SOUTH ASIA REGIONAL INITIATIVE FOR ENERGY INTEGRATION (SARI/EI)

Linking South Asia with Burma & Southeast Asia to Advance Cross Border Electricity Trade: A Political Economy Study

Final Report

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Abbreviations

AC	Alternating Current
ACE	The ASEAN Centre for Energy
ADB	Asian Development Bank
AMS	ASEAN Member States
APSCL	Ashuganj Power Station Company Ltd.
ASEAN	Association of Southeast Asian Nations
BBIN	Bangladesh, Bhutan, India and Myanmar
BEA	Bhutan Electricity Authority
BEA	Bhutan Electricity Authority
BERC	Bangladesh Energy Regulatory Commission
BIFPCL	Bangladesh-India Friendship Power Company (Pvt.) Ltd.
BIMSTEC	Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation
BOO	Build Own Operate
BOT	Build Operate Transfer
BPC	Bhutan Power Corporation
BPC	Bhutan Power Corporation
BPDB	Bangladesh Power Development Board
BSEC	Black Sea Economic Cooperation
BSR	Balance and Settlement Regulation
BSTP	Black Sea Regional Transmission System Planning Project
CA	Constituent Assembly
CAGR	Compound Annual Growth Rate
CCPP	combined cycle power plants
CEA	Central Electricity Authority
CERC	Central Electricity Regulatory Commission
CIS	Commonwealth of Independent States
CSO	Civil Society Organizations
D/c	Double circuit
DAM	Day Ahead Market
DC	Direct Current
DESCO	Dhaka Electricity Supply Company
DFID	Department for International Development
DGPC	Druk Green Power Corporation
DGPC	Druk Green Power Corporation
DHPC	Dagachu Hydro Power Corporation
DHPS	Department of Hydropower and Power Systems
DoED	Department of Electricity Development, Nepal
DPDC	Dhaka Power Distribution Company
EA	The Electricity Act 2003
EGCB	Electricity Generation Company of Bangladesh
EMRA	Energy Market Regulatory Authority
ENTSO-e	European Network of Transmission System Operators for Electricity
EPF	Electricity Power Forum
ERC	Electricity Regulatory Commission
ESCO	Electricity System Commercial Operator
ETFC	Electricity Tariff Fixation Commission
FBCCI	Federation of Bangladesh Chambers of Commerce and Industry
FDI	Foreign Direct Investment

GCC	Gulf Cooperation Council
GCCIA	Gulf Cooperation Council Interconnection Authority
GDP	Gross Domestic Product
GMS	Greater Mekong Sub-region
GNERC	Georgian National Electricity Regulatory Commission
GSE	Georgian State Electrosystem
GSE	Georgian State Electrosystem
GW	Giga Watt
GWh	Giga Watt-hour
HEP	Hydro Electric Plant
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
Hz	Hertz
IBN	Investment Board of Nepal
IGA	Inter-Governmental Agreement
IGA	Inter-Governmental Agreement
IL&FS	Infrastructure Leasing & Financial Services
IPP	Independent Power Producer
ITC	Interconnector Transmission Code
JV	Joint Venture
kV	Kilo Volt
MNRE	Ministry of New and Renewable Energy
MOE	Ministry of Energy
MOEE	Ministry of Electricity and Energy
MOEP	Ministry of Electric Power, Burma
MoP	Ministry of Power, India
MOU	Memorandum of Understanding
MOWR	Ministry of Water and Resources
MPEMR	Ministry of Power, Energy and Mineral Resources, Bangladesh
MTOE	Million Tons of Oil Equivalent
MW	Megawatt
NEA	Nepal Electricity Authority
NGO	Non-Governmental Organizations
NVVN	NTPC Vidyut Vyapar Nigam
NWPGCL	North West Power Generation Company Ltd.
PDA	Project Development Agreement
PEA	Political Economy Analysis
PETA	Power Exchange Trading Agreement
PGCB	Power Grid Company of Bangladesh Limited
PGCIL	Power Grid Corporation of India Limited
PPA	Power Purchase Agreement
PRC	People's Republic of China
PSU	Public Sector Undertaking
PTA	Power Trade Agreement
PWG	Planning Working Group
QRPP	Quick Rental Power Plant
REB	Rural Electrification Board
RERA	Regional Electricity Regulators Association of Southern Africa
RGOB	Royal Government of Bhutan
ROW	Right of Way

RPCC	Regional Power Coordination Center
RPCL	Rural Power Company Limited
RPGCL	Rastriya Prasaran Grid Company Limited
RPO	Renewable Purchase Obligation
RPP	Rental Power Plants
RPTCC	Regional Power Trade Coordinating Committee
RPTOA	Regional Power Trade Operating Agreement
RRB	Regional Regulatory Board
RTI	Right to Information
SAARC	South Asian Association for Regional Cooperation
SAARC	South Asian Association of Regional Cooperation (SAARC)
SADC	Southern African Development Community
SADC	Southern African Development Community
SAME	SAARC Market for Electricity
SAPP	Southern African Power Pool
SARCO	SAARC Arbitration Council
SARI/EI	South Asia Regional Initiative for Energy Integration
SARSO	SAARC Regional Standards Organization
SASEC	South Asia Sub-Regional Economic Cooperation
SDF	SAARC Development Fund
SEA	Southeast Asia
SEB	State Electricity Board
SREDA	Sustainable Renewable Development Authority
STEM	Short Term Electricity Market
TAU	Technical and Administrative Unit
TEAS	Turkish Electricity Generation-Transmission Corporation
TEIAS	Turkish Electricity Transmission Company
TEK	Turkish Electricity Company
TETAS	Turkish Electricity Wholesale Company
TSA	Transmission Service Agreement
TSO	Transmission System Operator
UAE	United Arab Emirates
UNCTAD	United Nations Conference on Trade and Development
USAID	United States Agency for International Development
USEA	United States Energy Association
WB	World Bank
WEC	Water and Energy Commission, Nepal
WR	Western Region
WZPDCL	West Zone Power Distribution Company Ltd

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1 EXECUTIVE SUMMARY

A. About this study

This study discusses the current political, policy, economic and institutional barriers to regional cross-border electricity trade linking South Asia (SA) and Southeast Asia (SEA). It provides comprehensive analysis of five dimensions of the sub-regional trade environment namely: 1) political, social and market dynamics; 2) harmonization of energy policies; 3) legal and regulatory framework; 4) structural and institutional framework; and 5) supporting institutions. The aim of the study is to provide a better understanding of the political and economic underpinnings that facilitate regional energy market formation and identify a roadmap for harmonization of regional energy policies and to promote legal and regulatory frameworks that makes regional trade between South Asia and Burma conducive.

B. Key findings

Regional cooperation offers an ideal platform to achieve sustainable growth through sharing of resources. In the context of the energy sector, it is applicable to the South Asian region at large but increasingly applies to the eastern sub-region comprising of Bangladesh, Bhutan, India, and Nepal (BBIN). The energy sector in the BBIN region has considerable diversity in generation sources, generation patterns, and demand patterns in all time frames (daily, monthly and annually). The dominance of certain fuel types, e.g. coal in India, gas in Bangladesh, and hydro power in Bhutan and Nepal, has led to over-dependence on these resources at a country level and made them vulnerable to supply-side risks.

The BBIN countries and Burma face similar challenges such as limited access to electricity for a large proportion of the population, concerns on energy security, availability of affordable power, and access to cleaner sources of energy. Increasing collaboration in the region through strengthening of cross-border electricity trade enables countries to improve access to electricity and reduces the dependence on environmentally harmful fuels.

The electricity sectors of the South Asian countries share a common historical legacy. The power sector in the region is evolving from a vertically integrated electricity utility, wherein the government was solely responsible for generation, transmission and distribution of electricity in the country, to segregated business functions. The reforms in the South Asian region were initiated in the early 1990s to address the growing problem of power shortages and increasing electricity requirements. India was the first country in the region to experiment with opening the sector for both private domestic and foreign investment by de-licensing the generation segment. Bhutan and Bangladesh have also progressed on paths of reforms and separated the various functions into independent entities. Nepal has recently initiated the process of reforms and restructuring in the electricity sector. The process of establishing an electricity regulator in Nepal is in an advanced stage while the restructuring of Nepal Electricity Authority (NEA), a government institution responsible for the generation, transmission, and distribution of electricity, is also under active consideration.

The electricity sector in Southeast Asia is continuously evolving to meet the rapid economic and population growth. In early 1990s, the process of policy reforms started in countries like Indonesia, Thailand and Philippines. The pace of reforms continued and deepened following the Asian financial crisis in late 1990s. The initial thrust was on inviting independent power producers (IPPs) to participate in the sector and by privatizing state-owned electricity enterprises. Subsequently, the focus shifted to evolving competitive power markets with Singapore being the first country in Southeast Asia to launch a competitive power market in 2001, followed by Philippines. In recent times, the electricity sector in Vietnam is in transition phase in moving towards a competitive market framework. The electricity market reforms in the region has also focused on diversification of the generation portfolio and development of cross-border electricity trade across SEA.

All the countries in the BBIN sub-region have introduced competition in the generation sector while India is the only country that has also brought in competition to the wholesale market. However, the single buyer model still dominates the wholesale generation market across the sub-region. The transmission and distribution sector continues to remain largely in the government's control. The transmission sector in India has seen the introduction of private sector participation since 2009, though most assets are still owned by the central or the state government companies. Several transmission links have been developed under the Public-Private Partnership (PPP) framework in recent times, including the India - Bhutan transmission link constructed as part of a joint venture between private investors and the Government of India. The distribution sector in all the countries in the sub-region remains largely under

the control of the government. India gained limited experience of distribution privatization in 1990s and early 2000s, but it has not been replicated in most states.

The electricity regulatory framework is well evolved in Bangladesh, Bhutan and India. The passage of Electricity Regulatory Commission Act for Nepal in July 2017 has paved the way for introduction of regulatory framework in the country and soon all the countries in the sub-region will have regulatory bodies to oversee the electricity sector in respective territories. The electricity law enacted in Burma in 1984 during the earlier regime did not have the legal framework for private sector participation in power projects, nor did it include a framework for independent power producer participation. It empowered the government to grant rights to specific organizations, including foreign participation in the sector. The new Burma electricity law, which replaced the old Electricity Law of 1984, was enacted by the Burma Parliament on October 27, 2014. However, even the new law authorizes the Ministry of Electric Power (MOEP), region and state governments, and leading bodies of self-administrated zones and self-administrated divisions the power to grant permits to entities to engage in electricity-related works such as generation, transmission, and distribution.

Effective cross-border trade requires institutional capacities for tracking electricity flows, maintaining grid integrity, collecting and transferring revenues, and resolving disputes, among other functions. Inefficient and inertia-bound domestic electricity sector policies and regulatory institutions impede establishment of the desired quality of cross-border coordination. The role of regional groupings and bilateral collaborations between countries assumes significance in overcoming the barriers to the regional cross-border electricity trade/cross-border power trade.

Few collaboration initiatives have been undertaken by countries in the region including initiatives by the South Asian Association of Regional Cooperation (SAARC), the Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) as well as sub-regional collaborations like BBIN, and Greater Mekong Sub-region (GMS). The progress under the SAARC framework agreement for energy cooperation signed in October 2014 has been slow due to political contradictions. BIMSTEC is a regional organization comprising seven member states around the Bay of Bengal. The regional group constitutes a bridge between South and Southeast Asia and represents a reinforcement of relations among these countries. Under this initiative, the member countries have agreed on the broad framework for the implementation of grid interconnections to promote rational and optimal power transmission in the region.

Despite these initiatives, it has largely been left to the individual countries to establish the cross-border electricity/cross-border power trade through bilateral arrangements. The present electricity trade between Bhutan and India, Bangladesh and India, and Nepal and India are good examples of strong bilateral frameworks which exist between neighboring countries. In addition, in 2006, India and Burma also took an initial step in bilateral electricity trade by establishing a link between border towns. The scope for widening this exchange into a regional electricity trade framework exists.

The risks and challenges associated with cross-border electricity/cross-border power trading in the sub-region are no different from those in any region that includes developing countries. The risks and challenges include political, commercial and technical aspects. There is a substantial level of political risk in some of the countries in South Asia particularly in the context of cross-border electricity/cross-border power trading due to uncertainties in policy, legal and regulatory regimes. These uncertainties also manifest as commercial risks in the form of currency exchange rates, taxes and duties, and repatriation of earnings and transaction costs. Many of the issues associated with political risks and to a certain extent, commercial and technical risks, in cross-border electricity/cross-border power trading are mitigated through bilateral agreements between the governments such as those already signed between Bhutan and India, Bangladesh and India, and Nepal and India. Some of the commercial risks are mitigated through appropriate provisions in the legal agreements for power purchase and the use of the transmission network services supported by necessary payment security structures, commercial risk guarantees, and specified dispute resolution. All the countries in South Asia follow similar technical standards in power system planning and operation that can be harmonized and adopted at the regional level to minimize the technical risks related to cross-border trading. In the case of the Bangladesh and India cross-border interconnection, the high-voltage direct current (HVDC) back-to-back link allows each country's system operator to independently manage their grid while lessening the likelihood of the neighboring country causing disturbance.

Sub-regional cooperation in South Asia includes the BBIN initiative which was established to formulate, implement and review quadrilateral agreements across areas such as water resources management and connectivity of power, transport, and infrastructure. Progress has been made on the bilateral front,

as multiple interconnections exists between member countries in the group and electricity is traded bilaterally between member countries. Working groups have been formed between India, Bangladesh, and Bhutan, and India, Bangladesh, and Nepal to explore the possibility of trilateral agreements. Once finalized these agreements will further strengthen the cooperation between countries and will also enable them to address issues related to harmonization of regulatory and operational standards.

The regional cooperation in the South Asia region lags significantly behind most of the regional electricity markets of the world in terms of the progress they have achieved in energy trade and regional integration. This has been mainly because of internal political differences and lack of mutual trust among countries which has slowed the process of regional electricity cooperation in the region.

C. Key inferences

The success of cross-border electricity/cross-border power trade depends on multiple factors. Political support from participating countries is the key enabler that can fast track the implementation of cross-border electricity/cross-border power trade. Deeper levels of integration also require national power markets to be at similar stages of reform. This may not be a pre-condition to cross-border electricity/cross-border power trade, but it does provide an enabling framework to address concerns and significantly improve regional interconnections and trade.

Consideration of the political, social, and market dynamics that currently exist in the South Asian countries is an important factor in determining the future course of cross-border electricity/cross-border power trade. Political will, availability and consumption of electricity, and economics of cross-border projects are the three most important considerations for creating a sustainable market for the faster implementation of cross-border electricity/cross-border power trade. Some of key factors that will drive the South Asian Region towards regional electricity trade are: (1) motivation of countries to meet the growing electricity requirements caused by demand – supply mismatch at domestic level, (2) consideration of procurement of electricity from neighboring states to meet the objective of the national governments to provide electricity to all, especially to rural households, and (3) the economics or reduction of tariff per unit of electricity. Most of the countries in the region have high domestic tariff, e.g. Bangladesh has a high cost per unit of electricity as the electricity mix in the country is dominated by imported liquid fuels. Thus, to reduce the cost burden on consumers, it will be economically beneficial for the countries that have high tariffs, to consider engaging in regional or cross-border electricity/cross-border power trade.

In the absence of harmonized and predictable legal and regulatory frameworks, regional energy trade in South Asia will continue to be constrained. The region as a whole has cumbersome regulatory processes which are time consuming for governments and investors to make decisions. The policy and regulations sometimes favor public sector enterprise and there is discriminatory treatment in the application of laws, regulations, taxes, and required technical or operational standards. The harmonization of policies and regulations will play an important role since the countries in the region are at different stages of evolution in terms of power market design. Deeper levels of integration will require that national power markets are at similar stages of reform in order to address concerns regarding the benefits of integration. India is the only country in the region that has progressively implemented power sector reforms. The new amendments proposed, but yet to be approved, include language that further segregates the wires and supply business in the distribution sector. Although other countries in the region have undertaken power sector reforms these measures have been mostly on the institutional side with limited impact on the design of the power market.

Guidelines to promote cross-border electricity/cross-border power trade to foster greater transparency, consistency and predictability is another area which has remained passive over the past few years. While India has recently issued guidelines to promote cross-border trade, concerns have been expressed by the stakeholders of the neighboring states. Stakeholders are concerned that the views of the external stakeholders have not been adequately addressed in the guidelines and that the guidelines offer preferential treatment to projects where the majority stake rests with an Indian player.

Lack of market-oriented reforms in the region have restricted either the entry or establishment of supporting institutions. Presence of supporting institutions such as power exchanges, traders, and private sector participation can lead to improvement in domestic power sector performance and can advance the progress towards regional integration. However, countries in the region have limited or no exposure to the functionality of trading and power exchange. The provision and existence of a tribunal for dispute settlement is also absent, with exception of India. The success of regional integration depends on the presence of supporting institutions and the strongest institutions are those that grow organically from local initiatives rather than imposed from outside.

