

# Cross-Border Power Trade between India and Bhutan: Problem and Prospects

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**Abstract**—India and Bhutan are developing countries of South Asia. Both the nations have warm and cordial relations since long time. Further, electricity trade has strengthened the economic relation between India and Bhutan. India is one of the fastest growing countries as its GDP growth estimated 7.1 per cent in current year 2017-18. But it lagged far behind at its development counterpart in terms of access to clean reliable and affordable energy especially power. Even today a large number of rural populations rely on conventional source of energy like oil, gas and coal etc. but these reserves of primary resources in the boundaries of country are not sufficient to meet domestic needs. As against 17.5 per cent of the world population, India only has 0.6, 0.4 and 0.8 per cent of world's total oil, gas and coal reserves respectively. So it is not possible to fulfil all requirements domestically. On the other hand Bhutan is blessed with hydro resources. The estimated hydropower potential of the country is 30,000 MW which can be tapped with financial and technical assistance of India and both the countries are already working in this direction. The mutual cooperation between India and Bhutan to develop power generation capacity and electricity trade has been a win-win situation for both the countries. It has provided a possibility to fulfil the energy requirements of India and for Bhutan. This paper aims to analyse the opportunities and challenges to trade of power between India and Bhutan.

## Introduction

India and Bhutan are developing countries of South Asian region and also founder of member of SAARC. Bhutan is a landlocked country situated between the Tibetan autonomous region of China in the north and India in the South, east and west. Its geographical location increases its dependence on India for export and import with rest of the world. The Indo-Bhutan relations are deep rooted in the history and still share cordial relations with each other. Both the nations share special bilateral relations in trade and development by the virtue of the Indo-Bhutan Treaty of 1949. And with the inception of Bhutan's planned development in 1961, India's assistance began to flow into the country and the volume has increased steadily over the years from Rs 107 million in the first FYI to Rs. 45,000 million in eleventh FYP. India completely financed the first two FYP. Although Bhutan's source of foreign aid diversified significantly since it joined the UN, but India remained to be the major donor of external aid to Bhutan. Besides planned assistance, India has provided partial and full grant assistance to Bhutan. The economic

relations between both the countries have gradually evolved with cooperation extending towards mutually beneficial projects such as in Hydropower projects and other industrial projects.

Hydropower power projects in Bhutan have received a special attention from India. Bhutan has a theoretical potential of about 30,000 MW of which 16,280 MW is considered to techno-economically feasible but Bhutan itself cannot harness all its resources. India has provided an open hearted financial and technical assistance to the country. Chhukha hydropower project commissioned in 1988, was the first mega-project undertaken with a 60 per cent grant and 40 per cent loan of the total completion cost of Nu 2470 million. The diverse benefits of this project motivated both the nations to extend the cooperation in this direction and led to development of Kurichu Hydel-Electricity project and Tala Hydel-Electricity project in 2002 and 2007 respectively. This co-operation turned into a successful venture as the electricity export turned her deficit trade balance with India into surplus. India faced 2 per cent of peak energy deficit during 2017-18 and according to 15.5 per cent of total population have no access to electricity. In such conditions power trade between India and Bhutan has been a win-win situation for both the nations.

## Cross-Border Power Trade between India and Bhutan

Being developing countries both India and Bhutan are witnessing structural changes where the share of energy consuming industrial and service sector finds an increasing role. Also the increasing use of electricity in agriculture and household have further led to increase in electricity demand. In spite of being well endowed with natural resources they have not achieved desired goals of electrification and continuously struggling to strengthen their power system.

Table shows the current power scenario of both the countries. None of them have achieved 100 per cent electrification yet. In India 92 per cent of total population have access to electricity. Although Bhutan is producing surplus but still only 97 per cent of the total population have access to power. Capacity addition to power generation has been a priority for both the countries. During 2017 the total installed capacity of

Bhutan and India was 1631 MW and 302087 MW respectively. As far as per capita electricity consumption is concerned even after being a very large and strong power system the per capita consumption is very low in comparison to Bhutan. The per capita electricity consumption in India and Bhutan was 701 Kwh and 2902 kwh respectively. The per capita electricity consumption in India is far below than any other developed country.

**Table 1: Power Sector during 2017**

	India	Bhutan
Electricity Access %	92	97
Installed capacity (MW)	302087	1631
T. Generation (Mn Kwh)	1116850	7959
T. Consumption (Mn Kwh)	948328	2177
Per Capita electricity Consumption	701	2902

Source: Asian Development Bank, 2018.

