

# **Comparison of Electricity Supply and Tariff Rates in South Asian Countries**

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## **Introduction**

A reliable, accessible and affordable supply of energy produced in a sustainable manner is fundamental for development of a modern society. South Asia is an under-developed and energy resources deficient region that housed 1.5 billion people at present, which makes one-fourth of the world population. The region contains the highest number of people without access to electricity (612 Million).<sup>1</sup> Per capita energy consumption in South Asia has been less than 3% of the per capita energy consumption in the United States.<sup>2</sup> Key statistics of overall energy availability and consumption in the countries of the region is given at Annex-I.

Higher economic growth rates are achieved by few South Asian countries in 2000s. These countries are facing rapidly rising electricity demand vis-à-vis fragile electricity supply infrastructure resulting in electricity shortfalls and extensive electricity outages. In short, heavy load shedding, excessive distribution losses and rising tariff rates despite the provision of huge government subsidies are the general features of electricity supply sectors of almost all South Asian countries. The inadequate and inefficient transmission and distribution infrastructure is due to under investment and poor governance causing severe constraints to the operations, reliability, affordability and the quality of electricity supply. The electricity supply is public dominated although independent power producers are engaged in generation in all the countries studied. Annex-II lists the key organizations constituting electricity sectors of these countries. Below is given a comparison of important parameters of electricity sectors in countries of the region.

## **Generation Capacity and Load Shedding**

South Asian countries face on average a shortage of 15% to 30% of electricity with respect to peak load demand (Table 1). The situation is most depressing in Nepal, where a power cut of up to 20 hours takes place in peak demand periods of winter and the peak electricity demand almost doubles the capability or dependable capacity. The capability may be significantly lower than the

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<sup>1</sup> Source: World Energy Outlook 2010

<sup>2</sup> World Bank 1996.

installed capacity based on the seasonality factor in hydel generation and life and inefficiencies in thermal power plants.

South Asia has huge untapped hydropower potential. Only Pakistan, Bhutan and Nepal have techno-economically feasible hydropower potentials of 50 GW, 23.7 GW and 42 GW respectively. India is restricting Nepal's hydel capacity by not allowing foreign investment for hydropower development in Nepal for political reasons. However, Bangladesh and Sri Lanka have exhausted their hydropower source to a large extent. Electricity demand due to rapid economic growth and depletion of domestic gas reservoirs is the key to energy crisis in Bangladesh. Sri Lanka is handling the shortage by generating and selling very expensive electricity to its consumers. Pakistan has enormous hydel generation potential and can export surplus electricity to these countries by tapping its huge potential (See, Table 3).

Regional electricity trade may be an option to mitigate the shortfalls in South Asia. In Nepal, the peak demand months are in winter whereas, in most other countries peak demand takes place in summer. Trade of electricity on small scale is already taking place in the region. For example, India is importing around 1,200 MW of electricity from Bhutan. Pakistan is importing electricity from Iran. Nepal is importing electricity from India. Bhutan is the only country with surplus electricity round the year and power export is contributing almost 45% of Bhutan's annual revenue.

There is a general neglect of electricity generation from renewable sources in South Asia, although huge potential exist for wind power, especially in coastal areas of India and Pakistan. However, India is taking the lead in developing renewable energy in the region. The installed capacity of wind power in India of 2 GW (out of 43 GW gross potential) is the 5th largest wind power installed capacity in the world. Renewable capacity is generally add to the off-grid systems based on small hydro power or solar /wind/biomass power plants in few countries.

### **Distribution Losses**

Distribution losses, electricity theft and non-payment for electricity charges are major issues with almost all South Asian countries. Table 2 gives a glimpse of distribution losses in the countries over time. Heavy electricity losses are major reason of electricity shortfall, rising tariffs and lower investments in the power sectors of South Asian countries.

## **Nuclear Power Generation**

Nuclear power have high capital cost for building the plant and relatively low fuel cost. Currently, two South Asian economies viz. India and Pakistan are generating nuclear electric power while Bangladesh and Sri Lanka may join the group in future. Bangladesh Atomic Energy Commission (BAEC) for instance, has set a target of raising the share of nuclear electricity in total generation up to 10% by 2021. The historical nuclear electricity generation in India and Pakistan is shown in Figure 1.