2 INTRODUCTION

2.1 ABOUT SOUTH ASIA REGIONAL INITIATIVE FOR ENERGY INTEGRATION (SARI/EI)

The South Asia Regional Initiative for Energy (SARI/E) program was launched by the United States Agency for International Development (USAID) in 2000 with an aim to promote energy security in the region through energy cooperation and integration in the South Asian region. This program covered eight countries in the South Asia region namely Bangladesh, Bhutan, India, Nepal, Sri Lanka, Afghanistan, the Maldives, and Pakistan. The first phase of the program, which lasted from 2001 to 2004, focused on cross-border electricity/cross-border power trade and much of the emphasis was given on capacity building and information exchange among countries to enhance understanding of the energy sector and to demonstrate the advantages of regional cooperation. The second phase of the program (2004-2007) focused on energy market formation and stressed the need to improve policy, regulatory and legal framework for cross-border energy/cross-border power trade in the region. Phase three of the program (2007 – 2012) focused on creating the three pillars to regional energy integration: the institutional capacity, the policy and regulatory framework, and national energy markets. The current and fourth phase (2012-2017) of the SARI/EI program is focused on advancing cross-border energy trade through an inter-governmental consultative process. The overarching objective of the SARI/EI program is to develop a common template for technical and commercial aspects of power exchange among the South Asian countries. The program intends to create the right enabling environment to support the establishment of a South Asian electricity market and to gain consensus and support from the key decision makers and stakeholders in the South Asia region.

2.2 CONTEXT AND OBJECTIVE OF THIS REPORT

The cross-border electricity trade in South Asia has evolved through bilateral arrangements with India as the central figure by virtue of its geographical location and the fact that it is the largest economy in the region. While several initiatives have been undertaken under the SAARC framework, the cross-border electricity trade focus has shifted to the BBIN sub-group because of the bilateral arrangements and interconnection grid that exists between India and Bhutan, India and Bangladesh, and India and Nepal. These existing, developing, and proposed interconnections offer the opportunity to build an interconnected grid which will allow for timelier implementation of a regional electricity market. Recent events, including the expansion of the interconnection capacity between India and Bangladesh and the long-term agreement between India and Bhutan to jointly develop 5,000 MW, all point to a collaborative effort on part of governments in the region to establish cross-border electricity/cross-border power trading.

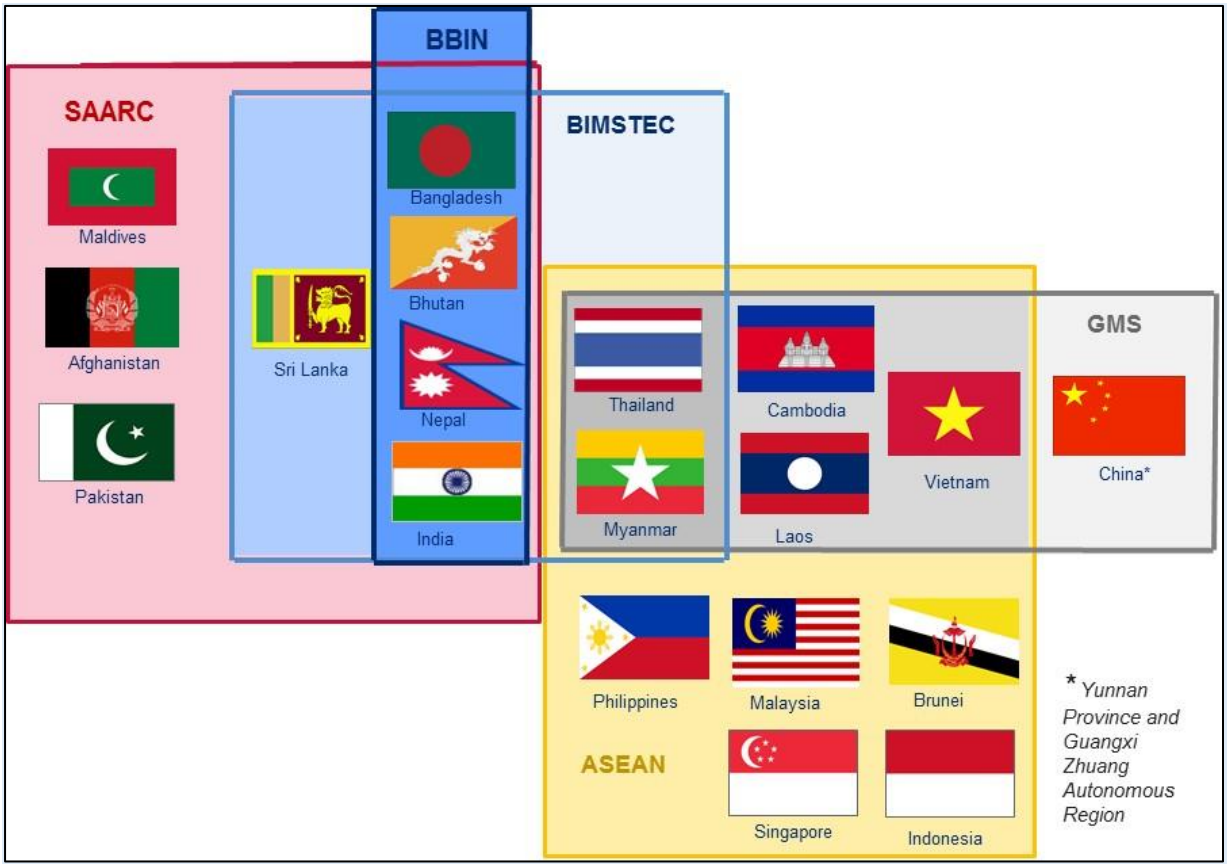
Burma is emerging as a key player in the region. The country has the potential to be a large energy consumer in the short term and an energy supplier in the long term. Its geographical proximity with the BBIN countries and as energy leader under the BIMSTEC regional grouping makes it an ideal candidate for bridging the cooperation between SAARC and Association of Southeast Asian Nations (ASEAN) regional groupings. Thus, there is a need to analyze the political underpinning, the policy and regulatory framework from the perspective of facilitating cross-border electricity/cross-border power trade beyond the evolving sub-regional eastern grid to encompass Burma and Southeast Asia. The key objectives of this analysis are to:

- Analyze the political, economic and policy underpinnings that facilitate regional energy market formation and cross-border energy (including but not limited to power) trade between Burma and the rest of South Asia; between South Asia and the Southeast Asian nations;
- Prioritize a policy, regulatory, and institutional reform agenda in Burma;
- Offer recommendations for capital mobilization to finance electricity interconnections within countries in the eastern region of South Asia, Burma and Southeast Asia;
- Recommend short-term strategies and a long-term road map aimed towards harmonization of regional energy policies and promotion of legal and regulatory frameworks conducive to regional trade between South Asia and Burma. Regional and sub-regional framework for CBET

2.3 REGIONAL GROUPINGS IN SOUTH ASIA AND SOUTHEAST ASIA

The regional and sub-regional groupings in South Asia and Southeast Asia are intricately interwoven as shown *Figure 1* below:

Figure 1: Regional groupings: South Asia and Southeast Asia



There are five well established institutional mechanisms dealing with regional/ sub-regional cooperation amongst the South Asian and Southeast Asian countries in energy. These are described below:

1 South Asia Association for Regional Cooperation (SAARC)

SAARC was established with the signing of the SAARC Charter in Dhaka on 8 December 1985. Its seven founding members are Bangladesh, Bhutan, India, the Maldives, Nepal, Pakistan, and Sri Lanka. Afghanistan joined the organization in 2007. Eleven areas were initially identified by the member countries for potential collaboration and cooperation. These included agriculture; education, culture, and sports; health, population, and child welfare; environment and meteorology; rural development (including the SAARC Youth Volunteers Program); tourism; transport; science and technology; communications; women in development; and the prevention of drug trafficking and drug abuse.

The SAARC region is made up of 3.9 percent of the world's land area and 23.7 percent of world's total population. India is the largest country in the group, both in terms of geography (64 percent of the region's area) and population (75 percent of the region's population). In gross domestic product (GDP) (current US Dollars) terms, the grouping's contribution to global GDP is 3.6 percent. The basic parameters for the constituent countries in SAARC region is provided in *Table 1* below.

Table 1: SAARC countries - Profile (2016)

Country	Land area (Square kM)	Population (Million)	Population density (per square kM)	GDP (USD Billion)	GDP per capita (USD)
Afghanistan	6,52,860	34.66	53.08	19.47	561.78
Bangladesh	1,47,630	162.95	1,103.78	221.42	1,358.78
Bhutan	38,394	0.80	20.78	2.21	2,773.55
India	32,87,259	1,324.17	402.82	2,263.79	1,709.59
Maldives	300	0.42	1,391.64	4.22	10,118.06
Nepal	1,47,180	28.98	196.92	21.13	729.12
Pakistan	7,70,880	193.20	250.63	278.91	1,443.63
Sri Lanka	65,610	21.20	323.17	81.32	3,835.39
SAARC	**51,10,113**	**1,766.38**	**345.66**	**2,892.48**	**1,637.52**

Source: World Development Indicators, 2017

2 Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC)

BIMSTEC is a sub-regional organization, created on June 6, 1997 through the Bangkok Declaration. It is made up of seven member states around the Bay of Bengal including: five deriving from South Asia (Bangladesh, Bhutan, India, Nepal, Sri Lanka) and two from Southeast Asia (Burma and Thailand). The regional group constitutes a bridge between South and Southeast Asia and represents a reinforcement of relations among these countries. BIMSTEC has also established a platform for intra-regional cooperation between SAARC and Association of Southeast Nations (ASEAN) members.

Initially, the economic bloc was formed with four member states with the acronym 'BIST-EC' (Bangladesh, India, Sri Lanka and Thailand Economic Cooperation). Following the inclusion of Myanmar (Official name of Burma) on December 22, 1997 during a special ministerial meeting in Bangkok, the group was renamed 'BIMST-EC' (Bangladesh, India, Myanmar, Sri Lanka and Thailand Economic Cooperation). With the admission of Nepal and Bhutan at the 6th Ministerial Meeting (February 2004, Thailand), the name of the grouping was changed to its current iteration, the BIMSTEC region.

The BIMSTEC region makes up for 3.76 percent of the world's land area and 22.38 percent of the world's total population. India is again the largest country in the group, both in terms of geography (67 percent of the region's area) and population (80 percent of the region's population). In GDP (current USD) terms, the grouping contribution to global GDP is 3.85 percent. The basic parameters for the constituent countries in BIMSTEC region are provided in *Table 2* below.

Table 2: BIMSTEC countries - Profile (2016)

Country	Land area (Square kM)	Population (Million)	Population density (per sq. kM)	GDP (USD Billion)	GDP per capita (US$)
Bangladesh	1,47,630	162.95	1,103.78	221.42	1,358.78
Bhutan	38,394	0.80	20.78	2.21	2,773.55
Burma	6,76,590	52.89	78.16	63.23	1,195.52
India	32,87,259	1,324.17	402.82	2,263.79	1,709.59
Nepal	1,47,180	28.98	196.92	21.13	729.12
Sri Lanka	65,610	21.20	323.17	81.32	3,835.39
Thailand	5,13,120	68.86	134.21	407.03	5,910.62
BIMSTEC	**48,75,783**	**1,659.86**	**340.43**	**3,060.13**	**1,843.61**

Source: World Development Indicators, 2017

3 Bangladesh-Bhutan-India-Nepal (BBIN) sub-region

The BBIN Initiative is a sub-regional architecture of countries in South Asia. It meets through official representation of member states to formulate, implement and review quadrilateral agreements across areas such as water resources management, connectivity of power, transport, and infrastructure.

South Asia Sub-Regional Economic Cooperation (SASEC) was initiated in 2001 with four member countries (Bangladesh, India, Bhutan, and Nepal) under an Asian Development Bank (ADB) initiative. ADB serves as the Secretariat for SASEC, which focuses on regional cooperation in the areas of energy, transport and trade facilitation (and tourism in the initial years). With accession of Maldives and Sri Lanka to SASEC in March 2014, the footprint was expanded. ADB has since been providing both technical and investment assistance under the SASEC framework for capacity building and cross-border investment in roads and transmission interconnections. Together, Bangladesh, Bhutan, India, and Nepal are home to 21 percent of the world's population. The region predominantly depends on traditional fossil fuels (coal and oil) to meet its energy needs despite being endowed with abundant cleaner energy resources such as solar, wind, hydropower, etc.

4 Association of Southeast Nations (ASEAN)

ASEAN was established on August 8, 1967 in Bangkok, Thailand, with the signing of the ASEAN Declaration (Bangkok Declaration) by the founding Ministers of ASEAN, namely Indonesia, Malaysia, Philippines, Singapore, and Thailand. Brunei Darussalam then joined on January 7, 1984, Vietnam on July 28 ,1995, Lao PDR and Myanmar on July 23, 1997, and Cambodia on April 30,1999, making up what is today the ten member states of ASEAN.

The key objectives of the regional grouping are to promote political, economic and security cooperation among its member states. The member countries represent a market of more than 639 million people and a combined GDP of USD 2.55 trillion with a realized trade of more than USD 2.2 trillion.

The ASEAN region makes up for 3.46 percent of the world's land area and 8.58 percent of the world's total population. Indonesia is the largest country in the grouping, both in terms of geography (43 percent of region's area) and population (41 percent of the region's population). In GDP (current USD) terms, the grouping contribution to global GDP is 3.37 percent. The basic parameters for the constituent countries in ASEAN region are provided in *Table 3* below.

Table 3: ASEAN countries - Profile (2016)

Country	Land area (kM)	Population (Million)	Population density (per sq kM)	GDP (USD Billion)	GDP per Capita (US$)
Brunei Darussalam	5,769	0.42	73.36	11.40	26,939.42
Burma	6,76,577	52.89	78.17	63.23	1,195.52
Cambodia	1,81,035	15.76	87.07	20.02	1,269.91
Indonesia	19,13,579	261.12	136.45	932.26	3,570.29
Lao PDR	2,36,800	6.76	28.54	15.90	2,353.14
Malaysia	3,30,290	31.19	94.42	296.54	9,508.24
Philippines	3,00,000	103.32	344.40	304.91	2,951.07
Singapore	719	5.61	7,798.72	296.98	52,962.49
Thailand	5,13,120	68.86	134.21	407.03	5,910.62
Vietnam	3,30,951	92.70	280.11	205.28	2,214.39
ASEAN	**44,88,840**	**638.62**	**142.27**	**2,553.52**	**3,998.48**

Source: World Development Indicators, 2017

5 Greater Mekong Sub-region (GMS)

The Greater Mekong Sub-region (GMS) is a natural economic area bound together by the Mekong river. The GMS countries are Cambodia, the People's Republic of China (PRC), specifically Yunnan Province

and Guangxi Zhuang Autonomous Region), Lao People's Democratic Republic (Lao PDR), Burma (Myanmar), Thailand, and Vietnam.

In 1992, with assistance from ADB, the six countries entered a program of sub-regional economic cooperation, designed to enhance economic relations among the countries. The ADB has provided vital support to the GMS since the program's founding, acting as its secretariat and providing coordination, financing, and technical expertise for all sectors covered in the program including energy. Lao PDR, Myanmar, Vietnam, and the two PRC provinces account for about 94 percent of the hydropower resources in the region. Burma, Thailand, and Vietnam possess natural gas deposits; Vietnam has the most oil reserves; and Yunnan Province, PRC holds the main coal deposits.

2.1 Regional Groupings – Key comparisons

The regional groupings in South Asia (SAARC) and Southeast Asia (ASEAN) are comparable in terms of the geographic area and GDP (current USD Billion – 2016). However, due to lower population in Southeast Asia, its GDP per capita is more than twice that of SAARC region. The regional grouping across South Asia and Southeast Asia (BIMSTEC) is comparable with SAARC and ASEAN as shown in *Table 4* below.

