, supported by a combination of policy readiness, land availability, favourable terrain and strong

private-sector participation (Details as per Annex). Uttar Pradesh relies mainly on off-stream closed-loop PSPs due to its predominantly flat terrain and favourable Policy initiatives of State Government. Govt. of Uttar Pradesh has provided certain incentives as Stamp Duty Exemption, Investment Promotion Subsidy, SGST Reimbursement etc. to promote Infrastructure projects including PSPs. Presently, these four leading states drive most of the national progress, with Maharashtra and Gujarat having a particularly large number of projects under Survey and Investigation, reflecting proactive state policies and strong private-sector engagement in closed-loop projects. Andhra Pradesh has substantial under-construction capacity, aided by supportive storage policies and plateau regions suitable for new upper and lower reservoirs.

Chapter 5
Road map to achieve 100 GW of PSP

5.1 Projected Capacity Addition of PSPs

As per information available with CEA, Pumped Storage Projects with an aggregate capacity of 100810 MW have been envisaged to be commissioned by the year 2035-36 including 11620 MW of PSP under construction. Summary of year wise capacity addition is given below:

Year	Year Wise Capacity Addition (MW)	Year Wise Cumulative Capacity (MW)
Up to 2024-25	-	4745
2025-26	2680	7425
2026-27	2920	10345
2027-28	1600	11945
2028-29	6350	18295
2029-30	13500	31795
2030-31	21190	52985
2031-32	8800	61785
2032-33	14590	76375
2033-34	11880	88255
2034-35	5700	93955
2035-36	11600	**105555**
Total	**100810**	

Note: Based on DPR finalization, some additional projects may be commissioned from 2031-32 onwards.

Year-wise PSP capacity addition with project details is given below:

S.No.	Name of Project	State	Capacity (MW)	Developer	Type	Stage
2025-26						
1	Pinnapuram	Andhra Pradesh	1680	Greenko	Off Stream (Closed Loop)	Commissioned in Oct 2025
2	Tehri PSS	Uttarakhand	1000	THDC	On Stream	3 Units Commissioned; One Unit Under Construction
	Sub Total		**2680**			

S.No.	Name of Project	State	Capacity (MW)	Developer	Type	Stage
2026-27						
4	Kundah PSP PhI,II & III	Tamilnadu	500	TANGEDCO	On Stream	Under Construction (1 units out of 4units)
5	MP 30 Gandhi Sagar	Madhya Pradesh	1920	Greenko	Off Stream (Open Loop)	Under Construction
6	Chitravathi	Andhra Pradesh	500	Adani Green	Off Stream (Open Loop)	Under Construction
	Sub Total		**2920**			
2027-28						
7	Saundatti	Karnataka	1600	Greenko	Off Stream (Open Loop)	Under Construction
	Sub Total		**1600**			
2028-29						
8	Upper Sileru	Andhra Pradesh	1350	APGENCO	On Stream	Under Construction
9	Bhivpuri	Maharashtra	1000	Tata Power	Off Stream (Open Loop)	Under Construction
10	Bhavali	Maharashtra	1500	JSW Energy	Off Stream (Open Loop)	Under Construction
11	Gandikota	Andhra Pradesh	1000	Adani Green	Off Stream (Open Loop)	Under Construction
12	Tarali	Maharashtra	1500	Adani Green	Off Stream (Open)	S&I (expected to be concurred in January 2026)
	Sub Total		**6350**			
2029-30						

S.No.	Name of Project	State	Capacity (MW)	Developer	Type	Stage
13	Kandhaura	Uttar Pradesh	1680	JSW Energy	Off Stream (Closed loop)	Concurred by CEA and yet to be taken up for construction
14	UP01	Uttar Pradesh	3660	Greenko	Off Stream (Closed)	S&I
15	Chichlik	Uttar Pradesh	1560	Avaada	Off Stream (Closed)	S&I
16	Sirohi	Rajasthan	1200	JSW Energy	Off Stream (Closed)	S&I
17	Narihalla	Karnataka	300	JSW Energy	Off Stream (Open)	S&I
18	Nayagaon	Maharashtra	2000	Greenko	Off Stream (Closed)	S&I
19	Panaura	Uttar Pradesh	1500	Adani Green	Off Stream (Closed)	S&I
20	Ukai	Gujarat	1600	Greenko	Off Stream (Closed)	S&I
	Sub Total		**13500**			
2030-31						
21	Shahpur	Rajasthan	1800	Greenko	Off Stream (Closed)	S&I
22	Bilaspur	Chhattisgarh	1000	Jindal Renewables	Off Stream (Closed)	S&I
23	Pane	Maharashtra	1500	JSW Energy	Off Stream (Open loop)	Concurred by CEA and yet to be taken up for construction
24	Malshejghat Bhorende	Maharastra	1500	Adani Green	Off Stream (Closed)	S&I
25	Warasgaon Warangi	Maharastra	1500	Adani Green	Off Stream (Closed)	S&I
26	Raiwada	Andhra Pradesh	900	Adani Green	Off Stream (Closed)	S&I

S.No.	Name of Project	State	Capacity (MW)	Developer	Type	Stage
27	Kamalapadu	Andhra Pradesh	950	APGENCO	Off Stream (Closed)	S&I
28	Shirawta	Maharashtra	1800	Tata Power	Off Stream (Open loop)	Concurred by CEA and yet to be taken up for construction
29	Saidongar 1 - Karjat	Maharashtra	3000	Torrent PSH 4 Pvt. Ltd.	Off Stream (Open)	Concurred
30	Indira Sagar	Madhya Pradesh	640	NHDC	On Stream	DPR submitted & under examination
31	Vempalli	Andhra Pradesh	1500	JSW energy	Off Stream (Closed)	S&I
32	Shoma	Uttar Pradesh	2400	Torrent PSH 1 Pvt. Ltd.	Off Stream (Closed)	S&I
33	Koyna Nivakane	Maharashtra	2700	Adani Green	Off Stream (Closed)	S&I
	Sub Total		**21190**			
2031-32						
34	Kamod	Maharashtra	2000	Megha Engineering	Off Stream (Closed)	S&I
35	Ghosla	Maharashtra	2000	Megha Engineering	Off Stream (Closed)	S&I
36	Pedakota	Andhra Pradesh	1800	Adani Green	Off Stream (Closed)	S&I
37	Upper Bhavani	Tamilnadu	1000	NTECL	On Stream	S&I
38	Masinta	Odisha	1000	NHPC	Off Stream (Closed)	S&I
39	Turga	West Bengal	1000	WBSEDCL		Concurred by CEA and yet to be taken up for construction
	Sub Total		**8800**			
2032-33						

S.No.	Name of Project	State	Capacity (MW)	Developer	Type	Stage
40	Upper Indravati	Odisha	600	OHPC	Off Stream (Open loop)	Concurred by CEA and yet to be taken up for construction
41	Sharavathy	Karnataka	2000	KPCL	On Stream	Under Construction
42	Musakhand	Uttar Pradesh	600	ACME	Off Stream (Closed)	S&I
43	Sukhpura	Rajasthan	2560	Greenko	Off Stream (Closed)	S&I
44	Serula	Gujarat	960	GSECL	Off Stream (Closed)	S&I
45	Dharoi	Gujarat	1250	GSECL	Off Stream (Closed)	S&I
46	Saidongar 2 - Maval	Maharashtra	1200	Torrent PSH 4 Pvt. Ltd.	Off Stream (Open)	S&I
47	Jhariya	Uttar Pradesh	1620	Jhariya AnantUrja	Off Stream (Closed)	S&I
48	Rayavaram	Andhra Pradesh	1500	APGENCO & ONGC	Off Stream (Closed)	S&I
49	Brahmani	Rajasthan	600	ACME Urja Two Private Limited	Off Stream (Closed)	S&I
50	Balimela	Odisha	500	OHPC	On Stream	S&I
51	Gadikota	Andhra Pradesh	1200	APGENCO & NHPC	Off Stream (Closed)	S&I
	Sub Total		**14590**			
2033-34						
52	Juni Kayaliwel	Gujarat	300	GSECL	Off Stream (Closed)	S&I
53	Amalpada	Gujarat	300	GSECL	Off Stream (Closed)	S&I
54	Juni Bavli	Gujarat	450	GSECL	Off Stream	S&I

S.No.	Name of Project	State	Capacity (MW)	Developer	Type	Stage
					(Open)	
55	Satkashi	Gujarat	330	GSECL	Off Stream (Open)	S&I
56	Upper Kolab	Odisha	600	OHPC	Off Stream (Open)	S&I
57	Savitri	Maharashtra	2400	NHPC	Off Stream (Open)	S&I
58	Hasdeo Bango	Chhattisgarh	800	CSPGCL	Off Stream (Open)	S&I
59	Sikaser	Chhattisgarh	1200	CSPGCL	Off Stream (Open)	S&I
60	Rouni	Chhattisgarh	2100	CSPGCL	Off Stream (Open)	S&I
61	Kalu Patti	Uttar Pradesh	1000	Renew Hydro	Off Stream (Closed)	S&I
62	Pawana Falyan	Maharashtra	2400	Avaada	Off Stream (Closed)	S&I
	Sub Total		**11880**			
2034-35						
63	Longtarai	Tripura	800	NHPC	Off Stream (Closed)	S&I
64	Howraghat	Assam	1500	Adani Green	Off Stream (Closed)	S&I
65	Moti Hojai	Assam	1200	Adani Green	Off Stream (Closed)	S&I
66	Motaraypura	Gujarat	1000	GSECL	Off Stream (Open)	S&I
67	Malshej Ghat	Maharshtra	1200	THDC	Off Stream (Closed)	S&I
	Sub Total		**5700**			
2035-36						

S.No.	Name of Project	State	Capacity (MW)	Developer	Type	Stage
68	Adnadi	Maharshtra	1500	Adani Hydro Energy Ten Limited	Off Stream (Closed)	S&I
69	Kumbhe	Maharshtra	1100	NTPC	Off Stream (Open)	S&I
70	Kalu	Maharshtra	1800	NHPC	Off Stream (Closed)	S&I
71	Gujjili	Andhra Pradesh	2400	NECL	Off Stream (Closed)	S&I
72	Chittamvalasa	Andhra Pradesh	1800	NECL	Off Stream (Closed)	S&I
73	Veeraballi Off-Stream	Andhra Pradesh	1800	Astha Green	Off Stream (Closed)	S&I
74	Paidipalem East	Andhra Pradesh	1200	Indosol Solar Power Pvt. Ltd.	Off Stream (Closed)	S&I
	Sub Total		**11600**			
	Total		**100810**			

5.2 Investment required for PSPs till 2035-36

The development of Pumped Storage Projects (PSPs) in India involves significant capital investment because these projects require major civil works, electro-mechanical equipment, and supporting infrastructure. Based on projections by the Central Electricity Authority (CEA), a large programme of PSP installation has been planned up to 2035-36 to meet the growing need for long-duration energy storage. As a result, the total investment required for upcoming PSPs is estimated at around ₹ 5.8 lakh crore, calculated at an average cost of ₹ 6 crore per MW. The investment requirement is spread over multiple years for each project, typically with 20% expenditure in the first year, 30% in the second year, 30% in the third year, and the remaining 20% in the fourth year. This phased expenditure pattern helps in managing cash flow, ensuring timely procurement, and maintaining steady progress in construction across different stages of the project cycle.

As per CEA projections total investment required for development of PSPs by 2035-36 is expected to be 5.8 Lakh Crore. Details are given below:

Year	Capacity Addition (MW)	Investment (Cr)
2025-26	2680	18972
2026-27	2920	34014
2027-28	1600	63078
2028-29	6350	80622
2029-30	13500	87690
2030-31	21190	81786
2031-32	8800	65046
2032-33	14590	63072
2033-34	11880	45396
2034-35	5700	27720
2035-36	11600	13920
Total		**581316**

5.3 Requirement of turbine & Generators

India is planning many new Pumped Storage Projects (PSPs) to support the growing use of solar and wind power. As more of these projects start moving forward, the need for turbines and generators shall increase multi-fold. To make sure these projects can be built on time, it is important to know in advance what sizes and how many units will be required. This helps manufacturers prepare, plan their production, and ensure that the equipment can be supplied without delays. Understanding this requirement is also important for strengthening India's domestic manufacturing and reducing dependence on imports.