## **Tariff Rate**

Electricity pricing (sometimes referred to as electricity tariff or the price of electricity) varies widely from country to country. There are many reasons that account for tariff rate differences. The price of power generation depends largely on the type and market price of the sources/fuels used, government subsidies, government and industry regulation, and even weather patterns.

As of 2010, Sri Lanka has the most expensive electricity tariff for residential and agricultural consumer categories in South Asia, followed by Pakistan. India has the highest tariff rate for industrial consumer category. Bangladesh has the lowest electricity tariff rates with about 85% electricity generation from domestic natural gas, but the cost of generation is expected to increase dramatically with the depleting domestic gas reserves. Therefore, the regulated tariff rate would be quite high in near future in Bangladesh. A comparative list of 2010 electricity tariffs in US Cents for South Asia is given at Table 4.

## **Conclusion**

The study concludes is that electricity sectors in the region are facing capacity shortfalls and are mostly relying on thermal (hydrocarbons) sources which are either depleting domestically or becoming costly due to rising crude prices. The issue can be resolved by tapping domestic Hydel potentials and choosing appropriate fuel mix (lesser imports) and diversification in thermal electricity generation sources. It will reduce vulnerability of electricity supply with international energy prices and make electricity affordable, which is fundamental for economic growth in the region. There is limited potential for regional electricity trade also.

**Table 1: Data on Capacity and Shortfall of Electricity in South Asian Countries.**

Items	India	Pakistan	Bangladesh	Nepal	Sri Lanka
Installed Capacity (MW)	176,990	20,921	6,837	549	2,811
Thermal:	115,649	13,978	5693	53	1636
Hydel:	38,106	6,481	230	496	1060
Nuclear:	4,780	462	0	0	0
Renewables:	18,455	0	0	0	115
Capability (MW)	101,609	15,232	4000-4890	460	1,842
Peak Demand (MW)	116,281	19,228	5,450	885	2,522
Electricity Shortfall/ Load Shedding (MW)	14,672 (14%)*	3,996 (30%)	560-1500 (25%)	425 (92%)	680 (37%)
Electricity Generated (GWh)	771,600	95,358	29,247	3,077	3,603
Per Capita Electricity Generation (KWh)	640	560	210	110	180
Net Import (MW)	1,200	39	0	613	0
Population Electrified (Percent)	65	77	49	26	78

\*Numbers in ( ) indicate the percentage of total electricity generation.

**Table 2: Comparison of Electricity Profiles of South Asian Countries (1990-2008)**

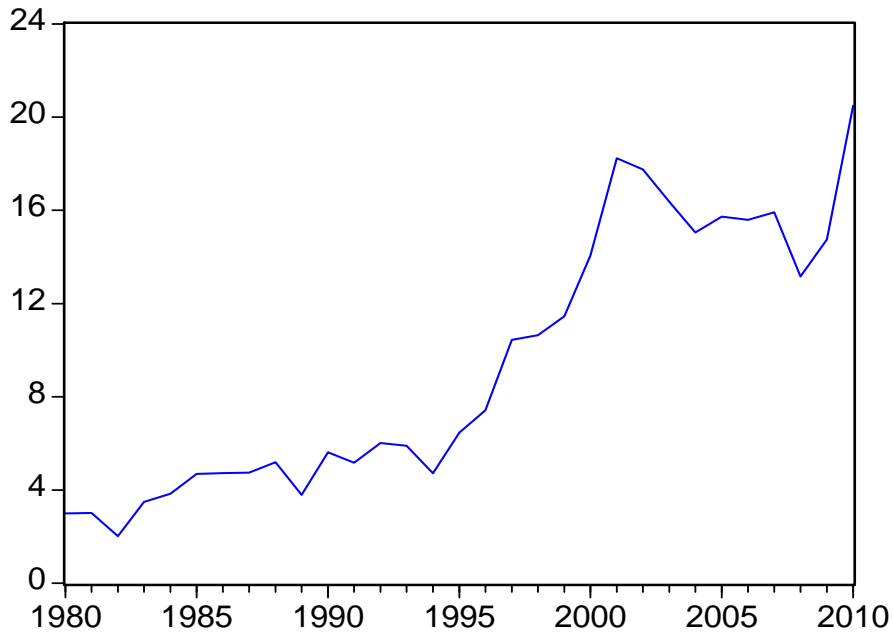
Country	Electricity Installed Capacity (GW)		Electricity Generation (000, GWh)		Distribution Losses (Percent)		Per capita Consumption (KWh)	
	1990	2008	1990	2008	1990	2008	1990	2008
India	74.69	177.38	275.49	785.53	20.52	24.66	276	566
Pakistan	7.74	19.77	36.34	87.74	21.48	21.87	277	436
Bangladesh	2.52	5.45	7.62	32.93	34.08	13.17	44	149
Nepal	0.27	0.72	0.90	3.05	18.40	19.56	35	89
Sri Lanka	1.29	2.64	3.12	8.89	16.86	11.33	149	414