Table 4: Regional groupings – Key Comparisons

Group	Land area (Square km)	Share of Global	Population (Million)	Share of Global	GDP (USD Billion)	Share of Global
SAARC	51,10,113	3.94%	1,766.38	23.73%	2,892.48	3.81%
BIMSTEC	48,75,783	3.76%	1,659.86	22.30%	3,060.13	4.03%
BBIN	36,20,463	2.79%	1,516.90	20.38%	2,508.55	3.31%
ASEAN	44,88,840	3.46%	638.62	8.58%	2,553.52	3.37%
World	12,97,33,173		7,442.14		75,845.11	

Source: World Development Indicators, 2017

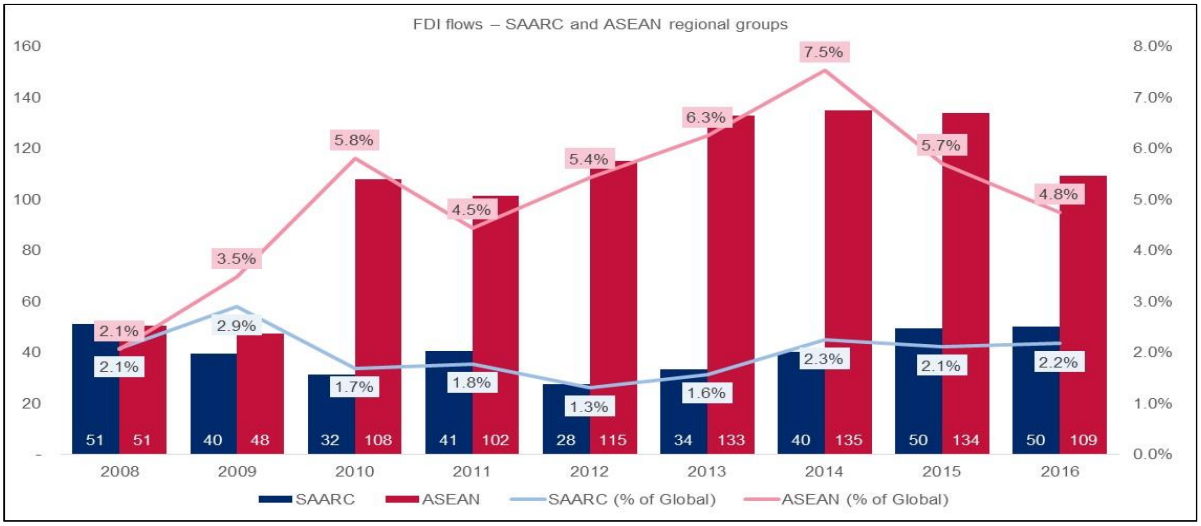
The ASEAN region is ahead of SAARC as far as the international merchandise trade is concerned. Similarly, ASEAN has been more successful in attracting foreign direct investment (FDI) to the region. The FDI in ASEAN was 2.7 times the FDI in SAARC (2016). The trends in international trade and FDI flows for the regional and sub-regional groupings are provided in *Table 5* and *Figure 2* below.

Table 5: International merchandise trade (2016)

Regional Grouping	Inflows (USD Billion)	Outflows (USD Billion)	Total trade (USD Billion)
SAARC	489.50	332.19	821.69
BIMSTEC	537.56	643.25	1,180.81
BBIN	300.59	414.28	714.88
ASEAN	1,085.70	1,151.83	2,237.53

Source: World Development Indicators, 2017

Figure 2: FDI flows – SAARC and ASEAN regional groups

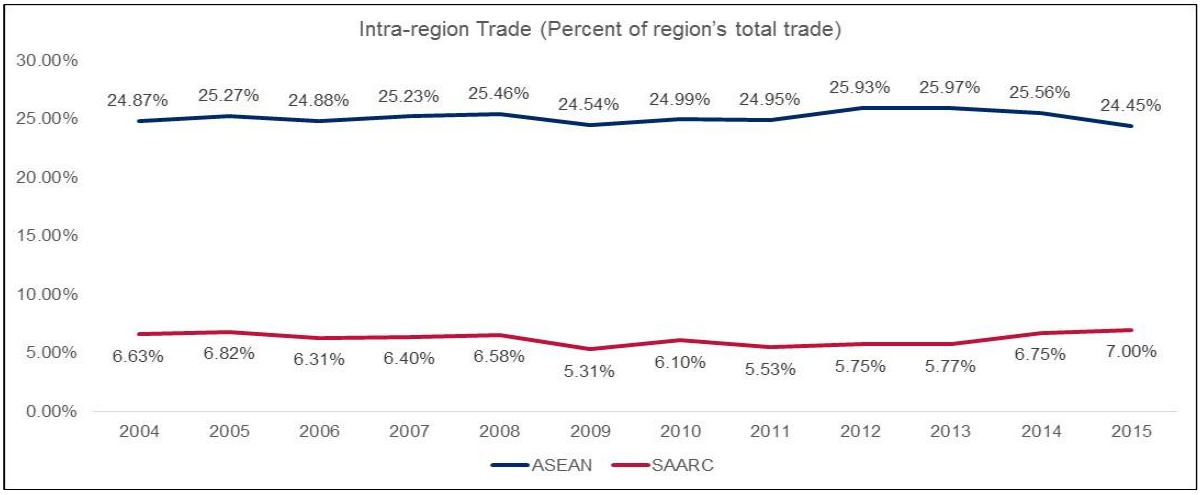


Source: World Development Indicators, 2017

In ASEAN, the intra-regional trade has been in the range of 24-25 percent of the total annual trade, while the intra-regional trading in SAARC has been in the range of five-seven percent for the same period.

Figure 3 below shows intra-region trade trends for the two large regional groupings.

Figure 3: Intra-region trade trends – SAARC and ASEAN



Source: UNCTAD Report, 2016

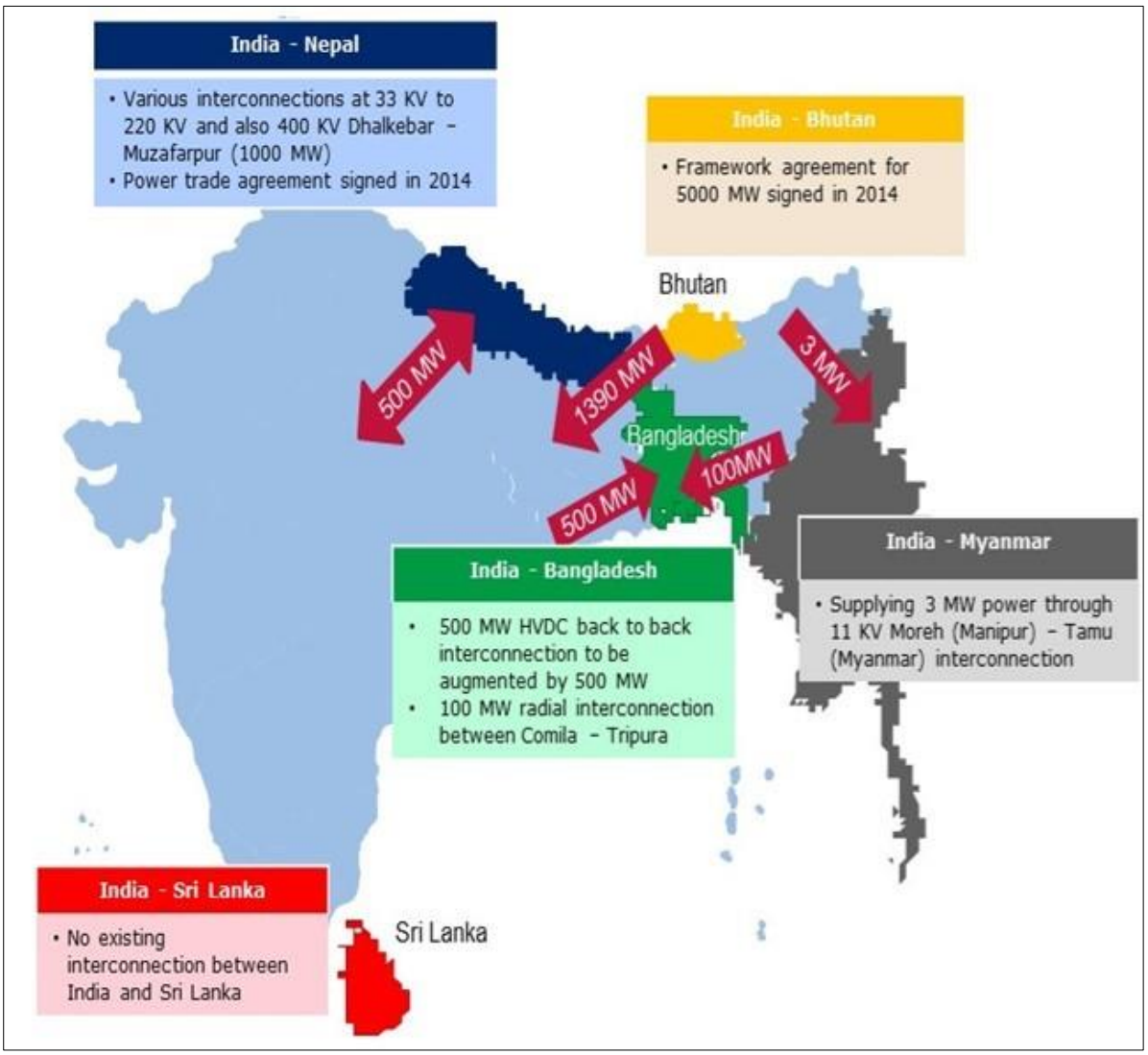
The regional cooperation groupings for the South Asian region and the Southeast Asian region have been described in detail in *Annexure 1.*

2.2 BILATERAL COOPERATION FOR ELECTRICITY TRADE IN SOUTH ASIA

The need for cross-border electricity/cross-border power trade in South Asia is well recognized and there have been continuous efforts in the recent past to increase the bilateral trade of electricity/power amongst the participating nations. In December 2016 the Government of India issued guidelines for the cross-border trade in electricity and this has been followed by draft regulations from Central Electricity Regulatory Commission (CERC), India. While this will strengthen the framework for bilateral electricity trading arrangements between India and neighboring countries in the short to medium term, the progression towards a regional integrated electricity market would be an important next step. Regional power sector integration involves robustly interconnected national electricity networks. These interconnected networks enable trading of substantial power across countries, integrated transmission network planning with well-defined systems operation rules for seamless supplies originating in another country to be delivered to domestic consumers, a market framework which encourages competitive trading of capacity and energy, and common market guidelines to attract investments in the sector.

At present, South Asian countries participate in cross-border electricity trade/ cross-border power trade projects on a bilateral basis and the total capacity is currently pegged at 2,300 MW. Electricity trade in South Asia takes place between India and Bhutan, India and Nepal, and India and Bangladesh. The electricity trade has been facilitated through bilateral government-to-government arrangements that are based on case-by-case negotiations. *Figure 4* below shows the existing transmission interconnections in the region.

Figure 4: Cross-border transmission interconnections in South Asia



2.2.1 India and Nepal

Indo-Nepal power exchange began in 1971 with exchange of 5 MW of power to cater to isolated pockets on either side of the border. The power exchange has been around 150 MW on radial mode at 11 kilo volt (kV) to 132 kV levels between NEA and utilities on the Indian side. The Power Trade Agreement (PTA) signed in October 2014 aims to open the Indian power market for Nepal hydro projects through cross-border transactions that:

- Allow for greater cooperation and planning in the development of transmission interconnections;
- Facilitate development of export-oriented projects in Nepal which will supply power to India;
- Meet the short-term deficit in Nepal through supply of additional power from India until sufficient generation capacity is developed in Nepal;
- Allow for export of surplus power available into the Nepal grid from India.

Nepal receives power from India through the following three modes;

- River Treaty: Koshi Treaty, Gandak Treaty and Mahakali Treaty;
- Border town exchange program;
- Commercial power trading with traders in India (PTC, NVVN) during the dry seasons.

Most of the power supply is through the state of Bihar in India. In addition, 70 Giga Watt-hour (GWh) of free power from the Tanakpur Hydropower Project in India is received through the 132 kV Tanakpur - Mahendranagar S/C line that is being supplied to Nepal under the Mahakali Treaty. There are 21 interconnections for power exchange through 11 kV, 33 kV, 132 kV transmission lines. Out of these interconnections, some 11 kV and 33 kV lines are not being utilized and have been discontinued. The interconnection points still in use are shown in *Table 6* below.

Table 6: Existing interconnections between India and Nepal

Transmission lines	Transfer Capacity (MW)	Voltage Level
Dhalkebar(Nepal) – Muzaffarpur (Bihar, India)	200	220 kV*
Kusaha/Duhabi (Nepal) - Kataiya (Bihar, India)	130	132 kV
Gandak/ Surajpura (Nepal) - Ramnagar (Bihar, India)	50	132 kV
Mahendranagar (Nepal) - Tanakpur (Uttarakhand, India)	50	132 kV
Birganj (Nepal) – Raxaul (Bihar, India); Jaleshwar (Nepal) – Sitamarhi (Bihar, India); Siraha (Nepal) - Jainnagar (Bihar, India); Rajbiraj (Nepal) – Kataiya (Bihar, India); Biratnagar/Rupri (Nepa) – Kataiya (Bihar, India); Nepalganj (Nepal)– Nanpara (UP, India); Mahendranagar (Nepal) – Lohia (Uttarakhand, India)		33 kV
Baitadi (Nepal) – Pithoragarh (Uttarakhand, India) Jaljibe (Nepal) - Dharchula (Uttarakhand, India) Pipli (Nepal) - Dharchula (Uttarakhand, India)		11 kV

A brief profile of the Dhalkebar-Muzaffarpur transmission line is provided below.

Dhalkebar – Muzaffarpur Transmission Line

In 2006 Infrastructure Leasing & Financial Services (IL&FS), Nepal Electricity Authority (NEA) and PTC India took initiative for the first Nepal-India EHV link. The 400 kV transmission link was conceptualized in 2007 with capacity of around 600 MW. The transmission line consists of 85.55 km of 400 kV D/C transmission line from Muzaffarpur (Bihar) to Sursand (Nepal Border) and extension of two 200 kV bays at 400/220 kV Muzaffarpur sub-station for termination of 400 kV D/C Muzaffarpur – Dhalkebar (Nepal) transmission line.

Nepal and India signed a Memorandum of Understanding in 2009 to develop the project on a fast-track mode. In 2010, the World Bank agreed to provide a loan of $99 million to expedite the project. The Bank also provided an additional assistance of $39 million under the Nepal-India Electricity Transmission and Trade Project.

Two joint venture (JV) companies were established to develop, own, operate, and maintain the Dhalkebar-Muzaffarpur transmission line. These include:

- Cross-Border Power Transmission Company Ltd. (CPTCL) – responsible for the Indian portion of the transmission line from Muzaffarpur to Sursand (90 kM)
  - Ownership: IL&FS Energy Development Company Ltd (38 percent), POWERGRID (26 percent), Satluj Jal Vidyut Nigam Ltd (26 percent) and NEA (10 percent)
  - License and tariff for transmission charges approved by CERC
- Power Transmission Company Nepal (PTCN) – responsible for the Nepal portion of the transmission line from Bitthamod to Dhalkebar (40 kM)
  - Ownership: NEA (50 percent), PGCIL (26 percent), HIDCL of Nepal (14 percent) and IL&FS Energy Development Company Ltd (10 percent) (IEDCL)
- Implementation and Transmission Service Agreement signed on 12 December 2011
- Joint venture cum share purchase agreement signed on 5 April 2014
- The transmission line was commissioned in February 2016 with initial charging at reduced voltage of 132 kV due to constraints on Nepal's end in evacuating the power.
- The transmission line was charged at 220 kV in March 2017.
- Due to absence of a government-to-government umbrella agreement, the commercial viability depends on NEA absorbing the risk. The project establishes synchronous interconnection between Nepalese and Indian electrical grids so as to import power from India at present levels and export power from Nepal at a later stage upon completion of ongoing hydro projects in Nepal. The construction of the transmission line is also likely to help Tamakoshi III, Arun III, Balefi and Dudh Koshi projects, which are being developed by local and international developers with an aim of exporting power to India.

Several new high-capacity cross-border interconnections are being considered between India and Nepal. Initially, these interconnections would be utilized for transfer of power from India to Nepal and later, with the development of hydro projects in Nepal, these links would be utilized for the transfer of surplus power from Nepal to India. The following two export-oriented projects for supply of hydropower from Nepal to Indian utilities were finalized in September 2014:

- 900 MW Arun III project (USD 825 million) awarded to an Indian company, SJVNL India
- 900 MW Upper Karnali project (USD 1.4 billion) awarded to an Indian company, GMR Ltd

India is also working with Nepal to supply power through two more radial 132 kV lines viz. Raxaul-Parwanipur and Kataiya-Kushaha, which are being commissioned through grant assistance from the Government of India.

The key interconnections between India and Nepal that are currently under consideration and a joint working group is being established are shown *Figure 5* below.