For under construction projects turbine & Generators have already been ordered. Based on the current development status of PSPs, tentatively, a total of 29 units with total capacity of 6580 MW are required under the category of Concurred by CEA and yet to be taken up for Construction. Details are as below:

S. No.	Description/Projects	Units	Capacity (GW)	Minimum Unit Size (MW)	Maximum Unit Size (MW)
1.	In Operation	117	30	125	400
2.	S & I	175	45	100	334
3.	Concurred by CEA and yet to be taken for construction	29	6.58	140	300

Overall, the combined assessment across all categories covers 321 units. The maximum unit size identified is 400 MW and the minimum unit size as 100

MW (with exception of 80 MW unit of ISP-OSP PSP), which gives a clear idea of the range of equipment that will be needed for upcoming projects.

Present status of Manufacturing capacity & E & M capacity: -

S. No.	**Name**	**Capacity (MW)**
1.	ANDRITZ HYDRO Pvt. Ltd.	5000 MW (Considering unit size around 250 to 300 MW) (Additional 1000 MW expected by September 2026)
2.	Voith Hydro	1500 MW (Additional 1000 MW expected in 2026-27)
3.	Toshiba	No facility in India
4.	GE	No active facility in India
5.	BHEL	2500 (for HEP), can be expanded for another 1500 MW, thus making the total capacity as 4000 MW/year. Presently not supplied any reversible Pump Turbine.

As far as civil contractors are concerned, more than 15 contractors are engaged/have been engaged in various Hydro Electric/PSP projects.

5.4 To bring competition and enhance indigenous production capacity of PSP, QR has been relaxed on 08.01.2026 for those manufactures who have successfully executed vertical centrifugal pumps of capacity as defined in the document and have successfully carried out model test of reversible fixed speed francis Pump Turbine.

Chapter 6
Measures for expeditious development and improving viability of PSPs

India is rapidly expanding its Pumped Storage Projects (PSPs) to support the increasing share of renewable energy and ensure reliable, round-the-clock power. However, PSPs often face challenges such as long approval processes, land acquisition issues, high initial costs, and delays in creating essential infrastructure. To overcome these barriers and make PSPs more viable and faster to develop, the Government of India and CEA have introduced several policy measures, guidelines, financial supports, and procedural reforms. These steps aim to simplify clearances, reduce project costs, encourage investment, strengthen domestic capability, and improve coordination among agencies so that PSPs can be built quickly and operated efficiently.

Accordingly, the Govt. of India has already taken the following measures to expedite the development of PSPs:

6.1 Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013

Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 has been notified by the Govt. of India on 27.09.2013 which have more participation of local people in terms of Land acquisition and Rehabilitation & Resettlement. The main objectives of the Act are given below:

- To ensure 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.
- Ensure that affected persons become partners in development leading to an improvement in their post-acquisition social and economic status.

6.2 Guidelines to promote development of Pumped Storage Projects

Ministry of Power has notified Guidelines to promote development of Pumped Storage Projects in the country on 10th April, 2023.

Keeping in view the immense utility of the PSPs in grid stabilization as well as meeting the peaking power demand, guidelines have been formulated to promote PSPs and set the direction of its development. The Ministry seeks to

promote the development of PSPs across the country with proactive support of the State Governments. The guidelines include:

i. Allotment of project sites;
    - On nomination basis to CPSUs and State PSUs
    - Allotment through competitive bidding
    - Allotment through TBCB
    - Self-identified off-stream Pumped Storage Projects
ii. Developers shall begin construction within a period of 2 years from the date of allotment of the project, failing which, allotment of the project site shall be cancelled by the State;
iii. Exemption from Free Power obligation;
iv. Avoidance of double taxation on power supplied by PSPs;
v. Notification of benchmark cost of storage by Central Government for investment decisions of CPSUs for PSPs considering 6-8 hours of operation;
vi. PSPs to be allowed to participate in the high price segment of the day ahead market (HP-DAM);
vii. Monetization of Ancillary services.

Suggestion:

In case of power generated by "on river projects in Monsoon in "Turbine" Mode, 80% energy is to be given at secondary energy rate, while 20% energy can be sold at market rate by developer. In order to improve the viability of Project, it is suggested that 80% of energy in "Turbine Mode" shall be made available @ 75% of MCP (Market Clearing Price) for the financial year to Home State.

6.3 Budgetary Support to Cost of Enabling Infrastructure

The hydro projects and PSPs are often taken up in remote areas which have infrastructure deficits. The infrastructure created for hydropower / PSP enables further development of the area as the same is available for reuse for other purposes. Given the same, the Central Government is providing budgetary support for funding the enabling infrastructure of hydropower projects. This scheme also covers PSPs. The grant for enabling infrastructure is for the creation of infrastructure facilities that have alternate developmental value.

The MoP vide OM dated 30.09.2024 has approved the modified scheme of budgetary support towards enabling infrastructure of hydroelectric projects wherein the ambit of enabling infrastructure has been widened to include the following apart from Roads/ Bridges

a) Railway Sidings
b) Transmission System upto pooling point including upgradation of pooling station
c) Communication infrastructure
d) Rope ways

Further, the limits for the scheme were revised as follows;

(a) Capped at Rs. 1.0 crore per MW for projects upto 200 MW;
(b) Capped at Rs. 200 crores + Rs. 0.75 crore per MW exceeding 200 MW, for projects above 200 MW.

- The scheme has a total outlay of Rs.12,461 crore for cumulative generation capacity of about 31GW (including 15 GW capacity of PSPs) to be implemented from FY 2024-25 to FY 2031-32.

6.4 Waiver of ISTS charges for PSPs

MoP vide order dated 10.06.2025 has extended the 100% waiver of ISTS charges for PSPs for which construction work is awarded on or before 30.06.2028. There will not be any ISTS charges waiver for PSPs, for which the construction work is awarded after 30.06.2028. Wavier shall be applicable for a period of 25 years from date of commissioning.

6.5 Tariff Based Competitive Bidding Guidelines For Procurement of Storage Capacity/ Stored Energy From Pumped Storage Plants- Feb'2025

- Ministry of Power (MoP) on 06.02.2025 issued the TBCB Guidelines for Procurement of Storage Capacity/Stored Energy from Pumped Storage Plants, aimed at establishing a transparent, fair, and standardized competitive bidding framework with balanced risk-sharing among stakeholders. The guidelines apply to both new and under-construction PSPs and are relevant to procurers—whether intermediary or end procurers—as well as developers. PSPs may supply energy under either a composite tariff model or a tolling tariff model. Procurement can take place through two approaches: in Model 1, the procurer identifies the site and develops the project through a Special Purpose Vehicle (SPV), while in Model 2, the developer identifies an existing or new site and obtains clearances, land, and a Detailed Project Report (DPR).
- Eligible bidders must demonstrate relevant technical experience in infrastructure development and meet financial requirements, including a minimum net worth or Assets Under Management equivalent to 20% of the estimated project cost. The guidelines prescribe an Earnest Money Deposit of 2% of the project cost and a Performance Bank Guarantee of 5%. Developers may bid under either the composite tariff model—where the developer arranges input power—or the tolling tariff model—where the procurer arranges input power. All tariffs are exclusive of GST, which is to be managed through input tax credit or statutory reimbursement. Projects must specify installed capacity (MW), storage/energy capacity (MWh), and daily charging/discharging cycles, while ensuring compliance with applicable technical standards

and project milestones. The minimum bid size is set at 50 MW for ISTS-connected projects and 10 MW for intra-state projects.

- The contractual structure requires PPAs to be signed by end procurers, with PSAs executed by intermediary procurers in a back-to-back arrangement to ensure risk mitigation and reliable power delivery. All transactions are required to comply with relevant legal, environmental, and regulatory provisions, and foreign developers must comply with applicable FDI norms.

6.6 Enhancement of the threshold limit for concurrence of the Central Electricity Authority (CEA) under Ease of Doing business.

MoP vide order dated 01.08.2025 published following notification regarding Enhancement of the threshold limit for concurrence of the Central Electricity Authority (CEA):

(1) Schemes for setting up of hydro generating stations, involving an estimated capital expenditure exceeding rupees three thousand crores shall require the concurrence of the Central Electricity Authority:
Provided that off-stream closed-loop pumped storage schemes, irrespective of the quantum of capital expenditure, shall be exempted from the requirement of concurrence by the Authority:
Provided also that for the schemes falling under the exempted category, the developer may seek technical guidance from the Authority.

(2) The developer referred to in paragraph (1) shall ensure adherence to the provisions of the National Dam Safety Act, 2021.

Further, MoP vide OM dated 29.08.2025 has clarified that CEA may appraise DPRs of projects falling under the exempted category, submitted to CEA, if requested by the Developer. CEA may consult CWC, GSI and CSMRS and any other such relevant organization, for the purpose of appraisal of such DPRs.

6.7 Energy Consumption Obligation

Central Government on 27.09.2025 in consultation with the Bureau of Energy Efficiency, specified the minimum share of electrical energy consumption from renewable energy for designated consumers, who are electricity distribution licensees, open access consumers and captive users. For open access consumers and captive users, this requirement applies to electricity consumption from sources other than distribution licensee.

Designated consumers may fulfil the specified Renewable Consumption Obligation through consumption of renewable electricity, either directly or through an energy storage system.

6.8 Utilization of exhausted mines to develop PSPs

The discarded mines including coal mines in different parts of the country could be used as Hydro Storage and thereby become natural enablers for development of Hydro Pumped Storage Projects (PSPs).

The development of PSPs on discarded mines, whose potential capacity appears to be significant in the country, could be done as it would involve minimal clearances, completion with lower gestation period & lower project cost. The need for development of Enabling Infrastructure such as roads and bridges would be limited to strengthen and widening since the proposed PSPs would come up in already developed areas. This would be instrumental in local area development and employment generation.

It is worthwhile to mention a total of 31 mine voids in Coal India Limited subsidiaries have been identified by the Ministry of Coal for development of PSPs. This includes nine voids in Maharashtra, Jharkhand, Chhattisgarh and West Bengal, with a cumulative water storage capacity of 72.595 MCM in Maharashtra, 2.38 MCM in Jharkhand, 28.44 MCM in Chhattisgarh and more than 53.45 MCM in West Bengal. Further, Ministry of Power vide letter dated March 15, 2022 had indicated CPSUs in the hydropower sector for carrying feasibility studies on establishing PSPs over these nine voids.

Further, in exhausted mines for development of Pumped Storage Projects requires specific safeguards due to unique water and geological conditions. Key measures include thorough assessment and treatment of mine water to control acidity, sediments, and dissolved minerals, use of corrosion- and abrasion-resistant turbine materials and coatings, and adoption of robust sealing and bearing protection systems. Hydraulic design must address variable heads and cavitation risks, while adequate desilting and debris control arrangements are essential to protect turbines. In addition, detailed geotechnical investigations, structural reinforcement of underground caverns, and continuous monitoring of water quality and turbine condition are necessary to ensure safe and reliable operation. Stability of mine while using it as reservoir and leakage may be a challenge.

6.9 Guidelines for Formulation of DPRs of PSPs

CEA has published Guidelines for Formulation of DPRs of PSPs to fastrack the process of formulation of DPRs. Important provisions of the guidelines are described below:

A. After signing MoA/MoU with State Government or approval of TOR from MOEF&CC, developer shall carry out topographical survey & geological surface mapping of the project and submit the proposed layout of the project and detailed investigation plans to CEA for appraisal and finalization. CEA along with CWC, GSI and CSMRS shall hold 1st consultation meeting with developer to finalize different alternatives of

the project layout. After completion of the first phase investigations, developer shall submit the results to CEA. CEA along with CWC, GSI and CSMRS shall hold 2nd consultation meeting with the developer for finalization of project layout and final phase-II investigations to be carried out by the developer. Prior to submission of DPR to the Authority for its Concurrence/ Appraisal, the Generating Company/ Project Developer shall get approval from respective appraising groups on 11 aspects/chapters.

B. Clearance of Inter-State Aspects is not required for Pumped Storage Projects (PSPs). However, the Developer is required to submit a certificate from the host State confirming that the water required for one- time filling and for replenishment of losses (including evaporation losses and water conductor system losses) will be provided from the host State's allocated share of water.

C. The preparation of the DPR is to be completed by the Developer within an indicative period of 690 days from the date of allotment or signing of the MoA/MoU for PSPs located in non-Himalayan regions with surface powerhouses or underground powerhouses in areas with good geology, while an extended period of 840 days is prescribed for PSPs located in the Himalayan region or non-Himalayan regions with underground powerhouses in poor geological conditions; in both cases, an additional extension of up to 180 days may be granted for reasons beyond the control of the Developer.