**Table 3: Hydropower potential and percent exploited in South Asian countries**

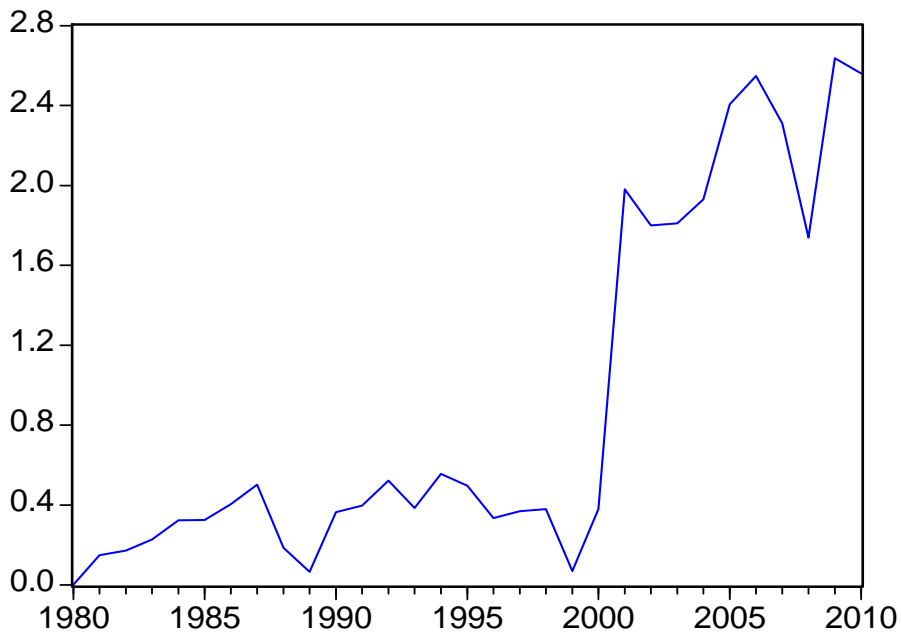
Country	Estimated Hydro-power Potential	Currently Exploited Percent
India	149 GW	25%
Nepal	83 GW	1%
Pakistan	50 GW	12.9%
Bhutan	30 GW	1.5%
Bangladesh	0.8 GW	28%
Sri Lanka	2 GW	60%
<b>Total</b>	<b>305.8 GW</b>	<b>6.2%</b>

Source: Pokharel (2010)

### Nuclear Electricity Generation (GWh) in India



### Nuclear Electricity Generation (GWh) in Pakistan



**Figure 1: Nuclear Electricity Generation in India and Pakistan During the period 1980-2010**

**Table 4: Summary of Electricity Tariff Rates across South Asian Countries**

(US Cents per KWh)

