

Hydroelectric Projects on Different River Basins in the State of Jammu and Kashmir: A Review

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Abstract: Electricity demand is increasing rapidly in each state of India and to fulfil this demand the development spreads to various states of the country due to this the production of electricity has become more. The review article mainly focus on state of Jammu and Kashmir which have significant water resources with the capability to generate about 20,000 MW of hydroelectric power and is experiencing worst power crises. Out of 20,000 MW capacities 16,000 MW have been identified economically and technically feasible. The state has various river basins which include Indus and its tributaries, Jhelum and its tributaries, Chenab and its tributaries; as well as Ravi water resources and many hydroelectric power projects are installed on these river basins. Some projects had been completed and some are under work. The State is deficit in power supply and even to fulfil its own requirement, around 70% of power is imported / purchased from outside states. The initiative to increase hydropower capacity is to turn towards more energy-efficient processes, which will also help the State to conserve electricity.

Keyword's: Hydroelectricity, River Basins, Jammu and Kashmir

1. Introduction

Hydropower is one of the most important renewable energy resources known worldwide. However, with environmental and social drawbacks its development suffers. The degradation of the environment and climate change can negatively impact hydropower generation. It is possible to make a sustainable hydropower project, but needs proper planning and design careful system to manage the challenges. Properly planned hydropower projects can contribute to supply sustainable amount of energy. The proper and appropriate knowledge is necessary for energy planners, investors, and other stakeholders to make informed decisions concerning hydropower projects[1]. This is basically a review article and the main focus of this article is in state Jammu and Kashmir.

Hydropower scenario in state J&K

The Hydro Electric Power potential of the J&K State is about 25,000 MW, but only 3132.87 MW have been harnessed so far. The demand of power in state Jammu & Kashmir's (J&K) is mostly met by the Central Generating Stations (CGS) and the State's own sources. The State Jammu and Kashmir has own installed generation capacity is 1,419.37 MW comprising of 1,110 MW of Hydroelectric Power Stations, 198 MW thermal (Gas turbine) and 110.96 MW of SHPs. The State owned plants contribute only 45 %

of the total energy requirement and contribution from CGS is 53% of the power supply and remaining 2.0 % is sourced from private sector. JKPDD is expecting a capacity addition/ increased allocation totalling 228.9MW from CGS which currently stands at 1,671.25MW. Generation capacity available from private players (Including Solar/Wind) is expected to increase by 787.5 MW by 2018-19. As the peak demand for power is projected to increase to 2,983 MW by FY19, the State is expected to face a peak deficit of 270 MW. However, in terms of energy availability, the State is likely to face a deficit of 1,060 MU in FY19 [2]. Central Electricity Authority, Ministry of Energy, has conducted a survey so as to forecast the power demand of J&K State. The PEAK LOAD (MWs) and ENERGY (Mus) demand projections in respective years for the State of Jammu and Kashmir are given in Tabular form (as per CEA)[2],[3]

S.no	Year	Peak Load (MWs)	Energy in Mus
1	1998-99	1459	7133
2	1999-00	1608	7886
3	2001-02	1768	8703
4	2004-05	2539	12678
5	2009-10	2650	16214
6	2015-16	2732	19470
7	2017-18	2899	18809
8	2018-19	2980	19420