- Inclusion of Checklist of Documents required for examination of various aspects of DPRs. The earlier checklist has been shortened.
- The some of the chapters have been dispensed with so the DPR has been made shorter.
- No mandatory requirement of approval of Cost & Financial Chapters. These chapters are to be submitted only for reference and record to meet the requirement of the Act.
- The process for giving the early excavation permission at the risk and cost of the developers have been streamlined so that advance action can be taken by the developers to start the excavation work of Powerhouse (surface type only) at the site. This is expected to save around 6 to 8 months' time in execution of the project.
- Prior to submission of DPR to the Authority for its Concurrence, the requirement of approved pre-DPR chapters has been reduced from 14 chapters to 11 chapters. The chapters Interstate, Instrumentation and Pondage/ Storage aspects has been removed.
- Introduction of NSWS portal for fair and transparent appraisal.

Time period for preparation of D.P.R needs to be curtailed to 18 months for faster development of PSPs.

6.10 Guidelines for Examination and Concurrence of DPRs of PSPs

As per Section 8(1) of the Electricity Act, 2003, any generating company intending to set up a hydro generating station shall prepare and submit to the Authority for its concurrence, a scheme estimated to involve a capital expenditure exceeding such sum, as may be fixed by the Central Government, from time to time, by notification.

Generating Company / Project Developer shall upload DPR on DPR approval Process Monitoring System for Hydro projects section of NSWS portal and submit 8 copies of DPR including pre-DPR chapters approved by respective appraising groups along with six soft copies on compact disks/ pen drives to HPA division, CEA.

In case the Pumped Storage Scheme is found technically viable with necessary inputs/ clearances having been tied up, the Authority may accord concurrence/appraisal for implementation of the pumped storage scheme, as far as practicable, within a period of 50 (fifty) days from the date of submission of 8 sets of DPR complete in all respects/ acceptance of Complete DPR by CEA from Developer.

Best practices of construction methodology to reduce time period of construction so as to reduce IDC and escalation costs, need to be adopted. Reasonable experience has been gained by developers (early entrants in PSPs) and the same needs to be documented and shared in Public Domain.

E & M works are on critical path in PSP. Standardization of say 30 unit sizes with model test of model done in laboratory is required so that once order is placed, manufacturer can straightway go for mass production of prototype. As off-stream closed loop projects occupy the lion's share, wherein flexibility to an extent is possible in placement of both reservoirs, besides adjusting the height of the dam, thus nethead available to units can be standardized unlike Hydro Projects where head is totally dependent on site conditions and more or less every Hydro Project is a tailormade project with different civil structures.

6.11 List of PSPs recently Concurred by CEA:

S. No.	Name of Scheme	Installed Capacity (MW)	Submission of DPR on NSWS Portal	Date of CEA Concurrence	Time taken for concurrence in days
1.	Bhavali PSP	1500	06.09.2024	24.09.2024	19
2.	Bhivpuri PSP	1000	16.07.2024	30.09.2024	77

S. No.	Name of Scheme	Installed Capacity (MW)	Submission of DPR on NSWS Portal	Date of CEA Concurrence	Time taken for concurrence in days
3.	MP 30 Gandhi Sagar	1920	26.11.2024	19.12.2024	23
4.	Chitravathi PSP	500	14.02.2025	05.03.2025	19
5.	Gandikota PSP	1000	02.04.2025	28.05.2025	56
6.	Kandhaura PSP	1680	03.06.2025	13.06.2025	10
7.	Saundatti PSP	1600	21.06.2025	29.07.2025	38
8.	Shirawta PSP	1800	17.07.2025	01.09.2025	46
9.	Pane PSP	1500	01.09.2025	09.10.2025	38
10.	Karjat (Saidongar-I) PSP	3000	09.12.2025	09.01.2026	31

Chapter 7
Transmission System for Evacuation of Power from PSPs

Transmission system is required for providing connectivity to PSPs for power requirement during pumping and evacuation of power during generating mode. Concept to commissioning of transmission elements generally takes about three to four years; about two to three years for augmentation of transformers and about three to four years for new transmission lines or substations.

In order to commission the transmission system in line with the implementation of PSPs, transmission planning is required to be done much in advance. This gives a visibility to PSP developers for evacuation of power from their PSP projects. Transmission system for 35.6 GW PSP has already been planned to be taken up by the year 2031-32. This plan has been included in the National Electricity Plan (Transmission) published in October, 2024. Further, based on the pre-DPR and DPR chapters received from developers, transmission plan for PSPs is being finalised. Accordingly, PSP developers shall approach CTUIL/STUs for connectivity.

For facilitating transmission, MoP vide OM dated 30.09.2024 approved the modified scheme of budgetary support towards enabling infrastructure of hydroelectric projects wherein the ambit of enabling infrastructure includes Transmission System from generation switchyard up to pooling point including upgradation of pooling station.

As on 30.11.2025, the summary of the transmission system planned for achieving 100 GW PSPs from the year 2025-26 to 2035-36, finalised based on the data as per NEP and pre-DPR/DPR chapters received from developers are given as below:

S. No.	**Status of Transmission System**	**No. of Projects**	**Capacity (MW)**
1	Commissioned	2	2,680
2	Under construction	9	11,370
3	Under implementation (construction yet to start)	5	6,580
4	Already planned, yet to be taken up for implementation	39	60,400
5	Yet to be planned	18	19,780
Total		**73**	**1,00,810**

The details of the transmission systems are as given below:

Status of Transmission System for Evacuation of Power from PSPs till 2035-36

S.No.	Name of Project	State	IC (MW)	Developer	Status of PSP	Transmission System planned	Status of Transmission System
2025-26							
1	Pinnapuram	Andhra Pradesh	1680	Greenko	Commissioned in Oct 2025	Greenko PSP – Kurnool (New) 400 kV (quad) D/c line	Commissioned
2	Tehri PSS	Uttarakhand	1000	THDC	3 Units Commissioned; One Unit Under Construction	Tehri PSP - Tehri PS 400 kV D/c line	Commissioned
	Sub Total		2680				
2026-27							
3	Kundah PSP PhI,II & III	Tamilnadu	500	TANGEDCO	Under Construction	Kundah PSP - 400/230 kV Parali S/s 400 kV D/c line	Under Construction
4	MP 30 Gandhi Sagar	Madhya Pradesh	1920	Greenko	Under Construction	MP 30 PSP - Mandsaur PS 400 kV D/c line (quad bersimis)	Under Construction
5	Chitravathi	Andhra Pradesh	500	Adani Green	Under Construction	Chitravathi PSP - Kurnool PS III S/s 400 kV D/c line (twin)	Under Construction
	Sub Total		2920				
2027-28							
6	Saundatti	Karnataka	1600	Greenko	Under Construction	Saundatti PSP - Gadag II S/s 400 kV D/c line (quad) Saundatti PSP - Dhoni S/s (KPTCL) 400 kV D/c line	Under Construction
	Sub Total		1600				
2028-29							
7	Upper Sileru	Andhra Pradesh	1350	APGENCO	Under Construction	Transmission System under Intra State	Under Construction
8	Bhivpuri	Maharashtra	1000	Tata Power	Under Construction	Bhivpuri PSP-South Kalamb S/s 400 kV D/c line (Twin HTLS)	Under Construction
9	Bhavali	Maharashtra	1500	JSW Energy	Under Construction	Bhavali PSP-Boisar-II S/s 400 kV D/c line (ACSR quad moose)	Under Construction
10	Gandikota	Andhra Pradesh	1000	Adani Green	Under Construction	Gandikota PSP - Kurnool-III PS	Under Construction

S.No.	Name of Project	State	IC (MW)	Developer	Status of PSP	Transmission System planned	Status of Transmission System
						S/s 400 kV D/c line (quad)	
11	Tarali	Maharashtra	1500	Adani Green	S&I	Tarali PSP-Pune-III (GIS) 400 kV D/c line (Quad bersimis/HTLS)	Already planned, yet to be taken up for implementation
	Sub Total		6350				
2029-30							
12	Kandhaura	Uttar Pradesh	1680	JSW Energy	Concurred by CEA and yet to be taken up for construction	Kandhaura PSP - Mirzapur PS (UPPTCL) 400 kV D/c line (quad)	Under implementation
13	UP01	Uttar Pradesh	3660	Greenko	S&I	UP01 PSP-Robertsganj (ISTS) 400 kV D/c lines (3 circuits) (quad)	Already planned, yet to be taken up for implementation
14	Chichlik	Uttar Pradesh	1560	Avaada	S&I	Chichlik PSP - Robertsganj (ISTS) 400 kV D/c line (quad)	Already planned, yet to be taken up for implementation
15	Sirohi	Rajasthan	1200	JSW Energy	S&I	Sirohi PSP - Sirohi (ISTS) 400 kV D/c line (quad)	Already planned, yet to be taken up for implementation
16	Narihalla	Karnataka	300	JSW Energy	S&I	DPR received from developer	Being planned
17	Nayagaon	Maharashtra	2000	Greenko	S&I	Nayagaon PSP - Waluj (MSETCL) 2 nos. of 400 kV D/c line (ACSR twin Moose)	Already planned, yet to be taken up for implementation
18	Panaura	Uttar Pradesh	1500	Adani Green	S&I	Panaura PSP - Mirzapur PS (UPPTCL) 400 kV D/c line (quad)	Already planned, yet to be taken up for implementation
19	Ukai	Gujarat	1600	Greenko	S&I	DPR yet to be received from developer	Being planned
	Sub Total		13500				
2030-31							
20	Shahpur	Rajasthan	1800	Greenko	S&I	LILO of one circuit of Gwalior- Bina 765 kV D/c line at Shahpur PSP	Already planned, yet to be taken up for

S.No.	Name of Project	State	IC (MW)	Developer	Status of PSP	Transmission System planned	Status of Transmission System
							implementation
21	Bilaspur	Chhattisgarh	1000	Jindal Renewables	S&I	DPR yet to be received from developer	Being planned
22	Pane	Maharashtra	1500	JSW Energy	Concurred by CEA and yet to be taken up for construction	Pane PSP- Pune-III (GIS) 400 kV D/c line (ACSR Quad Moose)	Under implementation
23	Malshejghat Bhorende	Maharashtra	1500	Adani Green	S&I	Malshejghat Bhorende PSP - Padghe GIS 400 kV D/c line (ACSR Quad Bersimis)	Already planned, yet to be taken up for implementation
24	Warasgaon Warangi	Maharashtra	1500	Adani Green	S&I	Warasgaon Warangi PSP- Pune-III (GIS) 400 kV D/c line (Quad Bersimis/HTLS)	Already planned, yet to be taken up for implementation
25	Raiwada	Andhra Pradesh	900	Adani Green	S&I	Raiwada PSP - 400 kV PGCIL Gazuwaka (option-1) or 400 kV PGCIL Vizag (option-2) 400 kV D/c ACSR Quad moose/HTLS transmission line (Pre-DPR has been returned)	Already planned, yet to be taken up for implementation
26	Kamalapadu	Andhra Pradesh	950	APGENCO	S&I	Kamalapadu PSP- Talaricheruvu substation of APTRANSCO 400 kV quad moose ACSR D/c line	Already planned, yet to be taken up for implementation
27	Shirawta	Maharashtra	1800	Tata Power	Concurred by CEA and yet to be taken up for construction	Shirawta PSP- South Kalamb S/s 400 kV D/c line (Quad HTLS)	Under implementation
28	Saidongar 1 - Karjat	Maharashtra	3000	Torrent PSH 4 Pvt. Ltd.	Concurred	Karjat (Saidongar-1) PSP-South Kalamb S/s through 2 nos. 400 kV D/c line (Quad bersimis/HTLS)	Already planned, yet to be taken up for implementation