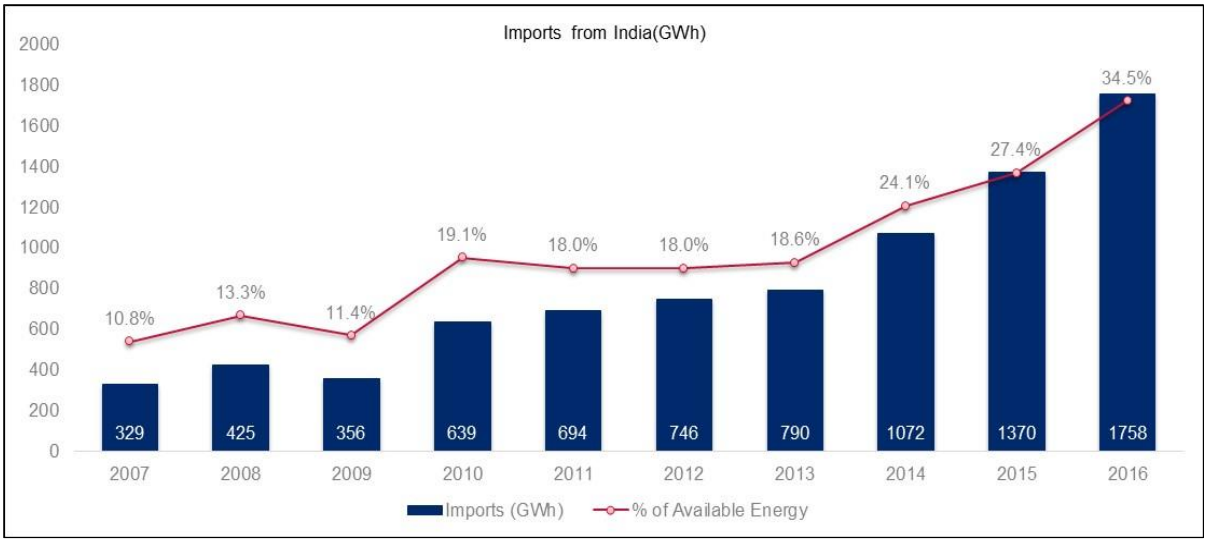
Figure 5: Proposed transmission interconnections between India and Nepal

Source: Central Electricity Authority (CEA), India Report

The increased bilateral cooperation between the two countries can aid India in gaining access to competitively priced clean energy to meet its rising demand and provide Nepal with the opportunity to meet its power deficit and monetize its hydropower resources for the overall benefit to the economy.

In recent times, Nepal's imports from India have risen due to delays in domestic capacity additions in Nepal. The commissioning of Dhalkebar (Nepal) – Muzaffarpur (India) 400 kV (132 kV) transmission link in February 2016 significantly added to the existing transmission capacity between the two countries. Currently, the imports from India account for nearly 35 percent of the annual electricity supply of the country in the financial year 2015-16 as shown in *Figure 6* below.

Figure 6: Electricity trade between Nepal and India



Source: NEA Annual Report, 2016

NEA imports 345 MW from India through four major transmission lines increased in fiscal year 2015/16. Currently, the following short-term Power Purchase Agreements (PPAs) with India have been executed:

- Power Trading Corporation of India (PTC) Ltd. for the import of 20 to 30 MW power at 132 kV level on a round-the-clock (RTC) basis from Tanakpur point

- NTPC Vidyut Vyapar Nigam Limited (NVVN) for the import of 80 MW power for the period February – to July 2016 at 132 kV level on round-the-clock (RTC) basis from Muzaffarpur off-take point through Dhalkebar-Muzaffarpur transmission line operated at 132 kV level. This has been extended through May 2017.
- NVVN for additional 40 MW electricity from January 2017, and the quantum was doubled to 80 MW after February and through May 2017

Nepal will continue to be a net importer of energy in the short term, specifically during the dry season (winter months). The power trading opportunities and option to sell to India will improve with the commissioning of domestic hydropower projects in Nepal.

2.2.2 India and Bhutan

Hydropower development in Bhutan has been the cornerstone of India-Bhutan cooperation. The development of hydro projects in Bhutan is largely based on bilateral agreements with India, deriving its framework from the India-Bhutan Friendship Agreement of 1949. Bhutan-India cooperation in hydropower started in 1961 and interconnection for sharing of electricity started in 1968 after the commissioning of Jaldhaka Hydroelectric project (27 MW) with a powerhouse in the state of West Bengal, India and barrage and catchment in Bhutan. Bhutan received 250 kW free royalty power (1.314 GWh per annum) from this project through the 11 kV interconnections at three delivery points. By the middle of the 1970s, India also started supplying power at 11 and 33 kV voltage inter-connections in South-Eastern towns bordering India.

The agreement for implementing the 336 MW Chukha run-of-the-river hydro-electric project (HEP) was signed in 1974 and the plant was fully commissioned in 1988. The agreements for implementing the 60 MW Kurichhu reservoir HEP and the 1020 MW Tala run-of-the river HEP were signed in February 1994 and March 1996. The construction of large hydropower projects has been made possible with financing from the Government of India through a mixture of grants and loans and the tariffs for hydropower exported to India have been secured at a cost-plus basis.

These projects provide Bhutan with electricity for its own use and give the country the opportunity to export the surplus power to India, which in turn provides much needed revenue and foreign exchange. The majority of power imported from Bhutan is under bilateral agreement between the Government of Bhutan and Government of India. Presently, India imports around 1,542 MW power from hydro stations located in Bhutan: 1,020 MW from Tala, 336 MW from Chukha, 60 MW from Kurichhu, and 126 MW from Dagachu. The following two companies supply power to India:

- Druk Green Power Corporation (DGPC), a Royal Government of Bhutan undertaking owning hydro power stations at Tala, Chukha and Kurichhu
- Dagachu Hydro Power Corporation (DHPC), a joint venture of DGPC and Tata Power Company Ltd.

Three models of developing projects have emerged in the hydropower development sector in Bhutan:

- Inter-governmental (IG), wherein the project is implemented by an independent project authority made up of stakeholders from both governments. Within two years of completing and commissioning a project, the project authority is dissolved, and the project is amalgamated into the Druk Green Power Corporation (DGPC). The three projects implemented with assistance from India (Chukha, Kurichhu and Tala HEPs) were implemented through the IG model. The project costs for these projects were met with a 60 percent grant and 40 percent loan from the Government of India and only surplus electricity is sold to India.
- Joint Venture (JV), wherein a project specific joint venture is incorporated with DGPC as one of the JV partners. The JV is the project authority. Basochhu I and II HEPs were implemented as joint ventures.
- Public-Private Partnerships (PPP), wherein the investment is tied to market availability. Dagachhu HEP was implemented as a PPP.

In July 2006, India and Bhutan signed a framework agreement on hydropower development and trade to facilitate development of hydropower projects and transmission systems and trade in electricity, through both public and private sector engagements. Under this umbrella agreement, India promised to provide technical and financial support and agreed to import a minimum of 5,000 MW of hydropower by 2020. The agreement was revised in 2009 to expand the generation capacity to 10,000 MW. An

empowered group with representatives from both governments was established to facilitate identification of projects, preparation of detailed project reports (DPR), and selection of agencies for speedy implementation of projects. The ten projects identified under the 2006 umbrella agreement are Punatsangchhu I, Punatsangchhu II, Mangdechhu, Bunakha, Sunkosh, Chamkarchhu, Kuri-gongri, Kholongchhu, Wangchhu and Amochhu. Six of these projects are planned to use the IG model and four are planned as joint venture (JV) projects.

In April 2014, the two countries also signed the "Framework Inter-Governmental Agreement" which provided for the development of joint venture hydropower projects through public sector undertakings of the two countries. This inter-governmental agreement provides the framework for implementing the four HEPs of Kholongchhu, Bunakha, Wangchu and Chamkharchu, totaling 2120 MW, on a JV model between public sector undertakings of the two countries. Three more HEPs are under construction and scheduled for commissioning in 2018-19. These are Punatsangchu I (1200 MW), Punatsangchu II (1020 MW) and Mangdechu (720 MW). The foundation for the 600 MW Kholongchu hydro-electric project was laid in 2014. This to be developed by SJVNL India along with Druk Green Power Corporation (DGPC) as 50/50 JV partners.

The present power transfer capacity between Bhutan and India is around 2,500 MW, this capacity is made available through the following interconnections between India and Bhutan:

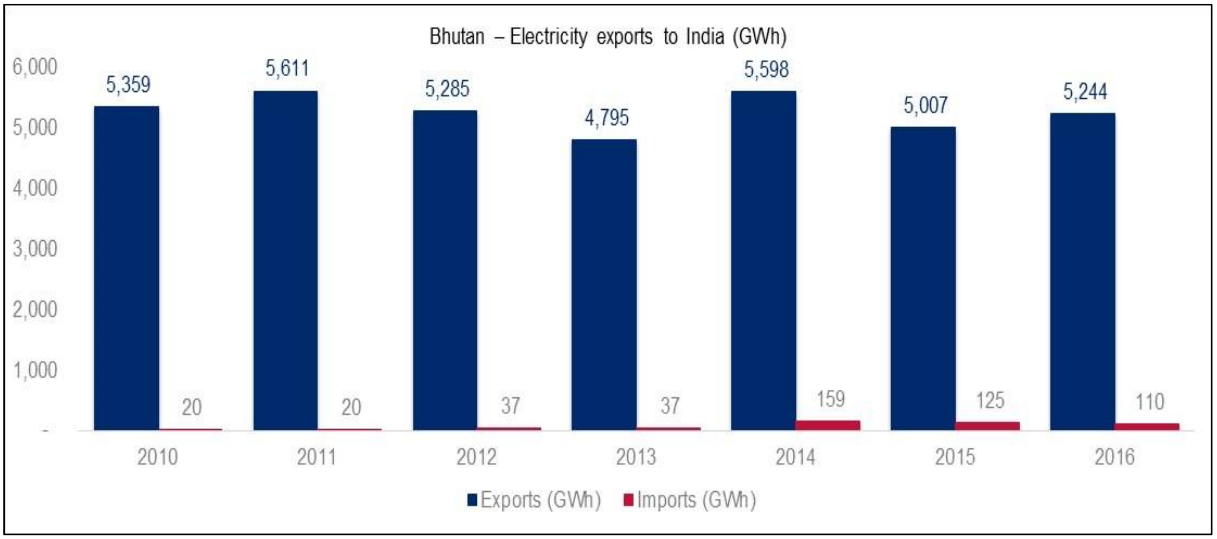
- Chukha (Bhutan) to Birpara (India): 220 kV transmission line
- Kuruchu: Geylegphug (Bhutan) – Salakati (India):132 kV S/C
- Tala (Bhutan) to Siliguri (India): 400kV 2x double circuit (D/c) line

The following interconnections are under implementation:

- First of the 3000 MW HVDC terminals being established at Alipurduar (India) along with a 6,000 MW interconnector between north eastern and northern grids in India
- Punatsangchu-I HEP: (Bhutan Portion) Punatsangchu - Lhamoizingkha (Bhutan border) 400 kV 2x D/c; (Indian portion): Lhamoizingkha – Alipurduar 400 kV D/c (Quad) Jigmeling – Alipurduar 400 kV D/c (quad) line

Expansion of 2,500 MW capacity between Bhutan and India is planned and will be undertaken to serve future development of hydro projects in Bhutan, providing jointly for the evacuation of power from future projects in Sikkim and the northeastern region of India. Hydropower exports (only surplus) provided more than 40 percent of Bhutan's annual revenues in the past and constituted 25 percent of its GDP at the time of commissioning of Tala. The contribution of revenues from sale of electricity to country's GDP is currently around 12.28 percent. The development of hydropower has improved electricity access for the population, with around 96 percent of the Bhutanese population having access in 2015 as compared to 68 percent in 2000. The *Figure 7* below depicts electricity trade with India.

Figure 7: Electricity trade between India and Bhutan



Source: CEA Reports

2.2.3 India and Bangladesh

The Government of India and the Government of Bangladesh signed a memorandum of understanding (MoU) on January 2010 to enhance bilateral cooperation in the areas of power generation, transmission, energy efficiency, renewable energy, consultancy services, training and development, constitution of a Joint Steering Committee, and establishment of grid connectivity between India and Bangladesh.

According to this MoU, NTPC will export 250 MW power to Bangladesh for a period of 25 years from the unallocated quota available with India's Ministry of Power. The tariff for this power trade would be determined based on Central Electricity Regulatory Commission (CERC) regulations. In addition, a PPAs has been signed between NTPC Limited and Bangladesh Power Development Board (BPDB) for supplying 250 MW of electricity over a period of three years to Bangladesh. The electricity grids of Bangladesh and India are connected through the Bheramara – Baharampur 400 kilovolt (kV) back-to-back high voltage direct current (HVDC) link with capacity of 500 megawatt (MW). The interconnection line was commissioned on October 2013. An additional 500 MW of electricity is likely to be traded with the commissioning of the second phase of the Bahrampur-Bheramara interconnection towards the end of 2018. In addition, a 100 MW link (eastern interconnection) was commissioned in 2016 from Tripura's state grid at Suryamaninagar to South Comilla of Bangladesh through 400 kV transmission line (to be operated initially at 132 kV) in radial mode. Presently, India is exporting 500 MW through the Baharampur-Bheramara interconnection and 100 MW of power to Bangladesh through the Tripura-Comilla interconnection.

The contractual arrangements for power trade between India and Bangladesh include:

- Transmission service agreement (TSA) between Power Grid Corporation of India Limited (PGCIL), India and Bangladesh Power Development Board (BPDB) for access through the Indian network;
- PPA between BPDB and NVVN Limited, India for supply of 250 MW of power from the central generating stations of the Government of India;
- Short term agreements through power traders (PTC India Limited, NVVN Limited) for procurement of additional 250 MW power from Indian market.

India and Bangladesh are exploring several additional interconnection proposals to augment the existing transmission capacity for increased power transfer between the two countries. These include:

- Capacity augmentation of existing Bheramara HVDC Station by 500 MW

This link will also enable Bangladesh to participate in the Indian power trading market and execute power trades with generation stations in India, Bhutan and Nepal using the Indian transmission network. Construction on this transmission project started in January 2015 and is slated for completion by June 2018.

- Interconnection with northeastern states of India

  The master plan for evacuation of power from hydro projects in Arunachal Pradesh envisages construction of high capacity transmission lines from the North-Eastern Region to other parts of India. In view of right of Way (RoW) constraints in the narrow stretch of Indian land between Nepal, Bhutan and Bangladesh (the Siliguri corridor), the possibility of routing the line through Bangladesh is envisaged. Bangladesh intends to import 2,000 MW from this line.

- JV for coal-based power plant in Bangladesh

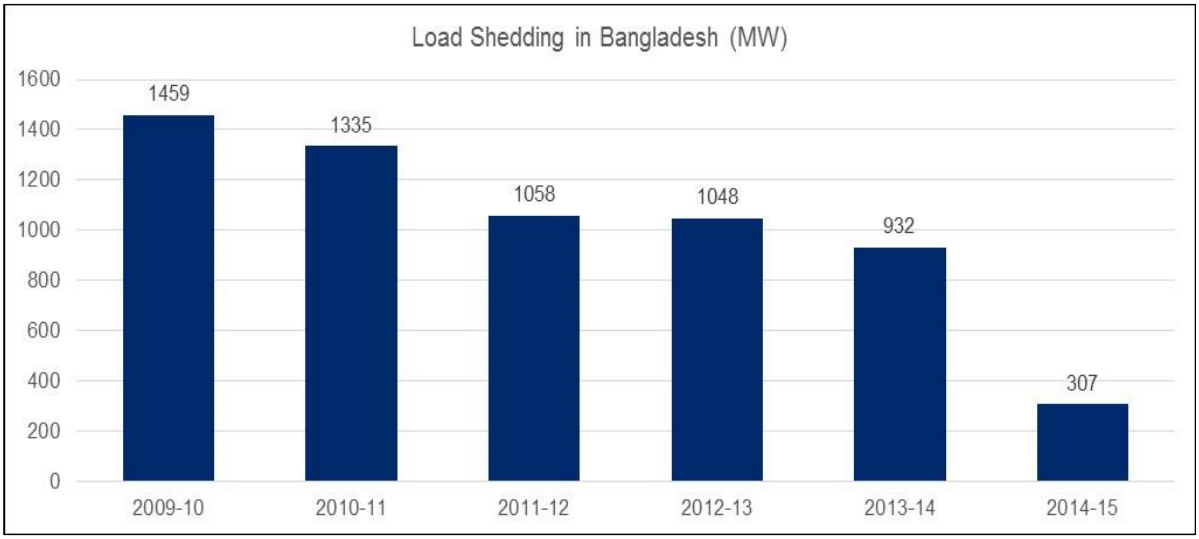
  NTPC India has entered into a joint venture with Bangladesh Power Development Board (BPDB) for developing 1,320 MW coal-based power project (Maitree Super Thermal Power Project) in Bangladesh.

The Bangladesh – India interconnection has been beneficial to Bangladesh in many ways:

- Reduction in load shedding

  The Bangladesh power sector used to experience huge load shedding due to a perennial deficit in supply. The reduction in gas availability and lack of alternate resources for the generation led to load shedding of around 1,459 MW in 2009-10. The situation has gradually improved with the supply of power from the Indian grid as shown in *Figure 8*.