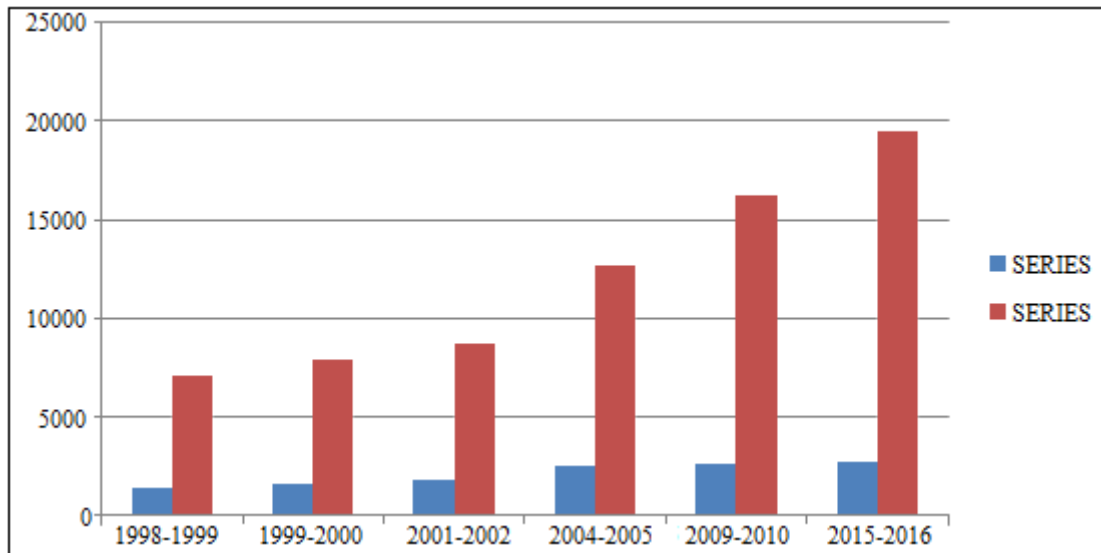


Figure 1: Represents the peak load and energy requirement from respective years in the State of Jammu and Kashmir [2][3].
Series 1: represents the peak load (MWs) from the years 1998-2019

Series 2: represents the energy requirement (Mus) from the years 1998-2019

2. Operational Projects of Rivers of J&K

The state has many lakes, rivers and glaciers. Major rivers that flow through jammu and kashmir from the himalayas are jhelum, chenab, sutlej, ravi and indus. All these river basins are located at a higher elevation that facilitating huge hydro power potential.

- 1) **Central Sector:** Total installed capacity of central sector in J&K is 2009MW. The projects of central sector are:
 - a) **Salal HEP:** Salal dam is also known salal hydroelectric power station. It is a power project on the river chenab in the reasi district of jammu. The installed capacity of the dam is 690 MW and annual generation is 3082 million kWh
 - b) **Uri-I:** It is known as Uri-1 hydroelectric project and the project is on the river jhelum. It is located 8 kms from

- c) **Dul-Hasti:** Dulhasti power station is run on the river chenab. It is located in kishtwar district of jammu and kashmir. The installed capacity of the dam is 390 MW.
- d) **Uri-II:** Uri-II hydroelectric plant is the second run of the river power project on the jhelum river in the uri area of baramulla district, jammu and kashmir. The installed capacity of the dam is 240 MW.
- e) **Chutak:** The chutak hydroelectric plant is a run on the river Suru in Kargil district of state. The installed capacity of the plant is 44 MW.
- f) **Nimo-Bazgoo:** The power project is run on the river Indus situated at Alchi village, which is located 75 kilometres from Leh. The installed capacity of the plant is 45 MW.
- g) **Sewa-II:** The plant is run on the river Sewa, a tributary of river Ravi. It is located in the himalayan region in jammu and kashmir. The installed capacity of the plant is 120 MW [4]