S.No.	Name of Project	State	IC (MW)	Developer	Status of PSP	Transmission System planned	Status of Transmission System
29	Indira Sagar	Madhya Pradesh	640	NHDC	DPR submitted & under examination	Indira Sagar PSP- Khandwa S/s 400 kV D/c line (Twin Moose)	Already planned, yet to be taken up for implementation
30	Vempalli	Andhra Pradesh	1500	JSW energy	S&I	Vemapalli PSP – 765/400 kV Kadapa (PGCIL) S/s 400 kV D/c (Quad Moose ACSR conductor) transmission line	Already planned, yet to be taken up for implementation
31	Shoma	Uttar Pradesh	2400	Torrent PSH 1 Pvt. Ltd.	S&I	Shoma PSP - Robertsganj (ISTS) 400 kV D/c line (HTLS)	Already planned, yet to be taken up for implementation
32	Koyna Nivakane	Maharashtra	2700	Adani Green	S&I	Koyna Nivakane PSP- Pune-III GIS 400 kV D/c line (ACSR Hexa Bersimis/HTLS)	Already planned, yet to be taken up for implementation
	Sub Total		21190				
2031-32							
33	Kamod	Maharashtra	2000	Megha Engineering	S&I	Kamod PSP- Dhule S/s 400 kV D/c line (Quad Bersimis/HTLS)	Already planned, yet to be taken up for implementation
34	Ghosla	Maharashtra	2000	Megha Engineering	S&I	Ghosla PSP- Waluj (MSETCL) 400 kV triple circuit line (ACSR Triple Moose)	Already planned, yet to be taken up for implementation
35	Pedakota	Andhra Pradesh	1800	Adani Green	S&I	Option 1:- Pedakota PSP – Gajuwaka (PGCIL S/s), 400 kV D/c line (ACSR Quad Bersimis/HTLS conductor) line length Approx. - 50 km Option 2 :- Pedakota PSP – Vizag (PGCIL S/s) 400 kV D/c line (ACSR Quad Bersimis/HTLS conductor) line length Approx. - 51 km	Already planned, yet to be taken up for implementation

S.No.	Name of Project	State	IC (MW)	Developer	Status of PSP	Transmission System planned	Status of Transmission System
36	Upper Bhavani	Tamilnadu	1000	NTECL	S&I	Upper Bhavani PSP - 400/230 kV Parali S/s 400 kV D/c line	Already planned, yet to be taken up for implementation
37	Masinta	Odisha	1000	NHPC	S&I	System being identified in ISTS and Intra-STS	Already planned, yet to be taken up for implementation
38	Turga	West Bengal	1000	WBSEDCL	Concurred by CEA and yet to be taken up for construction	Transmission System under Intra State	Under implementation
	Sub Total		8800				
2032-33							
39	Upper Indravati	Odisha	600	OHPC	Concurred by CEA and yet to be taken up for construction	Transmission System under Intra State	Under implementation
40	Sharavathy	Karnataka	2000	KPCL	Under Construction	Sharavathy PSP - 400/220 kV Talaguppa sub-station 400 kV D/c line with QM conductor/twin equivalent HPC and Sharavathy PSP - 400 kV Switching S/s at Guttur (Davangere) 400 kV D/c line with QM conductor/twin equivalent HPC	Under Construction
41	Musakhand	Uttar Pradesh	600	ACME	S&I	Musakhand PSP - Robertsganj (PGCIL) 400 kV D/c line	Already planned, yet to be taken up for implementation
42	Sukhpura	Rajasthan	2560	Greenko	S&I	LILO of one circuit of Beawar-Mandsaur 765 kV D/c line at Sukhpura PSP	Already planned, yet to be taken up for implementation
43	Serula	Gujarat	960	GSECL	S&I	Yet to be received from developer	Already planned, yet to be taken up for implementation

S.No.	Name of Project	State	IC (MW)	Developer	Status of PSP	Transmission System planned	Status of Transmission System
44	Dharoi	Gujarat	1250	GSECL	S&I	Dharoi PSP - Veloda (GETCO) 400 kV D/c line (ACSR triple bersimis).Yet to be received from developer	Already planned, yet to be taken up for implementation
45	Saidongar 2 - Maval	Maharashtra	1200	Torrent PSH 4 Pvt. Ltd.	S&I	Maval (Saidongar-2) PSP- South Kalamb S/s 400 kV D/c line (Quad Bersimis/HTLS)	Already planned, yet to be taken up for implementation
46	Jhariya	Uttar Pradesh	1620	Jhariya AnantUrja	S&I	Jahriya PSP - Obra/Mirzapur PS (UPPTCL) 400 kV D/c line (Quad)	Already planned, yet to be taken up for implementation
47	Rayavaram	Andhra Pradesh	1500	APGENCO & ONGC	S&I	Rayavaram PSP - Kalikiri 400/220 kV S/s (APTRANSCO) 400 kV D/c line (ACSR Quad Moose)	Already planned, yet to be taken up for implementation
48	Brahmani	Rajasthan	600	ACME Urja Two Private Limited	S&I	Brahmani PSP - Kota/Rishabdeo (ISTS) 400 kC D/c line	Already planned, yet to be taken up for implementation
49	Balimela	Odisha	500	OHPC	S&I	Transmission System under Intra State	Already planned, yet to be taken up for implementation
50	Gadikota	Andhra Pradesh	1200	APGENCO & NHPC	S&I	Gadikota PSP - Kalikiri 400/220 kV S/s (APTRANSCO) 400 kV D/c line (ACSR Quad Moose)	Already planned, yet to be taken up for implementation
	Sub Total		14590				
2033-34							
51	Juni Kayaliwel	Gujarat	300	GSECL	S&I	DPR yet to be received from developer	Being planned
52	Amalpada	Gujarat	300	GSECL	S&I	DPR yet to be received from developer	Being planned
53	Juni Bavli	Gujarat	450	GSECL	S&I	DPR yet to be received from developer	Being planned
54	Satkashi	Gujarat	330	GSECL	S&I	DPR yet to be received from developer	Being planned

S.No.	Name of Project	State	IC (MW)	Developer	Status of PSP	Transmission System planned	Status of Transmission System
55	Upper Kolab	Odisha	600	OHPC	S&I	Transmission System under Intra State	Already planned, yet to be taken up for implementation
56	Savitri	Maharashtra	2400	NHPC	S&I	Savitri PSP-Pune (Shikrapur) GIS 2 nos. 400 kV D/c line (Twin Moose)	Already planned, yet to be taken up for implementation
57	Hasdeo Bango	Chhattisgarh	800	CSPGCL	S&I	DPR yet to be received from developer	Being planned
58	Sikaser	Chhattisgarh	1200	CSPGCL	S&I	submitted Pre DPR but connection point not mentioned. Comment sought regarding that.	Being planned
59	Rouni	Chhattisgarh	2100	CSPGCL	S&I	Option 1:- Rouni PSP –PGCIL Raigarh S/s 2 nos. 400 kV D/c line (Twin Moose) line length Approx. -123 km Option 2 :- Rouni PSP – PGCIL Korba S/s 2 nos. 400 kV D/c line (Twin Moose) line length Approx. -131 km	Already planned, yet to be taken up for implementation
60	Kalu Patti	Uttar Pradesh	1000	Renew Hydro	S&I	Kalu Patti PSP - Robertsganj PS (ISTS) 400 kV D/c line	Already planned, yet to be taken up for implementation
61	Pawana Falyan	Maharashtra	2400	Avaada	S&I	Pawana Falyan PSP-400/220 kV Pune-PG (Talegaon) Substation 400 kV D/c transmission line with Quad Moose conductor	Already planned, yet to be taken up for implementation
	Sub Total		11880				
2034-35							
62	Longtarai	Tripura	800	NHPC	S&I	Longtharai PSP – PK Bari 400 kV D/c (Ampacity:	Already planned, yet to be taken up for

S.No.	Name of Project	State	IC (MW)	Developer	Status of PSP	Transmission System planned	Status of Transmission System
						1420A or more per ckt) line	implementation
63	Howraghat	Assam	1500	Adani Green	S&I	System being identified in ISTS	Being planned
64	Moti Hojai	Assam	1200	Adani Green	S&I	System being identified in ISTS and InSTS	Being planned
65	Motaraypura	Gujarat	1000	GSECL	S&I	DPR yet to be received from developer	Being planned
66	Malshej Ghat	Maharashtra	1200	THDC	S&I	DPR yet to be received from developer	Being planned
	Sub Total		5700				
			2035-36				
67	Adnadi	Maharashtra	1500	Adani Hydro Energy Ten Limited	S&I	DPR yet to be received from developer	Being planned
68	Kumbhe	Maharashtra	1100	NTPC	S&I	DPR yet to be received from developer	Being planned
69	Kalu	Maharashtra	1800	NHPC	S&I	DPR yet to be received from developer	Being planned
70	Gujjili	Andhra Pradesh	2400	NECL	S&I	Developers has not indicated/planned the Substation (ISTS/STU) for evacuation of power in the Pre-DPR submitted. The same is awaited	Being planned
71	Chittamvalasa	Andhra Pradesh	1800	NECL	S&I		Being planned
72	Veeraballi Off-Stream	Andhra Pradesh	1800	Astha Green	S&I	Veeraballi PSP-765/400 kV PGCIL S/s at Jamalpalle (Cuddapah) AP, 400 kV D/c line with HTLS or other suitable high ampacity conductor	Already planned, yet to be taken up for implementation
73	Paidipalem East	Andhra Pradesh	1200	Indosol Solar Power Pvt. Ltd.	S&I	Paidipalem East PSP - Nandipadu (PGCIL) 400 kV D/c line (quad)	Already planned, yet to be taken up for implementation
	Sub Total		11600				
	Total		**100810**				

Chapter 8

Role of MoEF&CC in the Sector: Present Support and Future Interventions

One of the main issues of slow pace of development of pumped storage projects in India are Environment and Forest Issues. Presently, the environmental clearance and forest clearance processes of PSPs are very cumbersome, since these projects are treated at par with the conventional hydro projects for the purpose of grant of EC and FC. The environment impact of PSPs constructed on existing reservoirs on on-the-river sites and on the off-the-river sites are much less than conventional HEPs. Further, unlike the conventional hydro projects, development of PSPs do not lead to significant displacement of the people and thus, require minimum Rehabilitation & Resettlement. Therefore, PSPs constructed on existing reservoirs and on off-the-river sites should be treated as a separate category for processing Environmental and Forest clearances.

Since 1978, it is an essential administrative requirement for the mega projects to obtain environmental clearance from the MoEF, Govt. of India. In order to assess the impact of the developmental projects/activities on the environment, the Ministry of Environment and Forests (MoEF), Govt. of India issued a gazette notification on the 14th September, 2006 which states that:

(a) In accordance with the Environment (Protection) Act of 1986 and EIA Notification of 2006, MoEF & CC, Government of India is responsible for providing Environmental Clearance (EC) to specified categories of River Valley & Hydel Projects viz. hydroelectric and irrigation projects irrespective of the cost.

(b) MoEF & CC is also responsible for granting PSP Project clearance for forests and wildlife in accordance with the Wildlife (Protection) Acts of 1972 and 1993 (MoEF & CC, 2024a)

8.1 Categorization of Projects and Activities

a) All projects and activities are broadly categorized into two categories - **Category A** and **Category B**, based on the spatial extent of potential impacts and potential impacts on human health and natural and man-made resources. The classification for River Valley projects as given in the Schedule to the Notification is as under:

- **Category A**

(a) > 100 MW hydroelectric power generation;
(b) > 10,000 ha. of culturable command area under irrigation projects

- **Category B**

(a) < 100 MW > 25 MW hydroelectric power generation;
(b) < 10,000 ha. of culturable command area under irrigation projects

b) All projects or activities included as Category 'A' in the Schedule, including expansion and modernization of existing projects or activities and change in product mix, shall require prior environmental clearance from The Ministry of Environment and Forests (MoEF) on the recommendations of an Expert Appraisal Committee (EAC) to be constituted by the Central Government for the purposes of this Notification;

c) All projects or activities included as Category 'B' in the Schedule, including expansion and modernization of existing projects will require prior environmental clearance from the State/Union territory Environment Impact Assessment Authority (SEIAA). The SEIAA shall base its decision on the recommendations of a State or Union territory level Expert Appraisal Committee (SEAC) as to be constituted for in this notification. In the absence of a duly constituted SEIAA or SEAC, a Category 'B' project shall be treated as a Category 'A' project

d) Category 'B' river valley projects falling in more than one State/projects in/in vicinity of Protected Area/ESZ/State boundary/International Boundary shall be apprised at the Central Level.