The electricity trade between India and Bhutan started in 1961 with the signing of Jaldhaka agreement. The interconnection for sharing of electricity started in 1968 after the commissioning of Jaldhaka Hydropower project with installed capacity of 27 MW. The major part of power produced at Jaldhaka Hydropower plant was exported to Southern Bhutan through 11Kv interconnection. Bhutan remained net imported for quite a long time. Chhukha Hydel-Electricity project with 336 MW installed capacity was the first hydropower project with full technical support of India under intergovernmental agreement of 1974. After the commissioning of this project Bhutan started exporting power to India. The diverse benefits of this project motivated both the nations to extend the cooperation on hydropower projects. And further, Kurichu HEP with 60 MW installed capacity and Tala HEP with 1020 MW installed capacity were developed in 2002 and 2007 respectively. Presently, five hydropower plants (Chukha, Kurichhu, Tala, Basochhu-I & II, and Dagachhu) accounts for 99 per cent of the total installed capacity of Bhutan [1]. Bhutan’s power generation is primarily based on hydropower, which is cyclic in nature due to the monsoon variations. Further, Bhutan also imports power from India during the dry season. However, the amount of power imported is much lower than the power exported.

Gains from trade can also be calculated by comparing Revealed Comparative Advantage Index (RCA) with Revealed Import Dependence Index (RID). The RCA analysis will tell us about the comparative advantage that a country enjoy in the export of certain commodities but it doesn’t necessarily tell about the specific import requirements of the countries being focused for export. So, A comparison of the RCA of commodities with RID commodities in other nations will provide us more reliable picture of possible export gain of the Indian energy resources in Bhutan and vice versa. If for a certain energy resource any country have RID greater than one then such energy resource considered to have possibly strong export gain in the particular country.

The RCA and RID analysis reveals that India has  $RID > 1$  (1.01) and Bhutan has  $RCA > 1$  (222.95) for electric energy. Bhutan also has  $RID > 1$  (2.62) but India doesn’t has  $RCA > 1$  (0.02) which means India doesn’t enjoy comparative advantage in electricity export. So this power trade is beneficial for Bhutan. Apart from this analysis the seasonal variations in water flows and difference between peak demand periods of both the countries builds a strong case for power trade. In Bhutan demand for electricity is very low in summers but it is considered as peak period in India. In winters when it is a dry season for Bhutan it is considered as peak period of electricity demand while India can generate surplus in this season. Altogether it shows a great power trade potential among these countries. And this power trade already exists and benefitted both the nations.

Presently, the export of electricity accounts around 38 per cent of Bhutan’s total export to India. Hydropower sector contributed 13.19 per cent to the GDP of Bhutan during 2017 [2]. Presently, Bhutan is exporting electricity through Cross-Border Electricity Trading (CBET) interconnections. The electrical interconnections between India and Bhutan with its diverse generation mix and unique demand characteristics are bringing economic and environmental benefits to the respective countries as well as South Asian region as a whole.

Figure 1 depicts India’s import of electricity from Bhutan since during 1985 to 2016. During 1985 Bhutan was net importer of electricity as, it imported 9 million Kwh from India during this period. Chhukha hydro power plant turned Bhutan into net exporter of electricity. During 1987 Bhutan exported 1109 mn kwh to India which increased to 5159 mn kwh in 2016 with Compound Annual growth rate (CAGR) of 15.13 per cent. During pre-SAFTA period the electricity export increased at CAGR of 20.97 per cent but in post-SAFTA period the CAGR declined to 3.64 per cent.

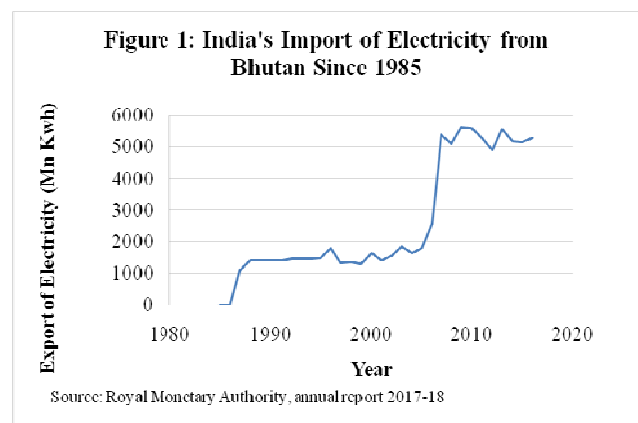


Table-2 shows Bhutan’s electricity trade balance with India during 1985 to 2015. During 1985 Bhutan was net importer of electricity but after the commissioning of Chukha hydro power project with installed capacity of 336 MW, it started exporting electricity to India. And the commissioning of Tala

Hydel Project (1020) in 2007, export of electricity increased tremendously. Presently, Tala Hydel project has largest installed capacity among all the installed power projects in Bhutan. Cooperation between Bhutan and India proved to be a successful venture and turned her negative trade balance into positive over the period of time. During 2015 the total trade of electricity of Bhutan was 4905 mn kwh and the trade balance was 4807 mn kwh.