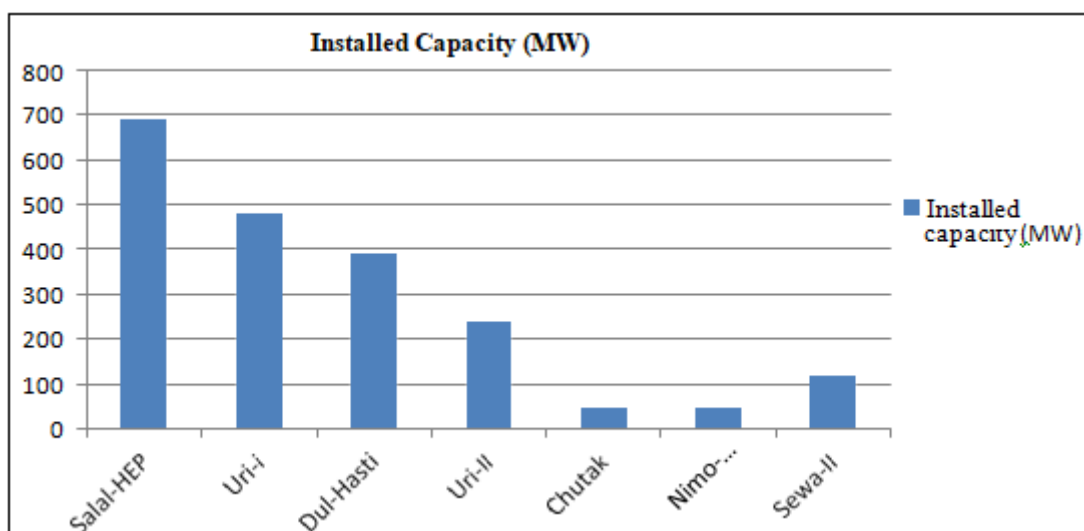


Figure 2: Represents the Installed capacity of different hydropower project of central sector in State of Jammu and Kashmir. (Source: JKSPDC)

2) **State sector:** The total installed capacity of state sector in J&K is 1211.96 MW.

The projects of state sector on different river basins are

a) **Jhelum river basin:** Jhelum river is a river in northern india and eastern pakistan. It is passes through the kashmir valley.

The different hydropower project on this river basin are:

- Lower jhelum: This project is located in near warikhah, baramulla district. The installed capacity is 105 MW
- Upper sindh-I: It is located in sumbal village of ganderbhal district. The installed capacity t is 22.6 MW
- Ganderbal: It is located in Gangerbhal district. The installed capacity is 15 MW
- Upper sindh-II: This project is located in Kangan tehsil of ganderbhal district. The installed capacity of the plant is 105 MW
- Pahalgam mini power project: It is installed in pahalgam. The installed capacity is 4.5 MW
- Karnah: This project is installed in karnah village of district kupwara. The installed capacity is 2 MW. [2]

b) **Chenab basin:**

- **Chenani-I:** It is installed in udhampur district. The installed capacity is 23.30 MW
- **Chenani-II:** This project is located in udhampur district. The installed capacity is 2 MW
- **Chenani-III:** It is located in udhampur district. The installed capacity is 7.50 MW
- **Bhaderwah:** This project is located in Doda district The installed capacity is 1.5 MW
- **Baghlihar power project:** This dam is installed in the Doda district. The installed capacity of the power project is 900MW.[4]

c) **Ravi basin:**

- **Sewa-III:** It is located in district kathua. The installed capacity of the plant is 9 MW.

d) **Indus basin:**

- **Iqbal:** This project is located in Kargil district. The installed capacity is 3.75 MW
- **Hunder:** It is installed in nobra of Leh district. The installed capacity is 0.40 MW
- **Sumoor:** This project is located in nobra of Leh district. The installed capacity is 0.10 MW.
- **Igo-marcellong:** It is located in Leh district. The installed capacity is 3 MW.
- **Haftal:** It is located in zanskar of kargil district. The installed capacity is 1 MW
- **Marpachoo:** This project is located in drass village of district kargil. The installed capacity is 0.75 MW.
- **Bazgo:** It is located in Leh district. The installed capacity is 0.30
- **Stakna:** This project is installed in stakna village of Leh district. The installed capacity is 4 MW [2] [4].
- **Sanjak:** This project is located in kargil district. The installed capacity is 1.26 MW

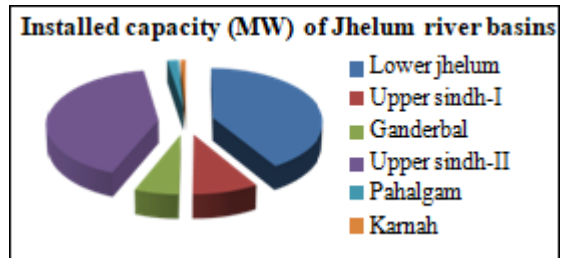


Figure 3: Pie chart represents the installed different hydroprojects on river JKSPDC

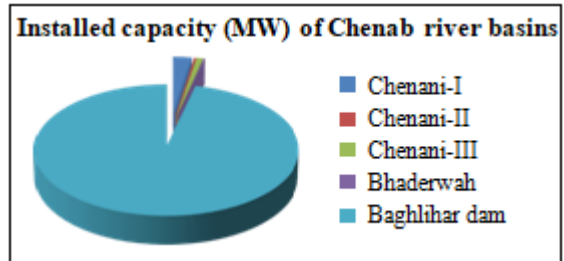


Figure 4: Pie chart represents the installed capacity of different hydroprojects on Jhelum (Source: river Chenab (Source: JKSPDC).