Various types of clearances required to be obtained from MoEF & CC for PSP Development in India are as follows:

S. No.	**Type of clearances**	**Issuing Authority**	**Reason for its requirement**	**Procedure**
I	Forest clearance (if applicable)	MoEF & CC/ State Government	This is required as per law.	For Forest Clearance, the project developer must obtain No objection Certificate (NOC) from State Forest Department as per law. Application is submitted to State Government for onward submission to MoEF & CC in case forest land is to be acquired by the project. Presently it is issued in two stages, first in-principal and once conditions stipulated are complied, then formal clearance.

S. No.	Type of clearances	Issuing Authority	Reason for its requirement	Procedure
II	Approval of Terms of Reference (ToR) along with the clearance for pre-construction activities from MoEF & CC	MoEF & CC	Approval of ToR and for pre-construction activities from MoEF is required under EIA Notification 2006	Filing of Application with filled in Form I along with a copy of PFR and draft ToR for undertaking EIA & EMP study to MoEF.
III	Environment clearance	MoEF & CC	Obtaining environmental clearance is required under the Act.	Final EIA & EMP reports incorporating comments received during Public consultation process is to be submitted to MoEF & CC. The proposal is referred to Expert Appraisal Committee.

8.2 Initiatives/support provided by MoEF&CC for development of PSPs

8.2.1 Treating Off Stream Closed Loop PSPs as separate entity

As per Notification dated 18.05.2023, MoEF & CC has taken following initiatives:

(i) Standalone PSPs categorized as a separate category under river valley and hydroelectric Projects

(ii) Off-stream closed loop PSPs shall be appraised based on one season (non-monsoon) baseline data collection

(iii) Open loop PSPs shall be appraised based on two season (pre-monsoon and post monsoon) baseline data collection

(iv) PSPs which meet all the criteria specified below shall be appraised as B2 category irrespective of power generation capacity:

- Projects which do not attract Forest Clearance and/or Wildlife clearance,
- Projects wherein no new Reservoir is created.
- Projects wherein there is no increase in capacity of the existing reservoir and in submergence area of an existing reservoir.

8.2.2 Survey in forest lands and Enhancing number of drill holes

The Survey & Investigation (S&I) phase is crucial for preparing bankable DPRs for HEPs as well as PSPs requiring small blast and Drill hole for in-situ rock mechanic testing and collecting rock samples for large scale triaxial tests and other laboratory rock mechanic testing. The results of these tests are vital inputs for Design. However, developers are facing significant challenges in conducting these tests. One major hurdle is the requirement for prior permission from the State Forest Department for on-site blasting and excavation. State Forest department ask for forest clearance for these activities while forest clearance can only be sought after project layout finalization based on investigations carried out at S & I stage.

To address this, MoEF&CC has taken following steps:

- MoEF & CC notification dated 29.11.2023 mentions "***Surveys in forest lands for mining purposes which involve breaking of forest land by way of drilling the bore holes and digging the trenches, such as for mining, shall not be treated a non-forest purpose as long as such surveys involve felling of up to hundred trees in the entire areas proposed for survey and drilling of 25 bore holes of 4-inch diameter per 10 sq km or 80 shot holes of 6.5-inch diameter per sq km in case of Seismic Surveys.***"

- MoEF & CC further issued notification on September, 2025 vide which, following guidelines were issued for enhancing the number of bore holes for undertaking survey and exploratory drilling in the forest areas:

  For undertaking survey and explorations in the forest area for mining and developmental projects such as roads, railways, hydel, etc. the following bore holes per 10 sq km shall be allowed by the States/UTs :

  a) For bedded stratiform and tabular deposits, **62 bore holes of upto 6-inch diameter per 10 sq km** subject to a maximum of **25** boreholes **per sq km.**
  b) For Lenticular ore bodies of all dimensions, **80 bore holes of upto 6-inch diameter per 10 sq km** subject to a maximum of **25** boreholes **per sq km.**

8.3 Other issues related with Environmental, Forest and Wild Life Clearances

a) Difficulty in providing Non-Forest Land (NFL) for Compensatory Afforestation (CA) due to non-availability near project areas.
b) Fresh EC is required even for marginal additional generation using e-flow through small dam to toe powerhouses.
c) Due to the predominance of dense forests mainly in the North-Eastern Region of India and the limited availability of degraded forest land, the process of site identification for Compensatory Afforestation often becomes cumbersome and time-consuming.
d) PSPs/Hydropower projects are prohibited within Eco Sensitive Zone (ESZ) and default 10 km zone, restricting project development in resource rich regions.
e) Catchment Area Treatment (CAT) Plan is mandated for all hydro projects though off-stream PSPs have no sedimentation issues.
f) Soil & Moisture Conservation Plan (SMCP) is mandated separately despite watershed development plan already covering soil and moisture measures, thus causing double payment.
g) Limitation upto 5 MB data for uploading documents on PARIVESH Portal 2.0 is inadequate for detailed project reports, affecting readability and risk of loss of critical information.
h) Delay of Forest Clearance (FC-II) due to time-consuming State approval of Rehabilitation & Resettlement Plans involving multiple layers of consultation and vetting.
i) Mandatory transfer/mutation of Non-Forest Land identified for Compensatory Afforestation in favour of State/UT Forest Department before FC-II causes delays for the projects sanctioned before 20.09.2024
j) Delay of approval of Mining Plan from concerned State/UT Government, holding up FC-II even when all other compliances are met.
k) Unified Forest Land diversion clearances for both linear (Road Infra only) and Non-linear components (entire project other than roads) cause delay in early start of the infrastructure work hampering overall progress of the project.
l) Long compliance period of 3–4 months from Stage-I to Stage-II Forest Clearance delays start of the project.
m) Work cannot start on non-forest land until approval of central government, causing delays in start of the construction work of PSPs.
n) Surface land above deep tunnels irrespective of the tunnel depth gets counted in diversion of forest land unnecessarily. As per the MoEF & CC OM dated 06.01.2022, the revised Net Present Value (NPV) rates provide that 50% of the applicable NPV rate shall be levied in respect of river bed areas for hydropower projects and for underground tunnels of roads and railways.
o) Terms of Reference (ToR) conflicts arise due to lack of coordination between MoEF & CC, National Tiger Conservation Authority and National Board for Wildlife and wildlife corridors notified during the mid phase of construction of the project cause uncertainty.

p) Manual process of obtaining NOC from Gram Sabha under Forest Right Acts (FRA) cause delays due to unjust demands and procedural challenges.
q) Off-Stream PSPs are not considered under the White category, which typically includes non-polluting industries and thus need to undergo cumbersome EC and FC processes leading to delay in according approval and start of construction work

8.4 Recommendations/ Proposal for Key Policy Interventions required for resolving above issues and rationalization of environmental and forest clearances

a) Instead of non-forest land for Compensatory Afforestation, use of degraded forest land twice the diverted forest area may be allowed for all the developers, as permitted currently only for CPSUs/captive coal blocks.
b) A National-Level Land Bank for Compensatory Afforestation may be created with mapped degraded land, GIS-based repository and monitoring framework.
c) PSPs may be permitted within ESZs and within 10 km aerial distance from Protected Areas (where ESZ is not notified). Differentiated regulatory approach for renewable projects may be adopted and restrictive Western Ghats conditions may be relaxed.
d) Off-stream PSPs may be exempted from CAT plan since sedimentation issues do not arise and watershed development already covers required measures.
e) Off-stream PSPs may be exempted from SMCP since soil and moisture measures are already covered under watershed development plans.
f) In order to facilitate seamless submission of comprehensive and accurate project-related documents, permissible document upload size on the PARIVESH Portal 2.0 may be enhanced from the present 5 MB to at least 20 MB per document.
g) Draft Resettlement & Rehabilitation plan may be allowed for FC-II clearance and final approval may be made mandatory before commencement of construction activities. MoEF & CC may stipulate periodic compliance reporting to confirm adherence to the approved R&R measures once approval is obtained.
h) FC-II may be granted based on identification of Non Forest Land and transfer/mutation may be stipulated as post FC-II compliance condition with periodic monitoring.
i) Requirement of submission of an approved mining plan may be exempted at FC-II clearance stage and an undertaking may be taken from project proponent for submission of approved mining plan before starting of actual mining.
j) Bifurcation of forest land diversion as linear and non-linear and both cases may be processed independently to allow early infrastructure development and expedite project construction.
Forest clearance for infrastructure work like Roads & construction Power Arrangement etc. may be permitted as Stage clearance

under FC-II and full clearance will only entitle the developer to take up formal main construction activities of Project on forest land.

k) Construction may be permitted after financial compliance of Stage-I while other processes continue in parallel.

l) Work on non-forest land should be permitted in cases where project involves both forest and non-forest land for Off stream PSPs.

m) For underground structures (tunnels) which are more than 5D below the surface and when the surface land above the tunnel is not required for the project use, these land parcels should be exempted from consideration in the total land diversion requirement.
It is proposed that for underground structures in hydropower projects (such as water conductor systems – headrace tunnels, tailrace tunnels, etc.), the NPV rate may be rationalized and NIL NPV may be considered for the portion of forest land diverted exclusively for underground use. NPV, if any, may be restricted only to the surface area actually impacted due to construction of adits, portals, surge shafts or other above-ground components.

n) Early-stage coordination within MoEF & CC, National Tiger Conservation Authority (NTCA) and National Board for Wildlife (NBWL) before ToR to identify potential overlaps upfront and frame clear policy for post-allocation corridor notifications.

o) A centralized online portal should be developed for submission and processing of FRA certificates. State Government should proactively address Gram Sabha rights during project allocation.

p) Off-Stream PSPs is requested to be considered under the White Category which would recognize their minimal environmental impact. This classification would simplify the EC & FC approval processes.

Chapter-9
Financial Support required by PSPs

(i) PSPs offer several advantages like providing inertia support, reactive power support, frequency regulation, black start etc. which do not get quantified in monetary terms. The cost of BESS has been showing declining trajectory whereas the capital cost of PSP is around Rs 5-6 Crores/MW, potentially making it less competitive in terms of cost as compared to BESS. Therefore, PSPs require a support in the form of VGF.

(ii) If the cost of pumping power is further reduced, hydro-based Pumped Storage Projects (PSPs) would become more affordable for distribution companies (DISCOMs) and other consumers the under competitive tariff model. Lower pumping costs would improve the overall economics of PSPs, reduce the levelised cost of storage, (including cost of pumping energy) and make PSP power more competitive in the market. This, in turn, would encourage wider adoption of PSPs as a reliable, long-duration energy storage solution to support India's renewable energy integration and grid stability.

(iii) The Government has already supported Battery Energy Storage Systems (BESS) through Viability Gap Funding (VGF) schemes, with two major tranches: one for 13,000 MWh and another for 30,000 MWh. This support has played a key role in reducing the cost of storage through BESS and accelerating deployment.

Given this precedent, it would be appropriate to extend similar VGF support to hydro-based Pumped Storage Projects (PSPs). Hydro PSPs are fully indigenous, long-lived, and environmentally sustainable, with minimal carbon footprint over their lifecycle. They provide long-duration storage, grid stability, and ancillary services that are highly complementary to India's growing renewable capacity.

Supporting PSPs through VGF will help promote a truly environment-friendly, domestically developed storage solution that is well suited to India's long-term energy security and decarbonization goals.

Chapter-10
Best Practices and case studies

Pumped Storage Projects (PSPs) are large-scale, long-duration energy storage systems that store electricity by pumping water from a lower reservoir to an upper reservoir during off-peak hours and releasing it to generate power during peak demand. In India's energy transition, PSP is critical to integrate high shares of variable renewable energy (solar and wind) and to provide grid stability, peaking power, and ancillary services like frequency regulation and black-start capability**.**

10.1 Key Project Components and Design Best Practices

A pumped storage scheme consists of two reservoirs (upper and lower), a water conductor system (tunnels, penstocks, surge tanks), reversible pump-turbines, a powerhouse, and a switchyard/pothead yard. Best practices in design for Indian projects include:

Site Selection and Layout

- Prioritize existing hydro sites: Use existing reservoirs (e.g., as upper/lower reservoir) to minimize submergence, land acquisition, and environmental impact, so as to have off stream open loop PSP.
- Closed-loop vs open-loop: Prefer closed-loop (off-river) PSP where possible, as they have minimal riverine impact and are easier to get environmental clearance.
- Topography and geology: Choose sites with high head (ideally > 200 m) and short tunnel length to reduce civil works cost and losses. Conduct detailed geological and geotechnical investigations early to avoid surprises during construction.