Figure 8: Bangladesh - Load shedding (MW)

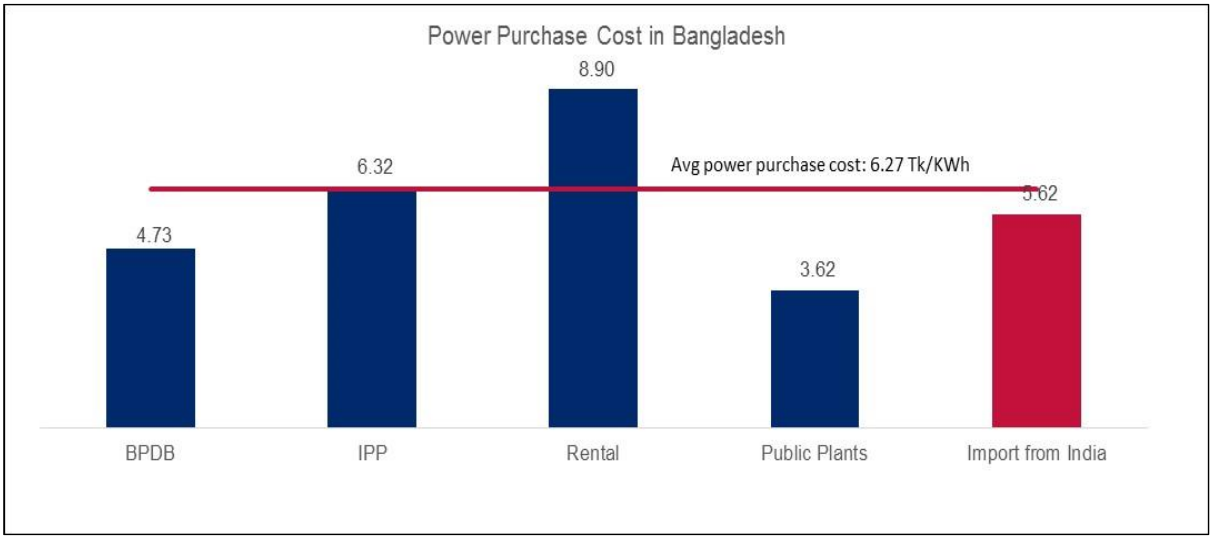


Source: BPDB Annual Reports

- Power procurement cost for BPDB has come down:

  The average power purchase cost for BPDB, the bulk procurer in the Bangladesh power sector, has lowered. This is due to replacement of costlier power from the rental based plants with imports from India. In fact, the cost of power from India is cheaper than the rental power plants and also lower than the average power procurement cost from IPPs as shown in *Figure 9* below.

Figure 9: Bangladesh - Average power purchase cost for BPDB



Source: BPDB Annual Report, 2015

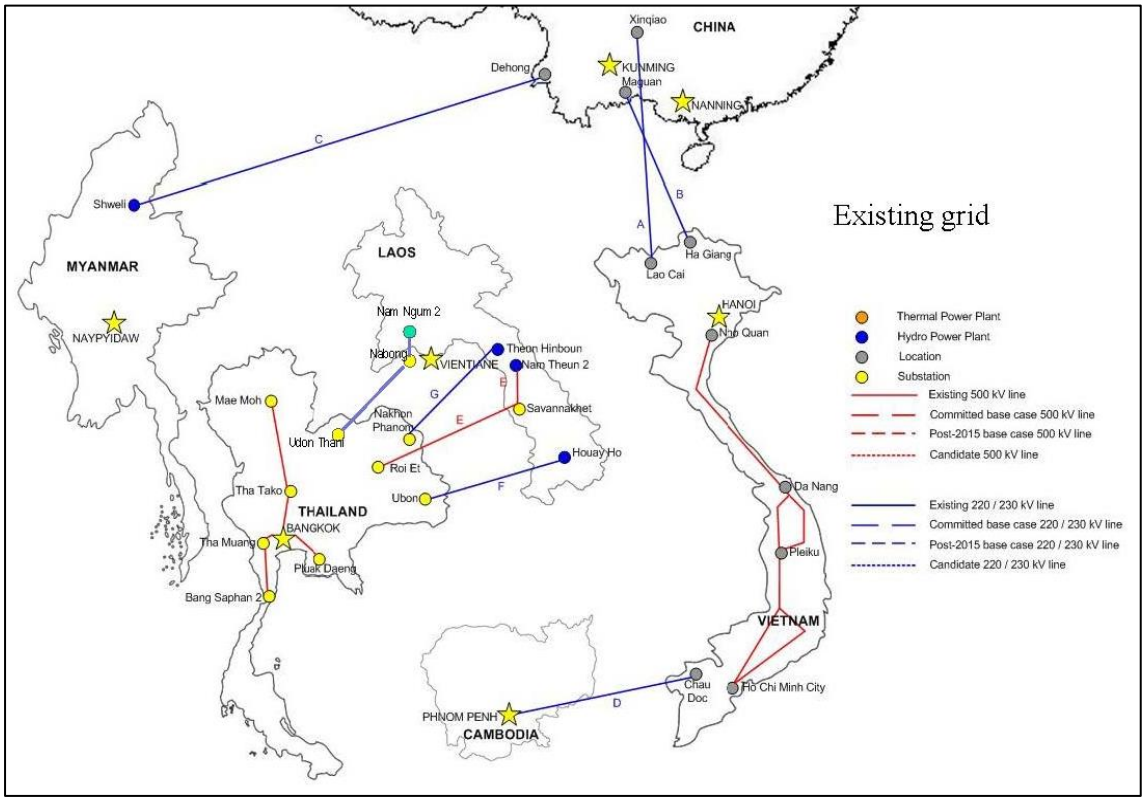
2.2.4 India and Burma

The cross-border electricity transactions between India and Burma is taking place through 11 kV Moreh (Manipur, India) –Tamu (Burma) distribution line and has started in April 2016. The quantum of electricity traded is very low (about 1-3 MW) and primarily for use in the Tamu town in Burma, which is not connected to rest of the Burma grid.

2.3 BILATERAL COOPERATION FOR ELECTRICITY IN SOUTHEAST ASIA

Burma is an integral part of the GMS system and has connections with China and new interconnections have been proposed with Thailand and China. *Figure 10* below shows the transmission interconnections, existing and proposed, in the Greater Mekong Subregion.

Figure 10: GMS transmission interconnections



Source: Power Trade in Greater Mekong Sub-region – Priyantha Wijayatunga, ADB (2016)

2.3.1 Burma and GMS countries

In 2010, Burma was exporting around 1,720 GWh of electricity from its hydropower plants to the southern region of the People's Republic of China. Apart from exporting power to China, Burma is not trading electricity with any other country in the sub-region, particularly countries in the Southeast Asia region.

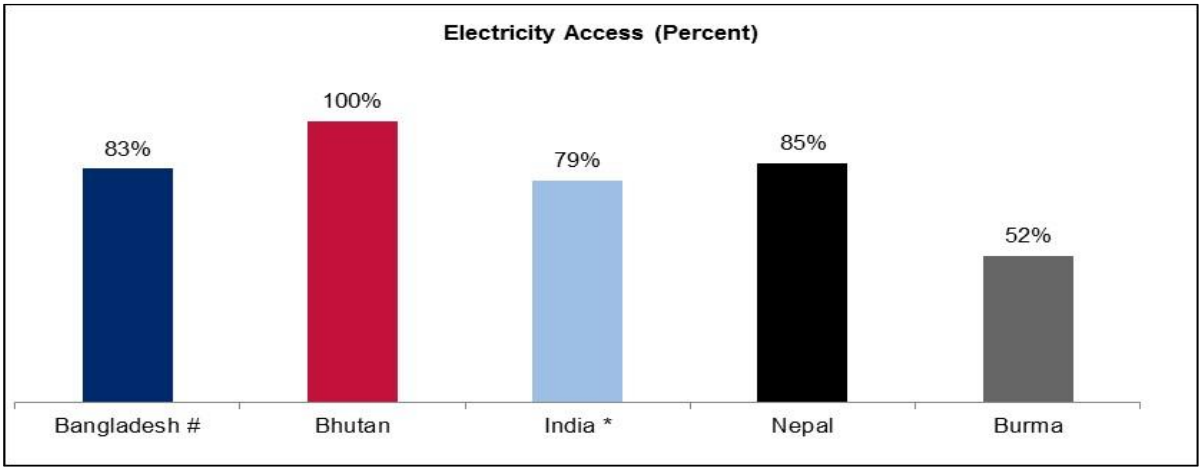
2.4 KEY DRIVERS FOR REGIONAL CROSS-BORDER ELECTRICITY TRADE

The regional energy profile presents certain opportunities and synergies across the region that can be leveraged for cross-border electricity trade. These include:

- Improving the access to electricity

The electricity access for countries in the region has been improving over past decade but is still relatively low for Bangladesh, Burma, India and Nepal, as shown in *Figure 11* below. Such low access to electricity hampers economic growth and prevents poverty alleviation. Sustainable supply of electricity can free large amounts of time and labor and promote a better socio-economic life.

Figure 11: Electricity Access (percent)

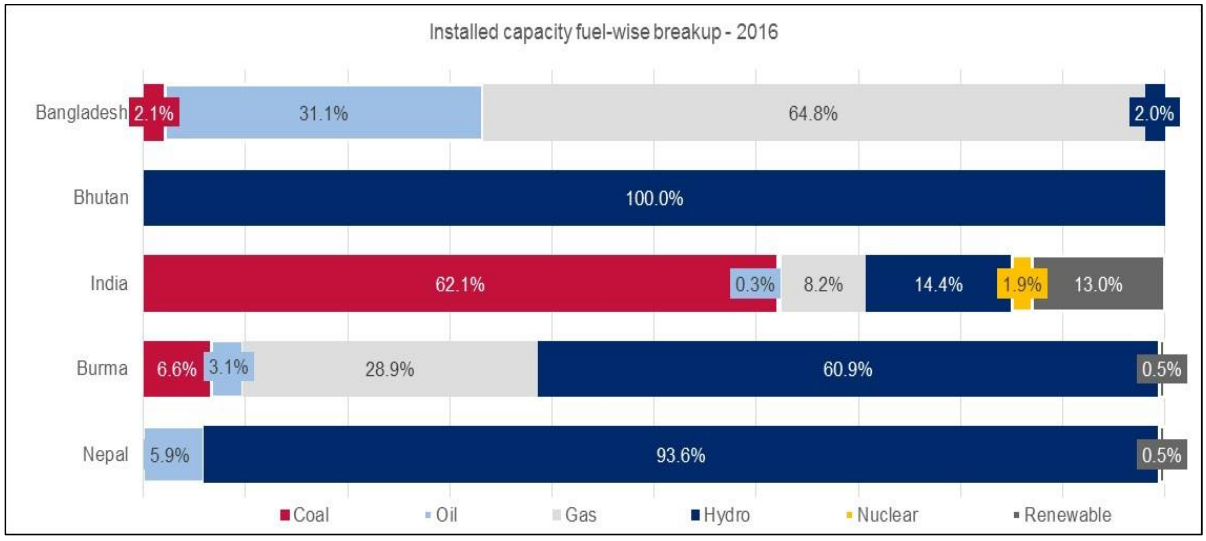


*Source: * 2014, World Development Indicators; # 2016, Bangladesh Power Cell website;$ 2016, CEB Long term generation plan 2018-37; ** 2016, Energy Balance of Thailand 2016; ## 2016, CEA Report 2017; $$ 2016; National Statistics Book, 2016*

- Diversify resource potential

  62 percent of India's electricity generation capacity comes from thermal. Bhutan and Nepal are primarily dependent on hydroelectricity (more than 90 percent), while natural gas dominates the current generation mix in Bangladesh (around 65 percent). Similarly, Burma is rich in both gas and hydro, but its current electricity mix is dominated by hydropower. The over-dependence on one single energy resource raises concerns for long term energy security. A cross-border power trading model, if suitably designed and implemented, can address the energy procurement portfolio mix and mitigate single energy source risk. *Figure 12* below shows the fuel diversity for Bangladesh, Bhutan, India, Nepal and Burma

Figure 12: Fuel wise breakup of installed capacity



Source: Country Reports

- Reduces dependence on imports

  Lack of steady electricity supply can also lead to rampant use of diesel generator sets, kerosene lamps, etc. All the countries in South Asia and Southeast Asia are dependent on imports of crude oil and in some countries even petroleum products. Such import dependence not only raises energy security concerns but also has foreign exchange reserves implications, including exposure of currency to pricing and exchange rate volatility. Increases in cross-border electricity trade among countries would partially insulate countries from negative price shocks.

- Optimum utilization of generation capacity

  The seasonal or peak power shortage in one country can be met by the surplus generation capacity available with a neighboring country during the same time. This eliminates the need for the deficit country to invest in peaking power plants, and results in better utilization of the neighbor's surplus capacity. This ultimately leads to economic operation of power systems for both the countries.

- Increased power system reliability

  Increased interconnectivity of power systems increases their reliability compared to smaller isolated systems. Interconnected systems can also address situations arising out of natural calamities that partly or fully handicap specific generation plants.

- More economical power flows

  Sometimes the geography of two countries is such that the loads of one country are closer in proximity to generation facilities belonging to the other country than to its own generation facilities. It would then be more economical to meet such loads from neighboring countries. These arrangements often result in lessened transmission investment, reduced line length, lower system losses, and ultimately in lower costs for the consumer.

- Reduction of adverse greenhouse gas (GHG) impacts

  Enhanced cross-border interconnections can help reduce adverse energy sector GHG impact on the environment by expanding the market for large-scale hydropower projects and, thereby, also increasing their economic viability and financing prospects. For instance, by setting up more export-oriented hydropower projects, Bhutan and Nepal can further help the region to reduce its dependence on fossil fuels and consequently reduce GHG emissions.

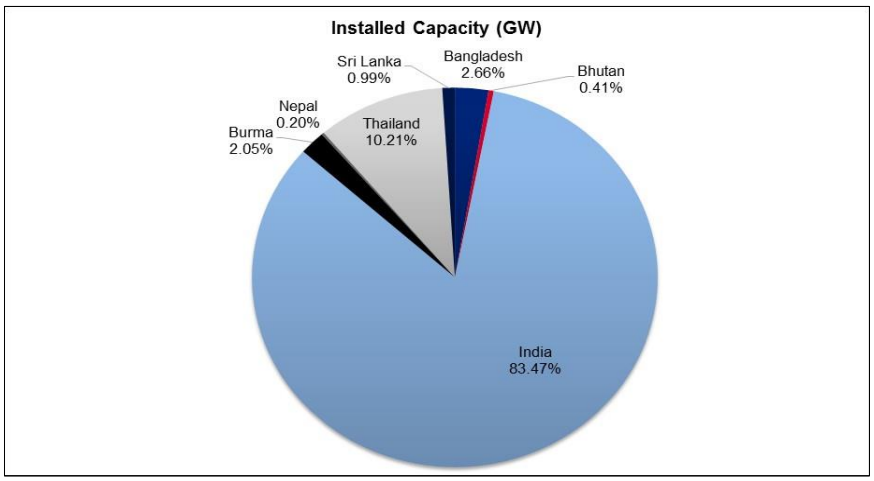
2.5 KEY CHALLENGES AND RISKS

The following section enumerates the key challenges and issues in the implementation of cross-border electricity trade in the region.

2.5.1 Imbalances in capacities and dominance of India

India contributes 84 percent of the installed generation capacity produced in South Asia (excluding Pakistan), Burma and Thailand. India's role as the largest economy and main producer places it in a position of influence in shaping regional energy policy. *Figure 13* below provides the installed generation capacity in the region.

Figure 13: South Asia – Country-wise generation capacity



Source: Country Reports

2.5.2 Limitations in infrastructure development

Lack of infrastructure and lack of maintenance of existing infrastructure is an important limiting factor. The regional power trade has been constrained by both transmission congestion and limitations in transmission systems.

2.5.3 Unequal financial burdens

Some countries face more burdensome spending to develop their resources than others, particularly those with hydropower potential. The countries with hydro potential also face higher environmental and social costs. The development of infrastructure for CBET would provide options for sharing or reducing the financial burden on the member countries.

2.5.4 Project implementation issues

Cross-border electricity trade involves various kinds of risks ranging from political, regulatory, commercial and financial risks. These risks can be categorized further as shown in *Table 7* below.