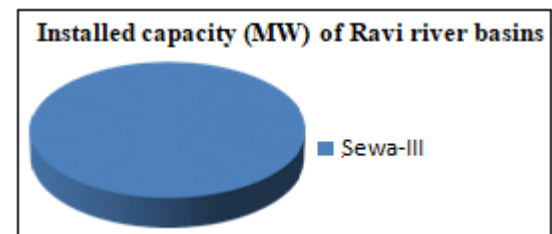


Figure 5: Pie chart represents the installed III hydroprojects on JKSPDC

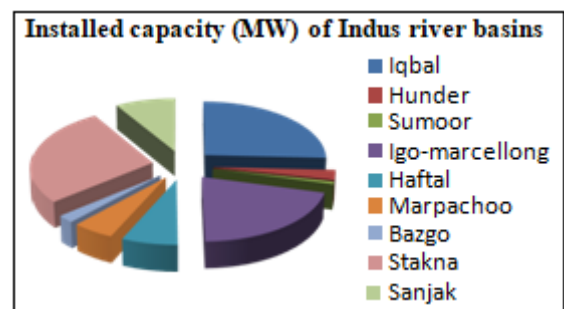


Figure 6: Pie chart represents the installed capacity of Sewa-capacity of different hydroprojects on river Ravi (Source: river Indus (Source: JKSPDC).

Upcoming projects on rivers of state J&K:

There are many upcoming hydroelectric projects on different river basins of state Jammu and Kashmir which are installed by central, state, joint venture between JKSPDC, NHPC & PTC and Large Hydro Power Projects (IPP) are shown in tabular form:

S. no	Name of project	River	Location	Installed capacity (MW)
State sector				
1	New Ganderbal	Jhelum	Ganderbal district	93.00
2	Parnai	Jhelum	Poonch district	37.50
3	Kirthai-I	Chenab	Kishtwar district	390
4	Kirthai-II	Chenab	Kishtwar district	930
5	Sawalkote	Chenab	Ramban district	1856
6	Hanu	Indus	Leh district	9
7	Dah	Indus	Leh district	9
8	Lower kalnai	Chenab	Doda district	48
9	BHEP-II	Chenab	Chanderkote, district Ramban	450
10	Achoor Gurez	Jhelum	Bandipora district	7
11	Ujh	Ravi	Kathua district	212
Central sector				
1	Burser	Chenab	Marwah tehsil of Kishtwar district	1200
2	Kishenganga	Jhelum	Bandipore district	330
Joint venture between JKSPDC, NHPC & PTC				
1	Kiru	Chenab	Kishtwar district	660
2	Kwar	Chenab	Kishtwar district	560
3	Pakaldul	Marusadar river, a tributary of Chenab river	Kishtwar district	1000
Large Hydro Power Projects (IPP)				
1	Ratle	Chenab	Doda district	850

3. Discussion

The paper has reviewed the state of Jammu and Kashmir energy scenario and how hydropower fits in as the solution to the state sustainable energy challenge. The Jammu & Kashmir (J&K) is the northernmost state of India and is situated at latitude of 34°.05 N and longitude of 74°.05 E. It comprises three distinct regions i.e., Jammu, Kashmir and Ladakh which are diverse in their culture, geography and environment. The Jammu region is graphically plain and experiences sub-tropical climate. On the other hand the Kashmir valley experiences temperate climate. In comparison to both Jammu & Kashmir regions, Ladakh is mountainous with little vegetation and experiences very cold and arid climate. Talking about energy starved states of the country, J&K is one of them and having tremendous hydro-power potential. Though, the state government has delivered electricity to almost all the villages for lighting but due to inadequate supply of electricity and severe cold climate particularly in Kashmir and Ladakh region, the requirement of energy is usually met by fuel, wood/coal and diesel sets which results in deforestation and land degradation. [5][6]. Due to the remoteness of the areas, the cost of transportation maintenance as well as the cost of electricity generation per unit is very high. The potential energy of surface water in certain areas, provides the cheapest, neat and clean resource of energy. Hydroelectric power also has the highest potential among the energy resources in the state. The major rivers and their tributaries can be efficiently exploited for domestic energy requirements through water mills and small-scale hydroelectric units. By scanning the literature there are about 2000 un-electrified villages in the state [7]. The estimated hydropower potential in the state is more than 20000 MW, of which only 16200MW have already been