Reservoirs and Storage

- Storage duration: Design for 6–8 hours of discharge at rated capacity to meet peak demand and to have cushion for Ancillary Services.
- Water balance: Ensure minimal net water consumption; closed-loop systems should be designed to operate with very low make-up water.
- Existing reservoirs: Where feasible, use existing dams/reservoirs as one of the two reservoirs (e.g., Tehri PSP uses existing Tehri & Koteshwar reservoir as upper and lower reservoirs respectively.

Turbines and Electro-Mechanical Equipment

- Reversible pump-turbines: Use Francis-type reversible units for high efficiency in both pumping and generating modes.
- Variable-speed units: Fixed Speed pump-turbine Units are generally preferred due to lower cost and less O&M costs. However, variable-speed pump-turbines may be considered in case of large head variation.

- Domestic manufacturing: Leverage India's strong domestic manufacturing base for turbines, generators, and transformers to support "Atmanirbhar Bharat" and reduce import dependence.

Water Conductor System

- Tunnels and penstocks: Optimize alignment and diameter to minimize head loss and construction cost.
- Surge control: Provide adequate surge tanks and valves to manage water hammer and transient pressures during rapid start/stop cycles. Optimize design to avoid surge shaft if design permits.
- Rugged terrain adaptation: In hilly regions (Himalayas, Western Ghats), design tunnels and penstocks to minimize environmental disturbance and avoid ecologically sensitive zones.
- Optimize rated head by appropriate selection of location of reservoirs and height of dams to ascertain if already available standard Generating unit size can be adopted.

10.2 Project Development and Implementation Best Practices

To ensure timely and cost-effective execution, follow these best practices:

Pre-Feasibility and DPR Preparation

- Follow CEA guidelines: Prepare the Detailed Project Report (DPR) as per CEA's "Guidelines for Formulation of Project Reports for Power Projects" and the revised PSP-specific guidelines.(for projects to be concurred by CEA)
- Realistic cost estimation: Use realistic quantities, updated rates, and adequate contingencies; avoid underestimation of civil works.

Power Optimization

- Integration with RE: Model the PSP operation in coordination with nearby solar/wind parks to minimize curtailment and maximize RE utilization. If PSP is co-located with solar, then captive solar can be used for Pumping.

Construction and Contracting

- Turnkey v/s distributed package contracts: For large projects, consider turnkey contracts for better coordination; for smaller projects, well-defined packages (civil, E&M, transmission) may be more suitable.
- Local infrastructure development: Plan for enabling infrastructure (roads, bridges, construction power, water) early as this will reduce actual construction time and the developer is likely to get more competitive rates from bidders for project works, the Central Government provides budgetary support for such infrastructure for hydro and PSP projects.
- Safety and quality: Adopt international standards (e.g., Hydropower Sustainability Standard) and ensure strong safety and quality management systems, especially for underground works.

Grid Integration and Operation

- Evacuation system: Ensure adequate transmission capacity and substation capacity; coordinate with Grid-India and the concerned State Transmission Utility (STU).

- Market participation: Design the project to participate in all market segments (Day-Ahead Market, Real-Time Market, ancillary services markets) to maximize revenue.
- Peak and off-peak tariffs: Advocate for clear peak/off-peak tariff signals to incentivize PSP operation during high-demand periods.

10.3 Sustainability and Social Best Practices

Sustainable development is key to long-term success:

- Environmental protection: Minimize deforestation, protect biodiversity, and implement a robust Environmental Management Plan (EMP).
- Desalination plants for drinking water requirement shall be needed.
- Minimal R&R: PSPs (especially off-river) typically involve very little submergence and displacement; where R&R is needed, follow the R&R policy and ensure fair compensation and rehabilitation.
- Local development: Use the project to boost local employment, skill development, and infrastructure (roads, schools, health centers).
- Exhausted mines as PSP sites: Explore the use of abandoned coal mines as lower reservoirs; this supports mine reclamation and provides a ready-made site
- Using sea as lower reservoir: This may be a promising option, and considering India has a long coastal range and the Western Ghats may provide good locations for the upper reservoir, R&D on materials withstanding high salinity (for pipelining, underwater parts of turbines, cooling water system, and the entire seawater intake and discharge system) will be needed.

10.4 Other best practices:

In case of PSPs, Power House works (Electromechanical works & Civil works) are very critical. Therefore, time saved in this activity directly affects the total construction period.

Some of the measures for timely construction are as follows:

a) Creation of a large-diameter shaft (say 10 m diameter) supported with a gantry crane of adequate capacity at the top and using a motorized trolley at the bottom of shaft to feed electromechanical sub-assemblies from a separate access, distinct from the normal access to the service bay/MAT.

b) Creating berms of sufficient width on both sides of the powerhouse (in case of a surface power station) and installing high-capacity mobile cranes to place electromechanical sub-assemblies.

c) Steel Columns above Machine Hall for quick construction up to EoT Beam and availability of roof.

10.5 Case study: Pinnapuram co-located IREP for optimisation of transmission system

Pinnapuram Integrated Renewable Energy Project (IREP) has been developed as the World's First & Largest Gigawatt Scale integrated project with Solar, Wind and Pumped Storage components at the same location that can supply Schedulable Power On Demand (SPOD) which is Dispatchable & Schedulable Renewable Energy to consumers across India.

All the RE Generation and PSP is connected at M/s Greenko's Common Pooling Substation (CPSS) which is further connected to 400 KV Kurnool (New) substation through a Dedicated Transmission Line (DTL).

The capacity of PSP during generation is 1680 MW and during pumping is 1855 MW. In addition to PSP, the proposed Solar and wind capacities are 2175 MW and 327.5 MW respectively including the generation capacity of M/s Arcelor Mittal which is also connected to M/s Greenko's CPSS. The total co-located installed Generation/pumping capacity is more than 4300 MW.

By integrating the solar & wind along with large capacity storage, the transmission systems i.e. DTL and ISTS (CTU), has been planned in an optimal manner.

In case these solar and wind generation sources were developed at different locations, it would have required a separate transmission system of 2500 MW capacity and 1855 MW (drawl requirement) capacity at two different locations and ISTS substations. Capacity utilisation factor (CUF) of these individual transmission systems would have been of the order of 25%-30% only, keeping in view the utilisation of transmission system for solar/wind would be only for 6-7 hours and transmission system for PSP would be only for 14-15 hours (both for Generation and pumping).

However, by co-locating both solar, wind and large-scale PSP, the requirement of combined transmission system gets reduced significantly and thus reduction of establishment of transmission infrastructure & better utilization of the existing grid. During daytime (Solar Hours), 1855 MW power generated from solar and wind is utilised for charging of PSP and only balance power of around 400–500 MW during peak solar hours is injected into transmission system. Similarly, transmission system which would have been required for drawl of power from ISTS (CTU) substation have also reduced significantly due to local distribution of power to PSP from co-located Solar and wind generation.

During evening time there will be requirement of transmission system for 1680 MW injection from PSP and 300 MW from Wind. In this way the net transmission system developed for this co-located generation capacity is around 2000 MW which otherwise would have been more than 4300 MW if the solar and wind were installed at different locations.

Further co-located development of Solar, Wind and PSP has resulted into local displacement of power from solar and wind to charging of PSP and the net power flow in the DTL and ISTS transmission system is reduced resulting into

lower transmission losses. On account of lower transmission losses there will be significant saving during lifetime of project.

Besides, co-located RE and PSP will go long way in balancing grid by neutralising the variable character of solar and wind generation resulting into large deviation. By integrating the variable RE generation with PSP deviation in scheduling can be minimised resulting into a stable power available to grid.

Chapter-11
International Scenario

Global Pumped Storage Hydropower: Status and Outlook (2025)

Pumped Storage Project (PSP) remains the world's dominant grid-scale storage technology, with global installed capacity reaching ~189 GW in 2024, according to the International Hydropower Association's 2025 World Hydropower Outlook. In 2024 alone, about 8.4 GW of new PSP capacity was added globally. The global PSP development pipeline now exceeds 600 GW, with more than 105 GW under construction, of which over 90 GW is in China.

IHA estimates that existing PSP plants can store up to ~9,000 GWh of electricity, providing critical inertia, frequency regulation, and long-duration storage for high-renewables grids. With China targeting 120–130 GW of PSP by 2030 and system operators projecting 129 GW in their regions, IHA expects around 70 GW of China's under-construction capacity to be commissioned by 2030. Globally, an estimated ~90 GW of new PSP could be added by 2030, raising total capacity to about 280 GW, a nearly 50% increase from today's base. This implies an average build rate of ~18 GW/year, roughly 5–10 times the 2–4 GW/year added annually over the past two decades.

11.1 Global PSP Capacity and Pipeline (2025)

Parameter	Value (2025)
Global operational PSP capacity	~189 GW
Global PSP projects (operational)	~340–400 Nos.
Estimated storage capacity	~9,000 GWh
PSP capacity added in 2024	8.4 GW
Global PSP under construction	>105 GW
Global PSP in development pipeline	>600 GW
Expected PSP addition by 2030	~90 GW
Projected global PSP capacity by 2030	~280 GW

11.2 Country-wise PSP Overview (Operational + Pipeline)

The table below summarizes the latest available data on operational and planned PSP capacity by country, based on IHA, national statistics, and recent project updates.

S. No	Country	Operational Projects (Nos.)	Operational Capacity (MW)	Announced / Under Construction (MW)
1	China	50	53,000	89,000
2	USA	39	22,170	~50,000
3	Japan	41	21,817	400
4	EU (Germany, Italy, France, Spain, Austria, Switzerland, etc.)	~120	~56,000	~15,000
5	India	10	7175	~104,000
6	South Korea	7	4,700	–
7	UK	4	2,833	>13,000
8	Australia	6	2,462	250
9	South Korea	7	4,700	–
10	Rest of Asia (Taiwan, Thailand, Philippines, etc.)	~10	~6,000	~1,000
11	Eastern Europe & Balkans (Ukraine, Russia, Bulgaria, Serbia, etc.)	~15	~7,500	~2,000
12	Latin America (Argentina, Brazil, Chile, etc.)	~10	~2,500	~1,500
13	Africa & Middle East (South Africa, Iran, etc.)	~10	~4,000	~1,000

China: The Global Leader

China dominates global pumped storage power (PSP) with ~53 GW of operational capacity and over 90 GW under construction as of 2025, making it by far the largest PSP market in the world. The National Energy Administration has set a national target of 120 GW of PSP by 2030, and system operators China State Grid and Southern State Grid project a combined 129 GW in their regions by that date. The International

Hydropower Association (IHA) estimates that around 70 GW of China's under-construction capacity could be commissioned by 2030, contributing significantly to the global PSP build-out. China has recently (December 2025) commissioned 425 MW capacity PSP unit in Tiantai PSP, Zhejiang East China.

United States: Storage for a Clean Grid

The US has 22.2 GW of operational PSP capacity and about 102 GW of total hydropower as of 2024. For the first time, battery storage (27 GW) has surpassed PSP as the largest source of utility-scale energy storage capacity, but PSP remains essential for long-duration storage (8–12 hours), grid stability, and renewable integration, especially in regions with high wind and solar penetration.

Japan: Stability and Innovation

Japan has ~21.8 GW of PSP across more than 40 plants, making it the third-largest PSP country globally. It has a long history of PSP and is a leader in innovative technologies, including seawater PSP (Okinawa Yanbaru) and large-scale reversible plants like Kannagawa, which is partially operational and will reach 2.82 GW when complete.

Europe: Flexibility for the Energy Transition

Europe's PSP capacity is 56 GW, with 201 MW added in 2024, and the development pipeline now stands at 52.9 GW, supported by EU-level reforms and national mechanisms designed to ensure long-term grid flexibility. The EU's 2024 electricity market reform and national mechanisms (e.g., capacity markets in Italy and Spain, Cap & Floor in the UK) are driving renewed interest in PSP as the most proven large-scale electricity storage technology.

Regional pipelines:

- UK: Over 13 GW of PSP projects announced and in development.
- Austria: Around 1.3 GW under construction, with 2.8 GW in early development.
- Italy: Pipeline nearing 4 GW.
- Greece: Over 3 GW of PSP in development.

11.3 Largest PSP:

Globally: (Under operation)	3600 MW (12 units of 300 MW each) Fengning Pumped Storage Power Station in Hebei Province
India :	3660 MW UP-01 PSP is likely to get TEC for CEA shortly.