<b>Consumer Category</b>	<b>India</b>	<b>Pakistan</b>	<b>Bangladesh</b>	<b>Nepal</b>	<b>Sri Lanka</b>
<b>Domestic</b>	0-200 KWh: 5.5 201-400 KWh: 8.8 >400 KWh: 10.4	0-50 KWh: 2.2 0-100 KWh: 5.1 101-300 KWh: 7.6 301-700 KWh: 12.4 >700 KWh: 15.4	0-100 KWh: 3.3 101-400: 4.2 >400 KWh: 7.0	0-20 KWh: 5.6 21-250 KWh: 10.3 >250 KWh: 13.9	0-30 KWh: 2.7 31-60 KWh: 4.3 61-90 KWh: 6.8 91-120 KWh: 19.1 121-180 KWh: 21.8 >180 KWh: 32.8
<b>Industrial</b>	11.3	10.3	5.4	9.3	9.1
<b>Agricultural</b>	3.5	6.2	2.6	5.0	13.6
<b>Commercial</b>		15.1	7.1	10.8	13.6

Source: Websites of Ministry of Power, India; Nepal Electricity Authority, Nepal; Bangladesh Power Development Board ; Ceylon Electricity Board, Sri Lanka and Pakistan Economic Survey 2010-11.

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**Table 5: Comparison of Key Energy Indicators over time Across South Asian Countries**

Country	Population (Million)		Energy Production (Million Tons of Oil Equivalent)		Energy Use (Million Tons of Oil Equi.)		Fossil Fuels Percent of Total Use (%)		GDP per unit of Energy Use 2005 PPP\$/Kg of oil Equi		Net Energy Imports of Energy Use (%)		Energy Intensity BTU per Year 2005 US\$	
	1990	2008	1990	2008	1990	2008	1990	2008	1990	2008	1990	2008	1990	2008
India	858.2	1140.6	291.8	468.3	318.9	621.0	55.7	71.1	3.3	5.1	8	25	22,337	18,825
Pakistan	118.8	178.5	34.3	63.3	43.0	82.8	52.8	61.8	4.2	4.7	20	24	20,230	19,852
Bangladesh	112.2	151.3	10.8	23.4	12.7	27.9	45.5	68.4	6.2	7.1	16	16	9,155	12,577
Nepal	18.9	28.2	5.5	8.7	5.8	9.8	5.1	10.9	2.3	3	5	11	4,164	8,157
Sri Lanka	17.4	21.1	4.2	5.1	5.5	8.9	24.1	43.4	6.3	9.5	24	43	8,730	7,241

Source: World Development Indicators 2010.



**Electric Power Related Public and Private Organizations in Major Countries of South Asia**

**India**

- Ministry of Power
- Central Electricity Authority
- National Thermal Power Corporation
- National Hydroelectric Power Corporation
- Power Grid Corporation of India
- Rural Electrification Corporation
- Power Finance Corporation
- Central Electricity Regulatory Commission (CERC)

**Pakistan**

- Ministry of Water and Power
- Water and Power Development Authority (WAPDA)
- Pakistan Electric Power Company (PEPCO)
- Karachi Electric Supply Company (KESC)
- Pakistan Atomic Energy Commission (PAEC)
- Independent Power Producers (IPPs)
- National Electric Power Regulatory Authority (NEPRA)

**Bangladesh**

- Ministry of Power Energy and Mineral Resources
- Bangladesh Power Development Board (BPDB)
- Rural Electrification Board (REB)
- Power Grid Company of Bangladesh
- Dhaka Electricity Supply Company (DESC)
- Independent Power Producers (IPPs)
- West Zone Power Distribution Co. Ltd (WZPDCL)
- North West Zone Power Distribution Co. Ltd (NWZPDCL)
- South Zone Power Distribution Company Ltd (SZPDCL)
- Bangladesh Energy Regulatory Commission (BERC)

## **Nepal**

- Ministry of Water Resources
- Nepal Electricity Authority (NEA)
- Electricity Development Department ( licensing and overall policy)
- Water and Energy Commission Secretariat, Nepal
- Independent Power Producers (IPPs)
- Butwal Power Company Limited
- Nepal Electricity Regulatory Commission (NERC)

## **Sri Lanka**

- Ministry of Power and Energy
- Ceylon Electricity Board (CEB)
- Sri Lanka Sustainable Energy Authority (SLSEA)
- Atomic Energy Authority (AEA)
- Lanka Electricity Company (Pvt) Ltd.
- Independent Power Producers (IPPs)
- Public Utilities Commission of Sri Lanka (PUCSL)