identified and able to develop a power 1474.65 MW. The major hydroelectric power plants in the state are Uri Hydroelectric Dam (480 MW), Dulhasti (390 MW), Salal (690 MW) and Baglihar (450 MW). The Uri hydroelectric power station is installed on the Jhelum River near Uri in Baramula district. This station is mainly built under a hill with a 10 km tunnel. The Dulhasti hydroelectric power plant is established in Kishtwar district on the run of the river Chenab in the Doda district. This project provides peaking power to the Northern Grid and the neighboring beneficiary states Punjab, Haryana, Uttar Pradesh, Uttarkhand, Rajasthan and Delhi. The (BHEP) Baglihar hydroelectric power project is established on the river Chenab and located in the southern Doda district with a volume of 1,800,000 m³ [8][9]. With huge hydroelectric potential of the state and day by day increasing power demand adversely affecting its economy on the other side, the State is continuously losing the opportunity of reducing huge expenditure possible in the event of development of available potential [10].

Government of Jammu & Kashmir has laid extreme emphasis on the full development of its hydro potential being clean & renewable source of energy. It has been alive to the necessity for encouraging private sector participation in development of Hydro Projects. The process of exploitation of hydel potential in small hydro sector through private sector participation began seriously in the State in 2003 through State Hydel Policy [11][12]. The State of Jammu and Kashmir bestowed with significant water resources has the potential to generate hydro electricity sufficient to meet its whole power requirement, along with satisfying the needs of northern Indian states.

4. Conclusion

The State of J&K is planning to develop many hydropower projects in order to meet the growing power requirements over the next two decades. The hydroelectric power plants with installed capacity above 200 MW are being assigned to the state-run National Hydroelectric Power Corp (NHPC). The other initiative to increase hydropower capacity is to turn towards more energy-efficient processes, which will also help the State to conserve electricity.

References

- [1] Kaunda, C.S., Kimambo, C.Z. and Nielsen, T.K. 2012. Hydropower in the Context of Sustainable Energy Supply: A Review of Technologies and Challenges. *International Scholarly Research Network*, p. 1-15.
- [2] Ummar Ahad. 2017. Hydro Power Projects in J&K State-Potential Scenario. *International Journal for Research in Applied Science & Engineering Technology*, vol: 5
- [3] Central Electricity Authority LGBR 2018-19 load generation balance report 2018-19
- [4] Sharma, A.K. and Thakur, N.S. 2015. Hydro power energy for sustainable development in Jammu and Kashmir. *International Conference on Hydropower for Sustainable Development*, 443-453.
- [5] Homepage of Jammu and Kashmir State Power Development Corporation Ltd. Available from <http://www.jkspdc.nic.in>. [Accessed on April 5, 2014].

- [6] Sultan S .Development of small hydro power in Jammu and Kashmir (India).Available from [http://www.unido.org/fileadmin/import/52395 Mr Shafat Marazi.pdf](http://www.unido.org/fileadmin/import/52395_Mr_Shafat_Marazi.pdf). [Accessed on April3, 2014].
- [7] Nazakat R, Nengroo A. Impact of Indus water treaty on Jammu and Kashmir State: with special reference to hydro power potential. Journal of resent advances in agriculture, 2012; 1(4):157-63.
- [8] Economic survey report Jammu and Kashmir, chapter 40: Power; 2013-2014. P.468511.
- [9] JKPDD, Energy audit report of hydro electric projects, Jammu and Kashmir Power Development Corporation Limited; 2011
- [10] JKPDD, Hydro Electric Development Policy 2011, Jammu and Kashmir Power Development Department; 2011. [19] CEA, Hydro Development Plan for 12th
- [11] NSO, Energy Statistics Annual Report 2013, National Statistics Organization, Ministry of Statistics and Programme Implementation, Government of India; 2013.
- [12] Five year plan (2012-2013), Central Electricity Authority, Ministry of Power, New Delhi, India; 2008.