Annex

State-wise Potential of ON-Stream Pumped Storage Projects

S.No.	Region/ Name of the Projects	Capacity (MW)	District	Status	Developer
Northern Region					
Himachal Pradesh					
1	Majra	700	Kangra	Balance	Indicated by MoP to BBMB
2	Renukaji (Renuka)	1630	Sirmaur	Balance	HPPCL (Himachal Pradesh Power Corporation Ltd.)
	Total (Himachal Pradesh)	**2330**			
Uttarakhand					
1	Tehri	1000	Tehri Garhwal	Under Active Construction (1 no of unit)/ In Operation (3 no of unit)	THDC
2	Ichari	600	Dehradun	Balance	UJVN Ltd
	Total (Uttarakhand)	**1600**			
	Total (Northern Region)	**3930**			
Western Region					
Maharashtra					
1	Ghatghar Stage-II	125	Ahmednagar	Balance	WRD, Maharashtra
2	Mutkhel	110	Ahmednagar	Balance	WRD, Maharashtra
3	Warasgaon	1200	Pune/Raigad	Balance	Initially alloted to WRD, Maharashtra
4	Bhira	150	Raigad	In Operation	Tata Power
5	Ghatgar	250	Thana	In Operation	Mahagenco
6	Kengadi	1550	Thane	Balance	Indicated by MoP to NHPC
7	Jalond	2400	Thane	Balance	Indicated by MoP to NHPC
8	Amba	800	Pune	Balance	Indicated by MoP to NTPC
9	Jalvara	2220	Ratnagiri/Belgaum	Balance	Indicated by MoP to SJVNL
10	Koyna Left Bank	80	Satara	Balance	WRD, Maharashtra
11	Varandhghat	800	Pune	Balance	WRD, Maharashtra
12	Panshet	1600	Satara	Balance	WRD, Maharashtra
13	Nive	1200	Pune	Balance	WRD, Maharashtra
14	Kodali	220	Kolhapur	Balance	WRD, Maharashtra

S.No.	Region/ Name of the Projects	Capacity (MW)	District	Status	Developer
15	Atvan	500	Pune/raigad	Balance	WRD, Maharashtra
16	Koyna St-VI	400	Satara	Balance	WRD, Maharashtra
	Total (Maharashtra)	**13605**			
Gujarat					
1	Kadana	240	Panchmahal	In Operation	GSECL
2	Sardar Sarover	1200	Baharuch	In Operation	SSNNL
	Total (Gujarat)	**1440**			
Madhya Pradesh					
1	Indira Sagar-Omkareshwar PSP	640	Khandwa	Under Examination	NHDC ltd
	Total (Madhya Pradesh)	**640**			
Chhattisgarh					
1	Chikni	325	Surajpur	Balance	Chikni Energy Private Limited
2	Kharauli	500	Surajpur	Balance	Kharauli Energy Private Limited
	Total (Chhattisgarh)	**825**			
	Total (Western Region)	**16510**			
Southern Region					
Telangana					
1	Srisailam LBPH	900	Karnool	In Operation	TSGENCO
2	Nagarjunasagar	705.60	Nalgonda	In Operation	TSGENCO
	Total (Telangana)	**1605.60**			
Andhra Pradesh					
1	Upper Sileru	1350	Vishakhapatnam	Under Constructio n	APGENCO
2	Kurukutti	1200	Vizianagaram	Balance	NREDCAP & AGEL
3	Karrivalasa	1000	Vizianagaram	Balance	NREDCAP & AGEL
4	Yerravaram PSP	1200	Vishakhapatnam	Balance	Initially alloted to Shirdi Sai Electricals Ltd.
	Total (Andhra Pradesh)	**4750**			
Tamil Nadu					
1	Sillahalla St.-I	1000	Nilgiri	Balance	Initially allotted to TANGEDCO
2	Kundah Pumped Storage (Stage I,II &III)	500	Nilgiri	Under Active Constructio n	TANGEDCO
3	Kadamparai	400	Coimbatore	In Operation	TANGEDCO

S.No.	Region/ Name of the Projects	Capacity (MW)	District	Status	Developer
4	Kodayar	500	Kanyakumari	Balance	Initially allotted to TANGEDCO
5	Sandynalla	1200	Nilgiris	Balance	Indicated by MoP to NTPC
6	Upper Bhavani	1000	Nilgiris	Under S&I	NTECL
7	Sigur	800	Nilgiris	Balance	Indicated by MoP to NTPC
8	Manalar	1200	Theni	Balance	TANGEDCO along with Tractbel Pvt Ltd
9	Chattar	1100	kanyakumari	Balance	TANGEDCO along with TATA Consultancy
10	Karayar	1000	Tirunelveli District	Balance	TANGEDCO along with TATA Consultancy energy Pvt Ltd
11	Aliyar	700	Coimbatore	Balance	PFR prepared by TANGEDCO
12	Palar-Porathalar	1100	Dindigul	Balance	TANGEDCO along with TATA Consultancy energy Pvt Ltd
13	Athur	300	Dindigul	Balance	TANGEDCO along with TATA Consultancy energy Pvt Ltd
14	Manjalar	500	Theni	Balance	TANGEDCO along with TATA Consultancy energy Pvt Ltd
15	Mettur	1000	Erode	Balance	TANGEDCO along with TATA Consultancy energy Pvt Ltd
	Total (Tamil Nadu)	**12300**			
Karnataka					
1	Varahi	1500	Dakshina Kannada	Balance	Indicated by MoP and allotted by Govt. of Karnataka to KPCL
2	Sharavathy	2000	Shivamonga	Under Construction	KPCL
	Total (Karnataka)	**3500**			
Kerala					
1	Idukki	600	Idukki	Balance	Indicated by MoP to THDCIL

S.No.	Region/ Name of the Projects	Capacity (MW)	District	Status	Developer
2	Pallivasal	600	Idukki	Balance	Indicated by MoP to THDCIL
	Total (Kerala)	**1200**			
	Total (Southern Region)	**23356**			
Eastern Region					
Jharkhand					
1	Lugupahar	1500	Bokaro	Balance	Initially alloted to DVC
	Total (Jharkhand)	**1500**			
West Bengal					
1	Kulbera	800	Purulia	Balance	Indicated by MoP to DVC
2	Bandhu	900	Purulia	Balance	WBSEDCL
3	Panchet Hill	1000	Purulia	Balance	Indicated by MoP to DVC
4	Purulia	900	Purulia	In Operation	WBSEDCL
5	Turga PSS	1000	Purulia	Concurred and yet to be taken up for construction	WBSEDCL
6	Kathlajal	900	Purulia	Balance	WBSEDCL
	Total (West Bengal)	**5500**			
Odisha					
1	Balimela	500	Malkangiri	Under S&I	OHPCL
	Total (Odisha)	**500**			
	Total (Eastern Region)	**7500**			
North Eastern Region					
Arunachal Pradesh					
1	Panyor	660	Lower Subansiri	Balance	Indicated by MoP to NEEPCO
	Total (Arunachal Pradesh)	**660**			
Assam					
1	Kopili	320	Dima Hasao	Balance	Indicated by MoP to NEEPCO
	Total (Assam)	**320**			
Mizoram					
1	Leiva Lui	1500	Aizawl	Balance	Indicated by MoP to NEEPCO
2	Tuiphai Lui	1650	Aizawl	Balance	Indicated by MoP to NEEPCO

S.No.	Region/ Name of the Projects	Capacity (MW)	District	Status	Developer
3	Nghasih	400	Lunglai	Balance	Indicated by MoP to NEEPCO
4	Daizo Lui	2000	Lunglai	Balance	Indicated by MoP to SJVNL
	Total (Mizoram)	**5550**			
	Total (North Eastern Region)	**6530**			
	Total All India (ON River)	**57825.60**			

State-wise Potential of OFF Stream Pumped Storage Projects

S.No	Region/ Name of the Projects	Capacity (MW)	District	Status	Developer
Northern Region					
Himachal Pradesh					
1	Dhaulasidh(Sadda)	180	Hamirpur	Balance	Indicated by MoP to SJVNL
2	Koldam PSP-I &II	2400		Balance	Indicated by MoP to NTPC(self identified)
3	Lehri	850	Bilaspur	Balance	Indicated by MoP to BBMB(self identified)
4	Raipur/Dobar Uparla	1500	Una	Balance	•Indicated by MoP to BBMB(self identified)
	Total (Himachal Pradesh)	**4930**			
Rajasthan					
1	Sukhpura Off-Stream	2560	Chittorgarh	Under S&I	Greenko
2	Shahpur	1800	Baran	Under S&I	Greenko
3	Sirohi	1200	Sirohi	Under S&I	JSW Energy
4	Rana Pratap Sagar	1200	Chittorgarh	Balance	Semaliya Energy Private Limited
5	Semaliya-II	1200	Chittorgarh	Balance	Semaliya Energy Private Limited
6	Brahmani	600	Chittorgarh	Under S&I	Acme Urja Two Private Limited
7	Sirohi	640	Sirohi	Balance	Sasa Stone Private limited
8	Balotra	1800	Barmer	Balance	Adani Green
9	Kadambari	1560	Pali & Sirohi	Balance	Avaada Aqua Batteries Private Limited
	Total (Rajasthan)	**12560**			
Uttarakhand					
1	Maneri bhali	400		Balance	UJVN Ltd
	Total (Uttarakhand)	400			
Uttar Pradesh					
1	Kandhaura	1680	Sonbhadra	Concurred and yet to be taken up	JSW Energy PSP Six ltd

S.No	Region/ Name of the Projects	Capacity (MW)	District	Status	Developer
				for construction	
2	Musakhand	600	Chandauli	Under S&I	ACME Urja Two Private Limited
3	UP01	3660	Sonbhadra	Under S&I	Greenko
4	Shoma	2400	Sonbhadra	Under S&I	Torrent Power
5	Sonbhadra	1200		Balance	Sri Siddharth Infratech & Services (I) Privated Limited
6	Sashnai	1760		Balance	Torrent Power limited
7	Astha UP	640		Balance	Astha Green Energy Ventures India Private Limited
8	Panaura	1500	Sonbhadra	Under S&I	Adani Green
9	Jhariya	1620	Sonbhadra	Under S&I	Jhariya anant urja
10	Chichlik	1560	Sonbhadra	Under S&I	Avaada
11	Kalu Patti	1000	Mirzapur	Under S&I	Renew Hydro
	Total (Uttar Pradesh)	**17620**			
	Total (Northern Region)	**35510**			
Western Region					
Madhya Pradesh					
1	MP30 Gandhi Sagar	1920	Neemach	Under Construction	Greenko MP01 IREP Pvt Ltd
2	Tekwa-2	800	Khargone	Balance	Initially alloted to NHDC
3	Satpura-2	1000	Chhindwara	Balance	Indicated by MoP to NHPC
4	Panari	1800	Satna	Balance	Sri Siddharth Infratech & Services (I) Privated Limited
5	Astha MP	1200	Khargone	Balance	Astha Green Energy Ventures India Private Limited
6	MP Pumped Storage Project	600	Panna	Balance	Rithwik Projects Private Limited

S.No	Region/ Name of the Projects	Capacity (MW)	District	Status	Developer
7	Rewa	600	Rewa	Balance	Sasa Stone Private Limited
8	Jankhai	1500	Rewa	Balance	GSC PSP Madhya Pvt Ltd
9	Bargi	1000	Mandla	Balance	Serentica Renewables India 21 Pvt. Ltd.
	Total (Madhya Pradesh)	**10420**			
Maharashtra					
1	Kundi	600	Ratnagiri	Balance	Indicated by MoP to NTPC
2	Pane	1500	Raigad	Concurred and yet to be taken up for construction	JSW Energy
3	Tarali	1500	Satara	Under S&I	Adani Green Energy Ltd
4	Malshej Ghat Bhorande	1500	Pune & Thane	Under S&I	Adani Green Energy Ltd.
5	Aruna	1950	Kolhapur	Balance	Indicated by MoP to THDCIL
6	Humbarli Birmani	1000	Satara/ Ratnagiri	Balance	Indicated by MoP to THDC
7	Shirwata	1800	Pune	Concurred and yet to be taken up for construction	TATA power
8	Bhivpuri	1000	Raigad	Under Construction	Tata Power Company Limited
9	Warasgaon Warangi	1500	Pune-Raigad	Under S&I	Adani Green
10	Patgaon	2100	Sindhudurg and Kolhapur	Balance	Initially alloted to Adani Green Energy Ltd.
11	Koyna Nivakane	2700	Satara	Under S&I	Adani Green Energy Ltd.
12	Nayagaon	2000	Chhatrapati Sambhajinagar	Under S&I	Greenko
13	Mhaismal	800	Aurangabad	Balance	Greenko Energy Private Limited