Table 7: Project implementation risks in cross-border electricity trade

Risk	Category	Details
Political and regulatory risks	Expropriation	Loss of control, ownership or rights to an investment because of acts by the host government. In extreme cases of government policy change, there is a risk of asset nationalization.
	War & civil disturbance risk / Security risk	Physical security risk arising from war, terrorism or civil disturbance. Affected by the country's law and order and military capability and effectiveness. Also affected by underlying social and political factors, which are generally outside of the control of non-government project sponsors.
	Breach of contract	Relevant contract counterparty, in particular the host government or government entities / state owned enterprises breaching or repudiating contractual agreement.
	Legal & regulatory risk	Adverse legal and regulatory change, application or enforcement affecting the operation, costs, payments to, or receipts from the project, thereby impacting the potential returns for investors.
Commercial risks	Project delay	Due to delays in planning, design, or construction caused by administrative delays in gaining approval for the construction of project facilities, delays or costs arising at later stages of the project due to problems that were not foreseen or allowed for in the initial project design, inadequate specified standards for construction and safety, incompatibility of construction or operating standards between two countries, poor project management and implementation, labor disputes, technical problems encountered during construction, and changes in the project environment such as regulatory or economic conditions.
	Supply risk	Interruption in supply from the generator or the transmission system. Impose costs on country economy equal to the value of production lost.
	Payment risk	Counterparty to a trade not making its contracted payments. Affects the project during the operation phase, as well as during the design and construction phases.
Financial Risk	Financing risk	Project's commercial viability (mainly dependent on prices, market risk and payment risk; prices are in turn affected by regulatory risks), the securities provided and the enforceability of contracts.
	Exchange rate risk	Fluctuations in the value of project components, fuel or payments denominated in a foreign currency and availability of foreign currency e.g. to make cross-border payments.
	Funding risk	Limited availability of project funding, whether through grant, loan, mezzanine or equity products due to political, commercial and financial risks or due to inadequacies in local financial markets or relate to government's individual budget programs

3 INTERNATIONAL EXPERIENCE IN CROSS-BORDER ELECTRICITY TRADE

With the regional power trading model still evolving in South Asian region, it is worth looking at other regional power trading models that have been implemented in other regions. The key regional models that have been successful and are relevant to the ongoing discussions in the South Asian power trading regional framework are provided in *Table 8* below:

Table 8: Regional power trade models

S No	Regional Entity	Formation	Members
1	Southern African Power Pool (SAPP)	1995	Botswana, Democratic Republic of Congo, Lesotho, Mozambique, Namibia, South Africa, Swaziland, Zambia, Zimbabwe
2	Greater Mekong sub-region (GMS)	1995	Cambodia, China, Lao PDR, Burma, Thailand, Vietnam
3	Gulf Cooperation Council (GCC)	2001	Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, UAE
4	Turkey-Georgia interconnection	1970	Turkey, Georgia
5	Black Sea Region Interconnection	2004	Armenia, Bulgaria, Georgia, Moldova, Romania, Ukraine and Turkey

3.1 SOUTHERN AFRICAN POWER POOL (SAPP)

The SAPP was created in August 1995 with the primary aim to provide reliable and economical electricity supply to the consumers of each of the SAPP members, consistent with the reasonable utilization of natural resources and the effect on the environment.

3.1.1 Key features

- Interconnections and electricity trade

  Bilateral contracts among individual countries have always dominated electricity trade in SAPP. The quantum of electricity traded bilaterally among member countries amounts to around 15,000 to 20,000 GWh per year. The short-term energy market (STEM), which was introduced in 2001 and operated until 2007 by the Southern African development community (SADC) coordination centre. STEM was introduced to provide a market platform for the surplus power that was not covered by bilateral contracts. STEM accounted for approximately 5- 10 percent of energy traded.

- Electricity market development

  It was decided to move towards a more competitive market in the form of a day ahead market (DAM),STEM was not considered to be sufficiently competitive since demand almost always exceeds supply and trading was biased against suppliers.

- Importance of electricity trade for member countries

  Individual countries have different electricity trade priorities. Some countries such as Botswana, Lesotho, Swaziland, Tanzania, and Zimbabwe plan to be net importers. DRC, Malawi, Mozambique, Namibia, South Africa, and Zambia plan to be net exporters. The gains from electricity trade vary significantly among importing countries, depending on whether participation of the country is to exploit the current market conditions i.e. procure cheap electricity from day ahead market or short-term electricity market.

3.1.2 Background of SAPP regional electricity trade

SAPP is the product of political and regional integration efforts undertaken as part of the Southern African Development Coordination Conference (SADCC) created in 1980, its successor, the Southern African Development Community (SADC) created in 1992, and its regional colonial history roots. The countries that later formed part of SAPP were former British colonies (Botswana, Lesotho, Malawi, South Africa, Swaziland, Zambia, and Zimbabwe), former German colonies taken over by the British

(Namibia and Tanzania), former Portuguese colonies (Angola and Mozambique), and a former Belgian colony (Democratic Republic of the Congo).

The roots of SAPP extend back to the pre-independence period when the former colonial powers in the different countries developed significant generation and transmission projects that are now the backbone of the regional grid. The formal process of establishing a power pool started with the establishment of the SADCC in 1980. Angola was given the responsibility of spearheading the integration of the region's energy sector. A technical and administrative unit (TAU) based in Luanda assisted the government of Angola with this responsibility. The TAU organized regular meetings of SADC energy ministers and officials, out of which resolutions and action plans for facilitating regional energy integration were agreed upon. One of these resolutions was the creation of an electricity subcommittee that first met at the SADC energy ministers meeting held in Harare in 1990. The subcommittee was comprised of the national utilities of the member countries and acted as technical advisers to the energy officials and ministers on issues relating to enhanced cooperation in the electricity sector.

The formal establishment of SAPP was not expected to lead to an immediate increase in trading among members. It was appreciated that this was only an institutional framework to begin the serious work of translating the vision of regional cooperation into reality. STEM was only introduced in 2001 because there was need for member countries to complete studies on wheeling charges. The more sophisticated DAM market was introduced in 2009 because members needed to thoroughly understand the financial, operational, and other impacts of moving from cooperative to competitive transactions.

One of the unique features of SAPP is the history of successful trading in electricity despite security and political concerns. The drive to achieve self-sufficiency and reduce dependency on neighboring countries led countries in the region to develop generation and transmission capacities. These assets enabled countries in the region to engage in the trade of electricity. The key drivers in the evolution of SAPP as a regional entity are as follows:

- Energy resources

  One of the main underlying driving forces in SAPP is meeting future demand growth in Southern Africa with environmentally clean hydropower generated in the northern part of the SAPP region. The emphasis on clean energy procurement led to the inter-governmental and inter-utility agreements and provided the context of the founding agreements for the SAPP.

- Demand

  Focus on increasing household electricity access and the manufacturing and mining activity in Southern Africa are key sources of demand in the SAPP region. Central to the realization of the recommended pool plan is the increased transmission investments required to facilitate large power transfers from areas of low-cost generation in the north to areas of high demand in the south.

- Energy tariff

  Historically the interconnected SAPP member countries have enjoyed low average electricity prices by world standards. This is because capital costs of the main SAPP grid infrastructure have already been depreciated. A recent study by the Regional Electricity Regulators Association (RERA) show average tariffs ranging from less than 4 USc/kWh (South Africa and Malawi), to between 4 and 7 USc/kWh (Botswana, Mozambique, Namibia, Swaziland, and Zambia), and above 8 USc/kWh (Angola and Tanzania). The highest prices are found in those countries that have not yet established interconnection to the regional grid.

In 2016, the fifteen SADC countries that comprise SAPP had a combined population of 277 million and GDP of USD 575.5 billion. Except for South Africa, and after accounting for distortion because of energy intensive industries in some of the states, the socioeconomic condition of the region was typical of sub-Saharan Africa – endemic poverty, low life expectancy, high infant mortality rates, low electrification, and low electricity consumption per capita rates.

3.1.3 Institutional framework

The governance structure of SAPP is led by SADC Directorate of Infrastructure and Services, under which energy lies in the regional organization. The SADC government ministers and officials are responsible for overall policy matters relating to the electricity sector. These determine both the institutional structure and market conditions in each member state. Although member utilities are

responsible for managing the day-to-day operation of the power pool, any decision related to the financing of generation and transmission projects that have regional significance is undertaken by national governments rather than SAPP.

In 2002, the SADC energy ministers approved constitution of a regional regulatory body, known as RERA. RERA is not considered as a regional regulator, in the sense of having authority and power in regulatory matters in the region. RERA is merely an association of national regulatory institutions. RERA's objective is to promote greater harmony in regulatory policies, legislation, standards, and practices and their aim is to increase the trade of electricity within the region.

3.1.4 Key lessons from SAPP electricity trade experience

By signing the intergovernmental agreement, the government of each country was able to grant formal authority to its national utility to participate in SAPP activities and guarantee the obligations of the utility. Through this agreement a utility that fails to discharge its obligations, such as paying for power delivered automatically, exposes its government to the liability.

Cooperation has resulted in benefits in auxiliary services. This has reduced the quantum of reserve requirement of the individual member countries and reduced load shedding by utilities.

The STEM that was developed and used during the period from 2001 through 2007 is a notable achievement, even though the amounts involved were always a small proportion of the region's total annual energy consumption (which is about 300,000 GWh in the interconnected grid). STEM is being replaced by the day-ahead market. However, most of the trade in electricity will continue to be via long term bilateral contracts.

1.4 GREATER MEKONG SUB-REGION (GMS)

3.1.5 Key features

The GMS includes countries such as Cambodia, PRC, Lao People's Democratic Republic (Lao PDR), Burma, Thailand, and Vietnam. In the year 1992, with assistance from Asian Development Bank (ADB), the six countries mutually agreed to promote sub-regional economic cooperation with an aim to enhance economic relations. Establishment of an integrated electricity market is one major component of such cooperation.

The Lao PDR, Burma, Vietnam, and the two PRC provinces account for about 94 percent of the hydropower resources in the region. Burma, Thailand and Vietnam possess natural gas deposits; Vietnam has the most oil reserves; and Yunnan Province, PRC holds the main coal deposits. Cross-border electricity trade in the GMS has led to the following pattern of electricity trading:

- Cambodia has been importing from the Lao PDR (south) since 2010, Thailand since 2009, and Vietnam (south) since 2008;
- The Lao PDR (north) has been importing from Thailand since the late 1990s and Yunnan Province, PRC since 2009;
- Thailand has been importing from the Lao PDR since 1971;
- Vietnam (north) has been importing from Yunnan Province, PRC since 2004;
- Yunnan Province, PRC has been importing from Burma since 2008.

An estimated USD 14.3 billion in savings has resulted from expanding the interconnection of GMS power systems, mainly due to the substitution of fossil fuel generation with hydropower. The GMS model has been successful due to:

- Transition from bilateral contracts to a more complex, centralized regional trading system.
- Strong institutional arrangement with a mandate to enforce inter-governmental commitment, and regional decision-making entities.

3.1.6 Background of GMS regional electricity trade

The GMS Program was launched in a sub-region emerging from prolonged conflict with a majority of the GMS countries transitioning from centrally planned economies. 2017 marks the program's 25th year in operation.

Considering the benefits of sharing the sub-region's diverse energy resources and of optimizing power supply to meet varying demand profiles across the region, energy was identified at the inception of the GMS Program as one of nine areas of sub-regional cooperation. The economic and environmental benefit of regional integration in the GMS energy sector is estimated at about USD 200 billion in savings, amounting to about 19 percent of total energy costs. The savings resulting from expanding the interconnection of GMS power systems alone are estimated at USD 14.3 billion, mainly due to the substituting hydropower for fossil fuel generation. Integration of power systems is also expected to result in slower growth of carbon emissions.

The initial years of energy cooperation, from GMS's inception in 1992 until the late 1990s, were focused on networking and building trust, and mechanisms for sub-regional collaboration among GMS members. In this initial period, various regional and sub-regional studies were carried out that were crucial to nascent GMS cooperation. The initial activities included:

- Reinforcing regional policy development, project preparation, information sharing, and familiarization with the regulatory and institutional structures of the national power systems of the GMS members;
- Encouraging collaboration and issues resolution with goodwill and a cooperative spirit;
- Fostering an environment that helped enable GMS members to embrace the benefits of sub-regional cooperation.

GMS governments have emphasized a gradual evolution of the regional electricity market from bilateral trading to a centralized regional trading system. Emphasis on a gradual implementation has two potential advantages:

- Bilateral trades enable the benefits of a cross-border transaction to be realized immediately. While a centralized trading platform (or effective power pool) can take years to develop, bilateral trades can be negotiated over months.
- Bilateral trading helps move toward future regional trading. Bilateral trades help to develop the physical infrastructure that is needed to underpin cross-border trading. Short-term trading does not provide sufficient revenue certainty to justify the construction of new generation and transmission facilities, which means that long-term bilateral deals are needed to provide investment certainty.

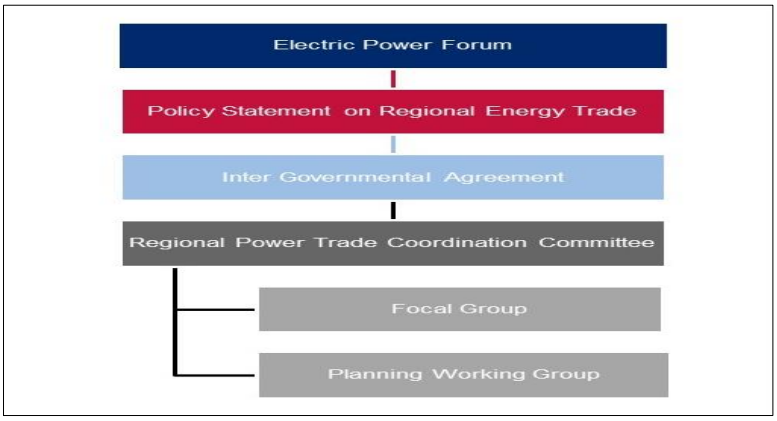
3.1.7 Institutional framework

Multiple coordinating and leading institutions were constituted to fast-track and support the transition from bilateral trade among participant countries to regional cross-border trade. There are three institutions specific to the GMS power market:

- Sub-regional electric power forum (EPF) inaugurated in April 1995;
- Regional power trade coordinating committee (RPTCC) established under Inter-Governmental Agreement (IGA) of November 2002;
- Focal group and planning working group established under RPTCC;

Figure 14 below shows the institutional framework in GMS

Figure 14: GMS - Institutional framework



The EPF serves as an advisory body to the GMS ministerial meetings on sub-regional power issues. EPF's objectives, as set out in its terms of reference, are to:

- Act as a cooperative link among government agencies and related institutions directly involved in power supply and power system development in the sub-region
- Act as a promotional and advisory organization for the development of efficient power systems in the sub-region
- Identify and promote opportunities for mutually beneficial sub-regional cooperation projects in the power sector
- Promote financing by government, utilities, donors, and the private sector for priority projects related to the development of sub-regional power systems
- Provide a forum for discussing software issues, such as planning tools and pricing principles, related to sub-regional cooperation in power projects
- Provide and disseminate information to participating countries and cooperate with regional and international organizations

Each GMS country is represented on the EPF by two members. One is a senior official from the ministry or other government agency responsible for power sector policy and planning, and the other is a senior manager from the key power utility in the country. The EPF has been supplanted by the establishment of the RPTCC, which has the same membership.

The RPTCC was established under Article 4 of the IGA. Its role, as defined in IGA, is to "…actively coordinate for successful implementation of regional trade and to represent the countries involved in regional power trade." The RPTCC reports to the GMS ministerial meeting.

The first task of the RPTCC, as defined by the IGA, is to establish and implement regional trade arrangements for endorsement by member countries. The specific requirements are given as the preparation of a plan to:

- Provide the parties with a final draft of the Regional Power Trade Operating Agreement (RPTOA), which will specify the rules of regional power trade
- Provide the parties with a recommendation for the overall policy and day-to-day management of regional power trade, including the necessary bodies for coordination
- Establish the short, medium and longer-term initiatives that need to be pursued on a priority basis to achieve the objectives of regional power trade within a specified timetable
- Identify necessary steps for implementation of regional trade, including means for financing

The focus group of RPTCC is tasked with coordinating priority RPTCC activities in each country and a planning working group (PWG), which is tasked to undertake planning and system operation studies that would help the GMS countries move towards common power trading guidelines.

The main objectives of the PWG during Stage 1 of the regional power market are:

- Preparing a plan for developing a regional network with facilities that are dedicated to cross-border transactions but are not linked to specific PPAs;
- Planning and prioritizing the addition of new transmission capacity, including recommendations regarding ownership and financing;
- Defining excess transmission capacity that is available on a non-firm basis to support short-term opportunity exchanges of power;
- Preparing plans for augmenting the capacity of existing cross-border transmission facilities and reinforcements required in national transmission systems to facilitate cross-border power trading;
- Participating in the development of performance standards regarding safety/security, reliability and quality of service;
- Creating and maintaining the regional database on power trading with due regard to the confidentiality aspects of PPAs with private parties.

The existing cross-border trades were negotiated and approved by the national utilities and various ministries in each of the countries. The RPTOA documents the governments' intention to create a Regional Regulatory Board (RRB), which will consist of one member from each GMS country. The RRB would:

- Review and improve the RPTOA;
- Set transmission tariffs;
- Facilitate arrangements for construction of cross-border transmission facilities;
- Evaluate reports of the PWG, and make decisions linked with recommendations for such reports;
- Solve disputes that may arise from cross-border transactions, or from the use of cross-border transmission facilities;
- Decide how to move to future stages of implementing the RPTOA.