Year	Export	Import	Balance of Trade	Total Trade
1984-85	0	9	-9	9
1989-90	1395	3	1392	1398
1994-95	1475	4	1471	1479
1999-00	1635	24	1601	1669
2004-05	1794	18	1776	1812
2009-10	5576	132	5444	5711
2014-15	4965	158	4807	4965

Source: Central Electricity Authority, India 2017..

It has been observed that industry in Bhutan is expanding rapidly due to spill-over effects created by the hydro power projects. Hence, economy is also prospering, which leads to increasing urbanization and better standard of living of the Bhutanese. All these developments are causing more domestic demand for electricity, as a result of which Bhutan can reduce the export of power to India under given power generation capacity [3]. The power cooperation has been proved beneficial for both the countries. This power cooperation is an interest driven cooperation with a win-win situation for both the countries. The diverse benefits from this trade motivated both the nations to enhance the cooperation.

Table-3 shows the upcoming power projects in Bhutan, primarily to export electricity to India. The table depicts that the total installed capacity of these projects would be 10334 MW. The major power plants are Punatsangchhu-I (1200 MW), Punatsangchhu-II (1020 MW), Sunkosh (2500 MW) and Kuri-Gongri (1800 MW) which are under construction and will be commission in between 2021 or 2022. All the power projects given in table-5 are under construction in Bhutan with the economic and technical assistance on India. Since the domestic needs of Bhutan is very low so these projects will primarily export electricity to India after meeting the domestic needs of the country.

S. No.	Name of Project	Installed Capacity
1.	Amochhu Reservoir HEP	540
2.	Chamkharchhu-I HEP	770
3.	Mangdechhu HEP	720
4.	Wangchhu HEP	570
5.	Punatsangchhu-I HEP	1200
6.	Punatsangchhu-II HEP	1020

7.	Sunkosh Main HEP	2500
8.	Sunkosh Barrage HEP	85
9.	Bunakha Reservoir HEP	180
10.	Dagachhu HEP	126
11.	Nikachhu HEP	210
12.	Kuri-Gongri HEP	1800
13.	Kholongchhu HEP	600
14.	Bindu Khola HEP	13
Total		10334

Source: Central Electricity Authority, India 2017.

### Challenges

In spite of being well endowed with natural resources Bhutan has not achieved a hundred percent electrification goals because it has not fully utilised its domestic potential. Secondly, Bhutan is not able to undertake the capital intensive projects and also there is a lack cross border infrastructure to facilitate energy trade. Even though Bhutan is ready to invest to hydro power projects but the country has always feared about market for its surplus power because China is already to increase its installed capacity to fulfil all energy requirements domestically. And on other hand Bhutan share its eastern, western and southern border with India only. So it is completely dependent on India which is a vast market for Bhutan's surplus power. And lastly, there is a lack of institutional mechanism that could promote inter and intra regional energy trade.

### Conclusion

This paper addresses the opportunities and challenges of trade of power between India and Bhutan. After adopting New Economic Policy in 1991 a dramatic structural change has emerged in India. With this change demand for electricity has increased in India which cannot be fulfilled domestically but Bhutan has hydropower potential to generate surplus electricity. It is already exporting electricity to India. But Bhutan is not economically strong to undertake the capital intensive projects and cannot bear the risk associated with these projects. The cooperation between India and Bhutan on the power projects has build-up an environment of confidence. Up to now this cooperation has been a fruitful venture for both the countries. One side it has fulfilled the energy requirements of India, and on the other side it has turned Bhutan's deficit trade balance into surplus. But the only condition to make this trade a successful venture is a mutual trust and strong will power.

### Suggestions

It is suggested that both countries needs to work on political as well as structural level. In this context, following policy suggestion may be helpful to increase the cooperation among these countries:

- India and Bhutan needs to harmonise legal and Regulatory frameworks.

- Since Royal Government of Bhutan not able to undertake the capital intensive projects, therefore, private participation and public private partnership should be encouraged.
- With support of India, Bhutan can create a market for its surplus power in the South Asian region where all the countries are facing acute power shortage.
- A comprehensive and reliable database for the region would facilitate better estimation of intra and inter regional trade and cooperation benefits. Moreover, sharing of information is a strong confidence building measure that could pave the way for better cooperation and trade within the region.
- Both states should have to commit a common agreement to promote energy trade in the region.

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