S.No	Region/ Name of the Projects	Capacity (MW)	District	Status	Developer
14	KOLHAPUR	1200	Kolhapur	Balance	Rithwik Projects Privated Limited
15	Maval (Saidongar-2)	1200	Pune and Raigarh	Under S&I	Torrent power
16	karjat (Saidongar-1)	3000	Raigad	Concurred and yet to be taken up for construction	Torrent power
17	Kamod	2000	Nandubar	Under S&I	Megha engineering
18	Pawana Falyan	2400	Pune - Raigad	Under S&I	Avaada
19	Ghosla	2000	Aurangabad	Under S&I	Megha engineering
20	Kalamb Thakurwadi	1000	Raigad	Balance	Renew Solar Power Pvt limited
21	Savitri	2400	Satara-Raigad	Under S&I	NHPC
22	Ambegaon	500	Ambegaon	Balance	Renew Hydro Power Pvt Ltd.
23	Bhavali	1500	Nashik/thane	Under Construction	JSW Energy PSP Two limited
24	Kumbhe	1100	Raigad	Under S&I	NTPC
25	Adnadi	1500	Amravati	Under S&I	Adani Hydro Energy Ten Limited
26	Kalu	1800	Pune & Thane	Under S&I	NHPC
27	Malshej Ghat	1200	Pune & Thane	Under S&I	THDC
	Total (Maharashtra)	**42750**			
Chhattisgarh					
1	Dangari	1400	Jashpur	Under S&I	CSPGCL
2	Rouni	2100	Jashpur	Under S&I	CSPGCL
3	CHH-09	1200	Surguja	Balance	Sterlite Grid 36 Limited
4	Gandhwani	1200	Surguja	Balance	Gandhwani Energy Private Limited
5	Bilaspur	1000	Bilaspur	Under S&I	Jindal Renewables
6	Sikaser	1200	Gariyaband	Under S&I	CSPGCL

S.No	Region/ Name of the Projects	Capacity (MW)	District	Status	Developer
7	Chirec	75	Surajpur	Balance	Venika Green Power Private Limited
8	Parsapani	1000	Bilaspur	Balance	Hunduja Renewable Energy limited
9	Hasdeo Bango	800	Korba	Under S&I	CSPGCL
10	Kotpali	1800	Balrampur	Balance	Chhattisgarh State Power Generation Company Limited
11	Mudghusri	1000	Kabeerdham	Balance	Renew Vidyut Tej Pvt. Ltd.
	Total (Chhattisgarh)	**12775**			
Gujarat					
1	Ukai	1600	Tapi	Under S&I	Greenko
2	Pindval	1000	Valsad	Balance	Torrent Power
3	Tokarpada	1300	Valsad	Balance	Torrent Power
4	Serula	960	Tapi	Under S&I	GSECL
5	Juni Kayaliwel	300	Tapi	Under S&I	GSECL
6	Amalpada	300	Tapi	Under S&I	GSECL
7	Juni Bavli	450	Tapi	Under S&I	GSECL
8	Satkashi	330	Tapi	Under S&I	GSECL
9	Dharoi	1250	Banaskantha	Under S&I	GSECL
10	Sukhi	500		Balance	GSECL
11	Dharampur	1500		Balance	Adani green
12	Motaraypura	1000	Narmada	Under S&I	GSECL
	Total (Gujarat)	**10490**			
	Total (Western Region)	**76435**			
Southern Region					
Andhra Pradesh					
1	Pinnapuram	1680	Kurnool	In Operation	Greenko AP01 IREP Private Limited
2	Gandikota	1000	Kadapa	Under Construction	Adani Green Energy Ltd.

S.No	Region/ Name of the Projects	Capacity (MW)	District	Status	Developer
3	Chitravathi	500	Ananthapuramu	Under Construction	Adani Renewable Energy Forty-Two Limited
4	Somasila	900	Kadapa	Balance	Initially alloted to Shirdi Sai Electricals Ltd.
5	Owk	800	Kurnool	Balance	RVR Project Pvt Ltd
6	Paidipalem East	1200	YSR	Balance	Initially alloted to Indosol Solar Power Pvt. Ltd.
7	Singanamala	800	Ananthapuramu	Balance	NREDCAP & AGEL
8	Paidipalem North	1000	YSR	Balance	Initially alloted to Indosol Solar Power Pvt. Ltd.
9	Veeraballi Off-Stream	1800	Annamayya	Balance	Initially alloted to Astha Green Energy Ventures India PVT. LTD.
10	Vempalli	1500	YSR Kadapa	Under S&I	JSW Energy
11	Gujjili	2400	Alluri Sitharama Raju	Under S&I	NECL
12	Raiwada	900	Anakapalle	Under S&I	Adani Green Energy Ltd.
13	Chittamvalasa	1800	Alluri Sitarama Raju	Under S&I	NECL
14	Yaganti	1000	Nandyal	Balance	Initially alloted to APGENCO
15	Kamalapadu	950	Ananthapuramu	Under S&I	APGENCO
16	Aravetipalli	1320	YSR	Balance	Initially alloted to APGENCO
17	Rayavaram	1500	Annamayya	Under S&I	APGENCO& ONGC
18	Gadikota	1200	Annamayya	Under S&I	APGENCO
19	Pedakota	1800	Alluri Seetharama Raju	Under S&I	Adani Green
20	Rajupalem	350	YSR Kadapa	Balance	NREDCAP
21	Yadaballi	1200	Annamayya	Balance	NREDCAP
22	Koppolu	2400	YSR Kadapa	Balance	
	Total (Andhra Pradesh)	**28000**			
Tamil Nadu					

S.No	Region/ Name of the Projects	Capacity (MW)	District	Status	Developer
1	Velimalai	1100	Kanyakumari	Balance	TANGEDCO along with TATA Consultancy energy Pvt Ltd
2	Sillahalla Stage-II	1000	Nilgiris & Coimbtore	Balance	Indicated by MoP to NTPC
3	Greenko TN01	1200	Tirupathar	Balance	Greenko Energy Private Limited
4	Arunachalam	900	Dharamapuri and tiruvannamalai	Balance	Volthills Private Limited
5	Tiruvannamalai	2000	Tiruvannamalai	Balance	Eco Leap Technologies India private limited
6	Greenko TN -11	1000	Salem	Balance	Greenko Energie private limited
7	Alleri	1800	Vellore	Balance	Adani Hydro Energy Fourteen Limited
	Total (Tamil Nadu)	**9000**			
Karnataka					
1	Saundatti	1600	Belgavi	Under Construction	Greenko KA01 IREP Private Limited
2	Netravathy Stage I	1500	Hasan	Balance	Indicated by MoP to NTPC
3	Narihalla	300	Bellary	Under S&I	JSW Energy
4	Shanti Sagar	270	Davanagere	Balance	Cerulean Energy Solutions Privated Limited
5	Vijayanagar	130	Bellary	Balance	JSW Renewable Energy (Vijayanagar) Limited
6	Sankanoor	300	Kalaburagi	Balance	Cerulean Energy Solutions Privated Limited
	Total (Karnataka)	**4100**			
Telangana					
1	Ippagudem	3960	Mulugu	Balance	Greenko energie Private Limited
2	Ranapur	1200	Adilabad	Balance	Sri Siddharth Infratech & Services (I) Private Limited

S.No	Region/ Name of the Projects	Capacity (MW)	District	Status	Developer
3	Greenko TS01	750	Adilabad	Balance	Greenko Energies Private Limited
4	Astha Telangana	600	Nizamabad	Balance	Astha Green Energy Ventures India Private Limited
5	Cerulean-II	640	Komarambheem	Balance	Cerulean Energy Solutions Privated Limited
	Total (Telangana)	**7150**			
	Total (Southern Region)	**48250.00**			
Eastern Region					
Odisha					
1	Upper Indravati	600	Kalahandi	Concurred and yet to be taken up for construction	OHPC
2	Upper Kolab	600	Koraput	Under S&I	OHPC
3	Greenko OD01	1200	Kalahandi	Balance	Greenko Energies Private Limited
4	Ramial Left	1500	Keonjhar	Balance	Renew Solar Power Private Limited
5	Tainsar	675	Deogarh	Balance	Jindal Renewable Power Private limited
6	Masinta	1000	Deogarh	Under S&I	NHPC
7	Saurali	840	Deogarh	Balance	Jindal Renewable Power Private limited
8	Dandadhar	900	Keonjhar	Balance	
9	Deo Dam	150	Mayurbhanj	Balance	
10	Telengiri	650	Koraput	Balance	
11	RET Dam	450	Kalahandi	Balance	
12	Brahmani River Stream	450	Sundargarh	Balance	
13	Salandi Reservoir	300	Keonjhar	Balance	
14	Ghodahada	250	Ganjam	Balance	
15	Patora Dam	350	Nuapada	Balance	

S.No	Region/ Name of the Projects	Capacity (MW)	District	Status	Developer
16	Harbhangi	300	Gajapati	Balance	
17	Badanalla Stream	600	Rayagada	Balance	
18	Koldihi	640	Deoghar	Balance	
19	Khunta	1000	Mayurbhanj	Balance	
20	Madhapur	1000	Baudha	Balance	
21	Tumudibandh	3000	Kandhamal	Balance	
22	Ambapani	1000	Kalahandi	Balance	
23	Kamalakheta	800	Gajapati	Balance	
24	Lakaisuni	920	Gajapati	Balance	
25	Prahadipanga	2300	Kandhamal	Balance	
26	Panabari	720	Nayagarh	Balance	
27	Kumulsingi	750	Gajapati	Balance	
28	PSP_2	3179	Malkangiri	Balance	
29	PSP_3	2380	Gajapati	Balance	
30	Makod Ghat	300	Sundergarh	Balance	
31	PSP_5	1158	Gajapati	Balance	
32	PSP_6	1117	Kehdujhar	Balance	
33	Barhagarh	1000	Ganjam	Balance	
34	Sikabadi	600	Gajapati	Balance	
35	Dhayagurha	750	Koraput	Balance	
36	PSP_10	583	Kalahandi	Balance	
37	PSP_11	507	Ganjam	Balance	
38	PSP_12	484	Nayagarh	Balance	
39	Dudhapalli	600	Malkangiri	Balance	
40	PSP_14	465	Koraput	Balance	
41	Mahughar	720	Gajapati	Balance	
42	PSP_16	367	Kehdujhar	Balance	
43	PSP_17	349	Malkangiri	Balance	
44	PSP_18	343	Kandhamal	Balance	
45	PSP_19	299	Kandhamal	Balance	
46	PSP_20	270	Sundergarh	Balance	
47	Jharigumma	500	Kalahandi/Nabarangpur	Balance	
48	Bhataguda	720	Malkangiri	Balance	
49	PSP_23	228	Nayagarh	Balance	
50	PSP_24	210	Malkangiri	Balance	
51	Balinala	750	Ganjam	Balance	
52	PSP_26	201	Malkangiri	Balance	
	Total (Odisha)	**41025**			
Bihar					

S.No	Region/ Name of the Projects	Capacity (MW)	District	Status	Developer
1	Bihar New PSP-1	910	Nawada	Balance	Sun Petrochemicals Pvt Ltd
2	Bihar New PSP-2	920	Nawada	Balance	Sun Petrochemicals Pvt Ltd
3	Bihar New PSP-3	650	Nawada	Balance	Sun Petrochemicals Pvt Ltd
4	Gosaintari	920		Balance	Sun Hydro energy Pvt Ltd
	Total (Bihar)	**3400**			
	Total (Eastern Region)	**44425**			
North Eastern Region					
Tripura					
1	Longtarai	800	Dhala	Under S&I	NHPC
	Total (Tripura)	**800**			
Assam					
1	Greenko Assam-01	900	Karbi Anglong & Marigaon	Balance	Greenko Energies Pvt. Ltd.
2	Howraghat	1500	Karbi Anglong & Marigaon	Under S&I	Adani Hydro Energy Eight Limited
3	Moti Hojai	1200	Dima hasao	Under S&I	Adani Hydro Energy Nine Limited
	Total (Assam)	**3600**			
	Total (North Eastern Region)	**4400**			
	Total All India (Off River)	**209020.0**			