In December 2013, the Regional Power Coordination Centre (RPCC), a permanent body of six GMS countries, was established to enhance regional power trade and implement regional power interconnection in the GMS.

3.1.8 Key lessons from GMS electricity trade experience

Several initiatives taken by GMS for establishing cooperation for electricity trade have led to implementation of successful cross-border trade. While the Inter-governmental agreement provided a basis for cooperation, each country recognized and endorsed international trading in electricity to be an integral part of its domestic policies.

The leadership was assumed by a regional coordination group while each country established an independent regulator to reduce financial uncertainties. An ad hoc group with no formal structure assumed responsibility for developing the regional protocols and early planning for regional integration. The development banks provided technical assistance to strengthen institutions on power trade issues.

Each government established a clear policy as to which entity will own and operate the transmission assets within its boundaries. The policies of open access to the transmission network for wholesale competition was recognized and established by each government. Environmental issues were addressed through a regional approach to resolve conflicts between regions and countries, coordinate regulation, and incorporate environment issues into overall planning.

An important aspect was the development of sub-regional master plan for providing information on least-cost plant locations and transmission development. Each government was committed to the construction of specific low-risk, least-cost transmission lines. The transmission system operators developed an operations protocol to establish procedures to maintain reliable operations and facilitate trading.

1.5 GULF COOPERATION COUNCIL (GCC)

The GCC is comprised of interconnections between Kuwait, Saudi Arabia, UAE, Bahrain, Oman, and Qatar.

3.1.1 Key features

The Gulf Cooperation Council Interconnection Authority (GCCIA) has commissioned a 400 kV super grid that connects the electrical power networks of the Arabian Gulf Cooperation Council countries of Bahrain, Kuwait, Qatar, Oman, United Arab Emirates (UAE), and Saudi Arabia. This interconnection enables electrical energy exchange and emergency support among these countries.

The physical infrastructure between the countries includes a 50 Hertz (Hz) alternating current (AC) interconnection between Kuwait, Bahrain, Qatar, UAE, and Oman with a back-to-back HVDC interconnection to the 60 Hz Saudi Arabian system.

3.1.2 Background of GCC regional electricity trade

All the countries, other than Bahrain, participating in the GCC electricity interconnection project are endowed with oil and/or natural gas resources. Saudi Arabia, Kuwait and the UAE have substantial oil reserves with associated natural gas. Qatar holds the third-largest gas reserves in the world and is the

world's top exporter of natural gas as liquified natural gas (LNG). Before electricity sector reform, power generation, transmission, and distribution activities were undertaken by state-owned vertically integrated utilities in all the countries.

With increasing world market prices for oil, oil products and natural gas, the wealth of the six countries has grown. Beginning in May 1981, with the main objective of developing and solidify the political, economic and social ties among the member states, the GCC countries were opting for energy intensive industries (such as petrochemicals, steel, aluminum, and cement), as well as focusing on other industries such as the real estate and tourism sectors. All these factors, along with a high birth rate, led to a fast-growing demand in electricity. As a result, large investments were required in electricity generating capacity.

Realizing the massive investments required to meet and maintain such demand, most GCC countries (except Kuwait) initiated reform of their electricity sectors and liberalization of electricity markets. The key reform efforts focused on unbundling of the sector and attracting private investments.

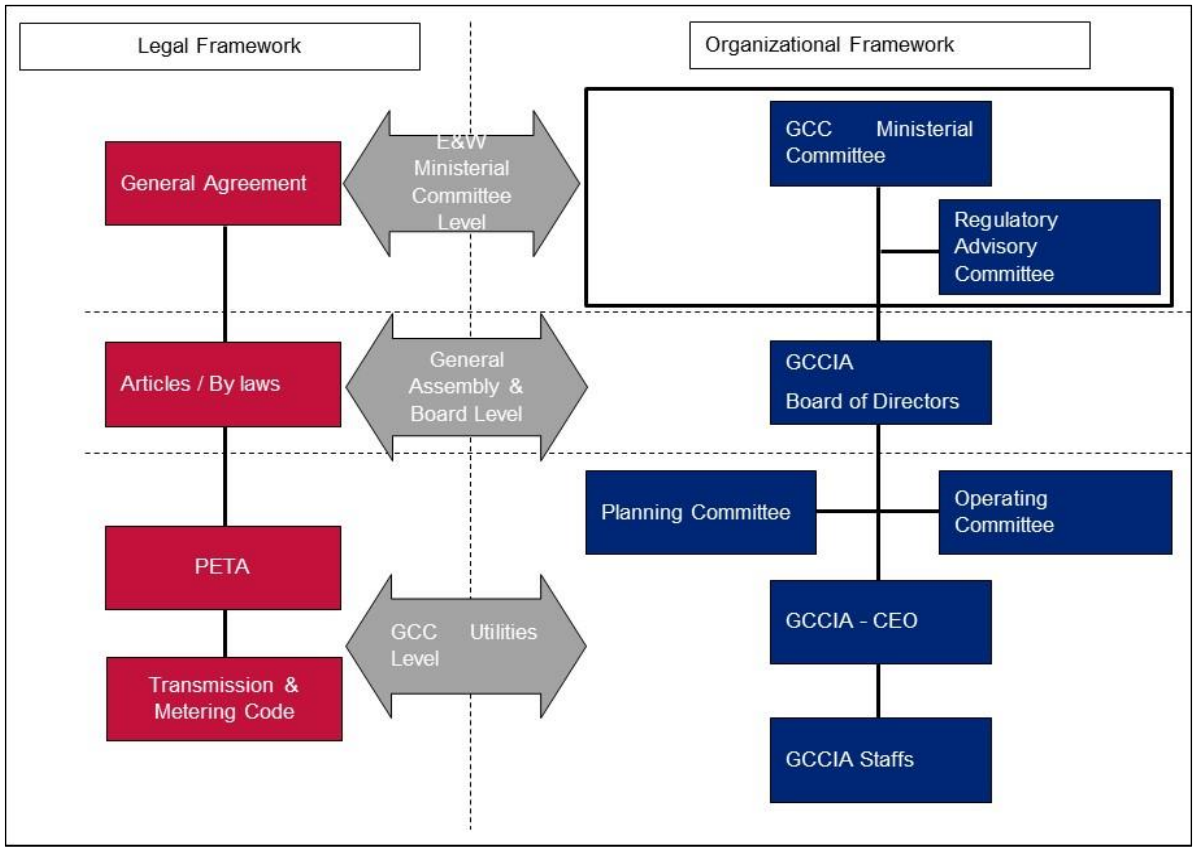
3.1.3 Institutional framework

GCCIA is a joint stock company owned by the electricity ministries in the six GCC states. Financing for the approved interconnection scheme was obtained from national governments. GCCIA's administration costs are funded on the same shared basis.

1 Contractual framework

The contractual framework in GCC is provided in *Figure 15* below.

Figure 15: Contractual Framework in GCC



The GCC Ministerial Committee is comprised of the ministers of electricity and water from each of the member countries. This committee, with inputs from the Regulatory Advisory Committee, guides the GCCIA board of directors on its policies and procedures.

The GCCIA board of directors are by the six member countries. The GCCIA board together with the planning committees and the operating committees (also nominated by GCC member states) form a General Assembly, which makes decisions on codes and agreements governing trade among member utilities and governing the activities of the GCCIA itself.

The general agreement is a high-level agreement between the member states setting out the rules and regulations governing the high-level relationships among the member states in relation to the scheme.

The legal framework for trade is centered on the proposed PETA signed by participating entities, primarily the transmission entities in member countries in 2009. This agreement relates chiefly to the obligations of participating entities. The Agreement is comprised of four sections, namely common legal terms and conditions, connectivity and usage, trading terms and interconnector transmission code (including the metering code).

The Interconnector Transmission Code (ITC) is a part of PETA and establishes the technical rules and provisions as well as the planning requirements for the connection and use of the GCC Interconnector. The metering code sets the metering requirements for the points of connectivity of the Interconnector with the national grids.

The following responsibilities are discharged by the member countries through the above mentioned contractual framework

- Installed capacity obligation

  The installed capacity obligation on each member state requires that nominated entities in each member state maintain a minimum level of capacity expressed as a percentage above that member's system peak demand. A nominated entity may fulfil this obligation by nominating capacity in another member state, subject to the interconnector transfer capacity constraint. Penalties may apply to the nominated entities that fail to meet the obligation.

- Allocation of interconnector capacity

  According to PETA, the primary purpose of the interconnector will be to share reserve capacity, and the GCCIA will determine the share of the capacity on each interconnector link that should be allocated for this purpose. All member states will be assigned basic transmission rights primarily for sharing reserve capacity, but any surpluses may be allocated to trade in capacity, energy and ancillary services.

  PETA defines two types of rights for the net capacity (available after allocating basic transmission rights):

  - Installed capacity interconnector rights relates to the installed capacity obligation, where the capacity obligation is partially met from capacity located in another state. The interconnector rights for this purpose are granted for a period of a year ahead and the two parties involved must be able to demonstrate that they have been assigned rights to the transmission capacity. Installed capacity interconnector rights cannot be used at the same time for trading energy.
  - Interconnector rights for operations to trading energy may be assigned on a residual basis after rights have been allocated to satisfy the requirement of sharing of reserve capacity which is the intended primary purpose of the interconnector. The rights for operation are non-firm. Basic rights and installed capacity interconnector rights take priority in the event of a constraint on available capacity in real time.

- Trading energy

  GCCIA acts as a facilitator rather than a market operator. It is expected that parties will trade based on bilateral contracts and make their own arrangements for settlement. But parties must inform GCCIA of the details of the origin, destination, start time and finish time, and quantity of the intended trade. The parties must also ensure that they have the appropriate level of interconnector rights for operations. GCCIA in turn subsequently confirms to the parties that the trade took place, or if the actual trade differed from that notified in advance, it notifies them of the actual exchange. The GCCIA has the right to refuse trade if it judges the trade to be infeasible.

- Pricing of interconnection capacity

  GCCIA has proposed that net interconnector capacity be auctioned by the GCC Interconnection Authority for different timescales. Installed capacity interconnector rights would be auctioned for annual contracts. Interconnector rights for operations would be auctioned for annual, monthly or daily contracts.

- Unscheduled transfers of energy

The interconnector is designed primarily to provide reserve capacity. Small unscheduled transfers will inevitably occur when a power plant or supply to a large consumer unexpectedly trips. This type of unscheduled transfer is expected to be repaid by a like-for-like (scheduled) reverse electricity flow within a few days of the unscheduled transfer. If the unscheduled support was provided in, for example, peak hours, then the repayment should be in similar peak hours. PETA also allows for the possibility of payment for sustained unscheduled transfers through publication of tariffs by member states.

3.1.4 Key features of the GCC electricity trade experience

The following are some of the key features of the GCC electricity trade experience:

- The GCC Interconnection Project has been conceptualized to share reserve capacity to minimize overall investment in peaking plants. Each member state is obligated to maintain a specified level of generation capacity as the reserve capacity. The member states are assigned transmission rights for sharing reserve capacity. *The reserve capacity sharing allows for mutual support in the event of unplanned plant outages and hence helps in optimizing the investments in the generation capacity amongst participating nations*. *The arrangement provides opportunities for the linked countries with an alternative source of operating reserves and support during emergencies.*
- In case of GCC, a general agreement has been signed at the ministerial level of the member states that sets out rules and regulations governing the high-level relationships among the member states in relation to the interconnection scheme. A second agreement, PETA, has been signed by the transmission entities in member countries, governs the terms and conditions, connectivity and usage, and technical and commercial rules of the electricity trade. *The two-layered legal framework governing electricity trade among member states provides flexibility at the operational level and helps in faster integration of the member states.*
- The project implementing and operating agency, GCC Interconnection Authority (GCCIA), is a joint stock company maintained by the electricity ministries in the six GCC states. GCCIA is headed by a Ministerial Committee, comprising of ministers of electricity and water from each of the member countries. The Committee guides the GCCIA Board of Directors, who are nominated by the member states. *The participative framework has also assisted in quick decision making and sharing of responsibilities amongst the member countries. The joint ownership and staffing has also helped in sharing of costs amongst member states and facilitated coordinated project implementation.*
- The opportunity costs for natural gas and oil-based power generation in the member states are low in GCC, which inhibits cross-border electricity trade. Hence, to encourage electricity trade among member states over and above reserve capacity sharing, GCCIA auctions interconnector capacity. Parties trade under bilateral contracts of different tenures. *The concept of interconnector capacity auction encourages further electricity trades amongst the member states through bilateral contracts and provides flexibility in the tenure for which the trade is undertaken. The interconnections have also gained importance as a mechanism to improve the economic efficiency of power systems.*

3.2 TURKEY – GEORGIA INTERCONNECTION

3.2.1 Key features

Between Turkey and Georgia, there are two interconnection lines. one is 220 kV Hopa - Batum Energy Transmission Line. This line is operated for the energy import to Turkey from Georgia with the isolated region method. The other is 400 kV transmission line between Akhaltsikhe (Georgia) and Borçka (Turkey) with a DC back-to-back station on the Georgian side. This line is operated with asynchronous parallel method. In accordance with the Electricity Trade Agreement between Turkey and Georgia, capacity allocation is determined by the exporter country (mostly Georgia). The capacity allocations are carried out by Georgian State Electrosystem (GSE) and the same is communicated to TEİAŞ, the Turkish system operator.

3.2.2 Background

1 Turkey

The energy sector in Turkey is exclusively marked by its journey towards liberalization, with the electricity sector assuming a lead role. The liberalization of the Turkish electricity market has a rather long and ambitious story, starting in early 1970s and progressing rapidly in the last decade. The transition to a free market has been an obvious necessity with decision-makers aware that the ever-increasing demand for electricity could not be met solely by public resources and the additional resources needed to meet this demand required extensive investments.

TETAS (Tradeco) was set-up under the ambit of EML 4628 in 2001. The primary task of TETAS was to take over all energy sale and purchase agreement of TEDAS (distribution company) and TEIAS (transmission company), including energy purchase and sales agreements entered into under build-operate-transfer (BOT), build-own-operate (BOO), and transfer of rights (TOR) contracts and export and import contracts. Also, initially EÜAS (generation company) would sell its generation to TETAS. The idea was that the relatively expensive electricity purchased through BOT, BOO, and TOR contacts would be balanced by what was perceived to be relatively cheap electricity purchased from EÜAS and the electricity would be sold under a uniform price to TEDAS. TETAS was designated wholesale trader of electricity and held all legacy state-owned contracts and liabilities – including BOT, BOO and transfer of operating rights (TOOR) contracts as well as import and export contracts[1].

The number of private wholesale companies has increased with the development of power market. For example, in 2003, five companies acquired licenses to perform wholesale activities, whereas the 161 acquired licenses during the first three months of 2013. The reduced eligibility threshold freed 77 percent of total load to choose their suppliers. Eligibility limits have progressively been reduced to enable more market opening and competition.

The developments in Turkey's electricity market have rapidly changed the rules of the game, pushing the sector towards progressive liberalization and the market players towards fast adaptation to the new environment. The process has been driven by the continuous development of the legal framework, the liberalization program (which is still an ongoing process), and the establishment of the Turkish independent regulatory authority, the Energy Market Regulatory Authority (EMRA). Under the Electricity Market Law, all electricity traders trading on the wholesale electricity market in Turkey and cross-border must hold a valid license. The license is issued by EMRA for up to 49 years and covers both trading on Turkey's wholesale market and cross-border trading as well.

Only companies incorporated in Turkey (either as a limited liability company or as a joint-stock company) can be licensed. There are no restrictions or special requirements with respect to these companies' share capital and/or shareholder structure. Licenses cannot be transferred to third parties, but there is no restriction on transferring the shares of the licensed electricity trader, provided that for transfers of more than 10 percent of the shares, EMRA's approval is obtained.

The EMRA sets tariff rates for TETAS, the state-owned wholesale supply company. State-owned TETAŞ operates as a wholesale supplier and has around 40 percent market share in the Turkish market.[2] Due to TETAS' significant share of the wholesale market, the tariffs that EMRA sets for TETAS also affect and influence the tariffs adopted by private supply companies.

2 Georgia

The Georgian power sector has gone through phases of reforms and restructuring since the adoption of the Law on Electricity in 1997, which provided the legal basis for a competitive, market-driven power sector. An independent regulator, the Georgian National Electricity Regulatory Commission (GNERC), was created to ensure transparency, approving supply and consumption rules, wheeling tariffs and fees for utilities. The integrated utility was restructured into three separate and autonomous entities focusing on generation, transmission and distribution operations. In 1998, the Georgian Wholesale Electricity Market (GWEM) was created as a clearinghouse under single-buyer model and was subsequently replaced by the Electricity System Commercial Operator (ESCO) under a new multiple-buyer model. Power generators, distribution companies, direct customers, and exporters were allowed to enter into direct contracts, while ESCO bought and sold balancing power and reserve capacity. In April 2008,

[1] Turkey: Economic Reform and Accession to the European Union, Bernard M. Hoekman and Subidey Togan

[2] www.us.practicallaw.com

ESCO was given the added function of negotiating power purchase agreements with new hydropower plants in conjunction with the government.

There are more than 40 power generating companies in the country, of which 14 companies are generation licensees. While most of the companies are privately owned, state companies generate 57% from the total generated volumes. Two power transmission licensees are operating in Georgia - Georgian State Electrosystem (GSE) and Sakrusenergo. The transmission licensees deliver the locally produced or imported electric energy to the distribution energy companies, direct consumers or the neighbor country`s energy systems without the right to sell and purchase electricity. The transmission tariff is established by the GNERC. GSE is also the system operator and carries out technical control over the entire power system. GSE has three types of customers: distribution companies, direct consumers and export markets.

Georgian grid is connected to power systems of neighboring countries at various voltage levels. A large portion of electricity generated by hydro-electric plants (HEPs) is consumed on the domestic market; only excess electricity is exported. Turkey is the only significant export market out of all neighboring countries. In 2015, around 4 percent of the generated electricity was exported to Turkey, exceeding 400 GWh.

Since 2006, Electricity System Commercial Operator is playing an important role in successful operation and development of Georgian electricity market. Balancing electricity is traded via ESCO and accounts for around 10 percent of total electricity trading while the remaining 90 percent is based on direct contracts.

3.2.3 Institutional framework

The Electricity Market Import and Export Regulation defines the principles and procedures relating to the trading of electricity between Turkey and Georgia. The initial version of the Regulation came out in September 2002 and this was subsequently replaced with a new version in December 2014.

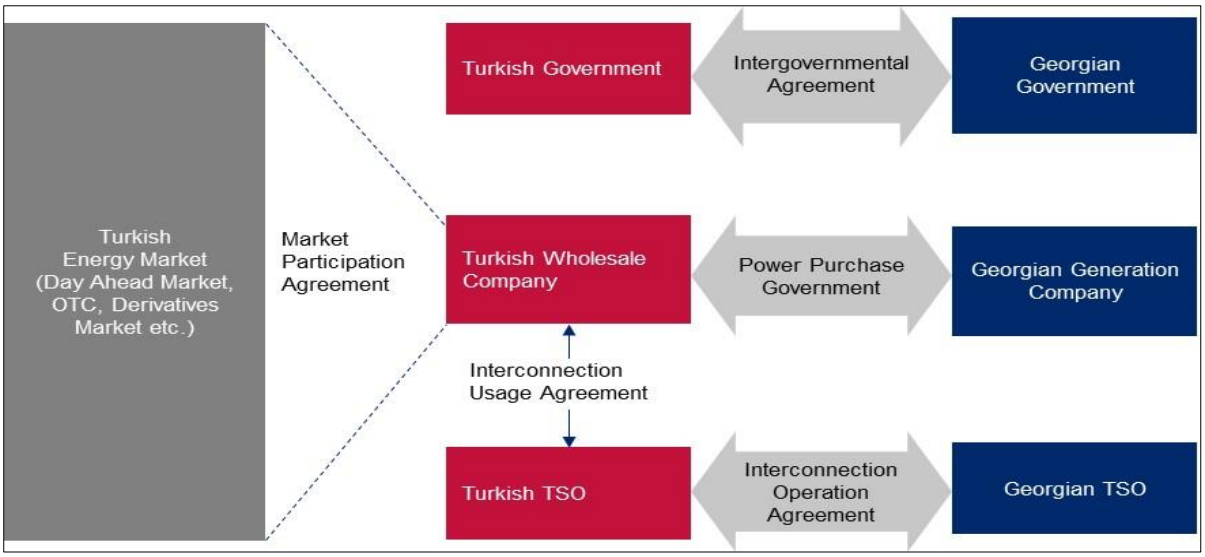
For Georgia, the cross-border electricity trade required changes in the operations and system despatch processes to align them with the requirements of Turkish system. The Georgian Transmission Grid Code was harmonized with the Turkish grid code and Europe rules established by ENTSO-E, thereby ensuring that the transmission system operators have clear rules for cross border trading. Georgia also undertook several legal and regulatory changes to develop the cross-border trade framework in response to the requirements of Turkish system. The electricity law was revised to include provisions for daily electricity trading, the electricity market transmission and distribution grid codes, regional transit of electricity as a new activity for transmission companies. The role of the energy regulator was expanded for overseeing and monitoring the progress of the competitive electricity market. Georgian Electricity Market Model (GEMM 2015) was introduced to reflect the changes. To facilitate the implementation of the reforms required to enable Georgian HPPs to sell power into Turkey and other regional markets, extensive capacity building measures were undertaken involving key stakeholders in Georgia.

For Turkey, the cross-border electricity trade with Georgia, procedures have been developed which allows Georgian HEPs and traders to sell energy to off-takers in Turkey. Since a day-ahead market does not yet exist in Georgia, implicit auction and market coupling is not possible between Georgia and Turkey in the short term. For Georgian traders and HEPs to sell electricity to Turkish off-takers, the following is required:

- the available transmission capacity in interconnection and obtaining the right for capacity usage;
- enter into a trade agreement with a Turkish counterparty, who is registered as a market operator and also has licensed balancing units in Turkey.

The *Figure 16* below shows various arrangements and agreements required to be entered between the Turkish and Georgian side for the cross-border electricity trade.

Figure 16: Turkey – Georgia electricity trade arrangements



Inter-governmental cross-border electricity trade agreement: In accordance with the electricity trade agreement between Turkey and Georgia, signed and approved in 2012, the exporting country allocates the capacity. Since Georgia is the exporting country most of the time, the related Georgian rules, regulations, and procedures are in place to make long term PPAs (or off-take agreements) possible. The capacity allocations are carried out by Georgian State Electrosystem (GSE). The Georgian system operator provides information to the TEIAS, Turkish system operator, regarding the exporters' capacity for the relevant period and market requirements for such import/export operations.

Interconnection Usage Agreement: On March 11, 2014 the market established an interconnection usage agreement between TEIAS and interconnection user in Turkey for export by asynchronous connection, which was approved and published by TEIAS. Below is the general flow of activity according to the agreement:

- TEIAS arranges the daily (minimum and maximum) capacity schedules for electricity import by 09:30 in the day ahead, considering the capacity allocated and within the framework of Turkish and regional electricity system conditions.
- The market participant to whom the capacity is allocated receives the hourly schedules for that day from TEIAS by 10:30 in the day ahead and cannot object to this schedule.
- The market participant to whom the capacity is allocated applies to the market operator to register its settlement aggregation, pursuant to balancing and settlement regulation. If the transmission line is allocated to more than one participant, this settlement aggregation entity is recorded on behalf of TEIAS. When the meter is read, TEIAS allocates the meter data considering their bilateral contracts volume, and settlement is based on this data.
- Each day, the market participant informs the market operator and system operator about the electricity volume to be imported (as a daily generation schedule) considering its bilateral contracts volume and day-ahead market transactions.

3.2.4 Key lessons from the Turkey-Georgia experience

The harmonization of operational codes between the two countries also demonstrated the need for a continuous interaction between the regulators in the two countries to respond to changes in regulations in each country. The establishment of a working group between the energy regulators of Turkey and Georgia was a key requirement.

The electricity market in Turkey is well developed while there is a need for developing market mechanisms and institutional frameworks on Georgian side. This has been undertaken through various capacity building initiatives with active support from the multi-lateral donor agencies.

3.3 BLACK SEA REGION POWER MARKET INTEGRATION

The Black Sea region currently encompasses three power system regulatory regimes of standards and operation modes – (1) European Network of Transmission System Operators for Electricity (ENTSO-e) comprising EU-member states and potential candidates of Southeast Europe, (2) IPS/UPS of the former Soviet Union and now including Russia and the CIS region, and (3) Turkey's, which is in the process of integrating into ENTSO-e.

Post-1991 cooperation initiatives in the Black Sea Region crystallized most visibly in the form of the Black Sea Economic Cooperation (BSEC) organization, which was founded in 1992 and today comprises Albania, Armenia, Azerbaijan, Bulgaria, Georgia, Greece, Moldova, Romania, Russia, Serbia, Montenegro, Turkey, and Ukraine. While the importance of the organization has diminished with the integration of countries towards the European Union, it continues to work as a coordination platform with an emphasis on regional projects.

Starting in 1996 the Russian Federation promoted the improvement and establishment of power inter-connections between member states with the goal of creating the so called Black Sea Energy Ring. In 2004, Russia's RAO Unified Energy System (RAO-UES) proposed a project for reconstruction and further extension of the already existing grid infrastructure between Russia, Georgia, Turkey, and Azerbaijan. The South Caucasus Project called for implementation in synergy with EU projects in the region.

In parallel, USAID launched a similarly structured regional initiative in the same year. The Black Sea Regional Transmission System Planning Project (BSTP) was established in 2004 by the United States Agency for International Development, the United States Energy Association (as the implementing partner) and the transmission system operators of the Black Sea Region to build institutional capacity to develop and analyze the region's first common transmission planning model. The initiative involved representatives from the transmission system operators (TSO) of Armenia, Bulgaria, Georgia, Moldova, Romania, Ukraine and Turkey. Even though the Russian side originally sought to combine these two almost identical projects, Russia was left with the position of just a participant party initially and was ultimately excluded from the implementation phase. Eventually, the TSO came together through series of capacity building programs and technical studies on opportunities for increased power exchange in the region. Fundamentally, these studies, conducted with the goal of lowering production costs and spare capacities, highlighted the possibility for increased east-west flows from Russia and Ukraine and to a lesser extent from Georgia and Azerbaijan towards Turkey and towards ENTSO-e networks.

In April 2009, under the same USAID initiative, the TSOs of Georgia, Azerbaijan and Turkey and the U.S. Energy Association (USEA) signed a memorandum of understanding to develop a common transmission system model for the three countries – named the Power Bridge Project – as a basis for government planning in furthering regional trade in electricity. .

The *Table 9* below provides a summary of regional cross-border trading pools for SAPP, GMS, GCC and Turkey-Georgia interconnection.

Table 9: Summary of regional cross-border trading arrangements

Parameter	SAPP	GMS	GCC	Turkey-Georgia
Objective for trade	• Resource diversification and the region's push to meet future energy demand through low cost hydropower from Northern Africa	• Resource diversification, demand supply gap	• Driver for economic growth and increased electricity demand. • Share reserve capacity, thereby reducing generation investment requirements	• Export of hydropower from Georgia to Turkey
Regional power trade agreements	• Inter-government MOU, inter-utility MOU, agreement between operating members, operating guidelines	• Inter-governmental agreements	• General Agreement and Power Exchange Trading agreement	• Inter-Governmental agreement, Interconnection Operation Agreement
Regulation and harmonization of systems	• Harmonization of rules, grid codes, and transmission tariff	• Simple rules agreed for the operation of the interconnected system	• Simple rules agreed for the operation of the interconnected system	• Harmonization through Interconnection Operation Agreement and Interconnection Usage Agreement
Institution and membership	• Part of Southern African Development Community (SADC); main organizations – executive management committees, 5 technical sub-committees; permanent secretariat in Harare, Zimbabwe	• Sub-regional Electric Power Forum; Regional Power Trade Coordination Committee; the Focal Group and Planning Working Group established	• Gulf Cooperation Council Interconnection Authority – Planning and Operating Committees, Secretariat in Saudi Arabia. • GCCIA is a joint stock company owned by the electricity ministries in the six GCC states	• PPA between Distribution/Trading companies in Turkey and Generation companies in Georgia
Trading arrangements	• Long-term PPAs supplemented with short-term markets	• Long-term bilateral • PPAs	• Long-term bilateral • PPAs	• Bilateral PPAs

Parameter	SAPP	GMS	GCC	Turkey-Georgia
Transmission and infrastructure investment	• Regional infrastructure investments are financed and undertaken by the utilities involved or by special purpose vehicle (SPV)	• Mostly through bilateral routes supported by multilateral funds	• Investment by member states	• Transmission lines developed by respective transmission utilities in each country
Market design and reforms	• Mix of unbundled and integrated utilities	• Prior to integration, reforms in member countries initiated like unbundling, whole sale markets etc.	• Most GCC countries (except Kuwait) initiated reform of their electricity sectors and liberalization of electricity markets	• Unbundling of utility to genco, transco, discom and tradeco • Fully competitive markets in Turkey
Implementation phases	• Planned stages: (1) bilateral trade, (2) short-term energy markets since 2001, (3) day-ahead markets since 2009, (4) energy imbalance settlement since 2010 • Ancillary services market – 2014-15 • Balancing market – 2017-18	• Planned stages: (1) bilateral export projects, (2) trade between any pair of GMS countries, (3) interconnections expressly for trade with third party, (4) integrated, competitive regional power market	Planned phases: • Phase-I: Interconnection of power grids of northern states to form GCC North Grid; • Phase-II: formation of GCC South Grid by integrating isolated networks of seven UAE emirates ; • Phase-III: interconnection of GCC North Grid with South Grid, linking Oman and UAE with the other four GCC countries	• Only bilateral trades happen at this point
PPP and investments	• Mix of intergovernmental and private ownership (mostly public)	• Cross-border trade supported in investments in new generation capacities like NT2 etc.	• Mix of public and private ownership	• Mix of private and state-owned gencos/ traders are part of the cross-border trade

4 POLITICAL ECONOMY ANALYSIS: COUNTRY LEVEL & SUB-REGIONAL LEVEL

Regional cooperation offers an ideal platform to achieve sustainable growth through sharing of resources. In the context of the energy sector, regional cooperation is applicable to the South Asian region at large but increasingly mostly to the eastern sub-region called BBIN comprised of Bangladesh, Bhutan, India, and Nepal. The realization of the full potential of the varied energy resources existing in these countries is currently constrained due to an absence of coordinated investment and cooperation in cross-border trade. The dominance of certain fuel types – coal in India, gas in Bangladesh, hydropower in Bhutan and Nepal – leads to over-dependence on these resources at a country level and leaves them vulnerable to supply-side risks. For example, Nepal's power sector is highly dependent on hydro, while India and Bangladesh have predominantly thermal generation.

The energy sector in the BBIN region has a considerable diversity of generation sources, generation patterns and demand patterns in all time frames (daily, monthly and annually). This diversity naturally helps to make a case for economically feasible power trading amongst these countries and between the SAARC region and neighboring regions. For instance, Bangladesh and Nepal have significant peak and energy shortages at different times of day and in different seasons. These countries could have benefited immensely if all the power systems were connected and operated through a regional power exchange where surplus power from other countries can be traded. Such operation through a power exchange would help the development of the Nepal hydropower sector in the long term since transactions under such operation will be equitable and transparent based on the power exchange operational rules. This will take away one of the major concerns of Nepal, doubt regarding the equitable treatment of power traded when the trade occurs based on bilateral agreements.

In addition, all the BBIN countries are experiencing exponential growth demand coupled with power shortages. The countries are dependent on import of fuel from outside the region. The present annual power exchange between Bhutan and India, which is mostly based on large hydropower transfer from Bhutan to India, is a good example for possibilities between Nepal and India due to latter's large power needs and rapidly increasing demand. While more than half of India's present electricity supply is based on thermal power plants mainly using coal, the long-term plan is to include more environmentally friendly resources like solar, wind, biomass, and hydro.

The risks associated with cross-border electricity trade/ cross-border power trade in South Asia are no different than those in any region consisting of developing countries. These encompass political, commercial and technical risks. There is a significant level of political risk in some of the countries in South Asia, particularly in the context of cross-border power trading, which could lead to uncertainties in policy, legal and regulatory regimes. These uncertainties also manifest as commercial risks in the form of exchange rates, taxes and duties, repatriation of earnings, and transaction costs. Many of the issues associated with political risks and to a certain extent, commercial and technical risks, in cross-border power trading are mitigated through bilateral agreements between the governments such those already signed between Bhutan and India, Bangladesh and India, and India and Nepal. Further, the SAARC Framework Agreement for Energy Cooperation (Electricity) signed by the member states in November 2014 includes principles based on which most of these risks can be addressed.

Some of the commercial risks can be mitigated through appropriate provisions in the legal agreements for power purchase and the use of the transmission network services supported by necessary payment security structures, commercial risk guarantees and specified dispute resolution.

All the countries in South Asia follow similar technical standards in power system planning and operation that can be harmonized and adopted at the regional level to minimize the technical risks related to cross-border trading. In the case of the Bangladesh India cross-border interconnection, power flows are through a HVDC back-to-back link that permits each country's system operator to independently manage their grid. The practice of joint technical studies on interconnections also reduces information asymmetry and has been demonstrated in the case of Bangladesh-India and India-Nepal arrangements. These countries have adopted working group mechanisms to address technical issues and integrate the planning process.

The country profile for BBIN countries have are covered in the following sections.

4.1 BANGLADESH

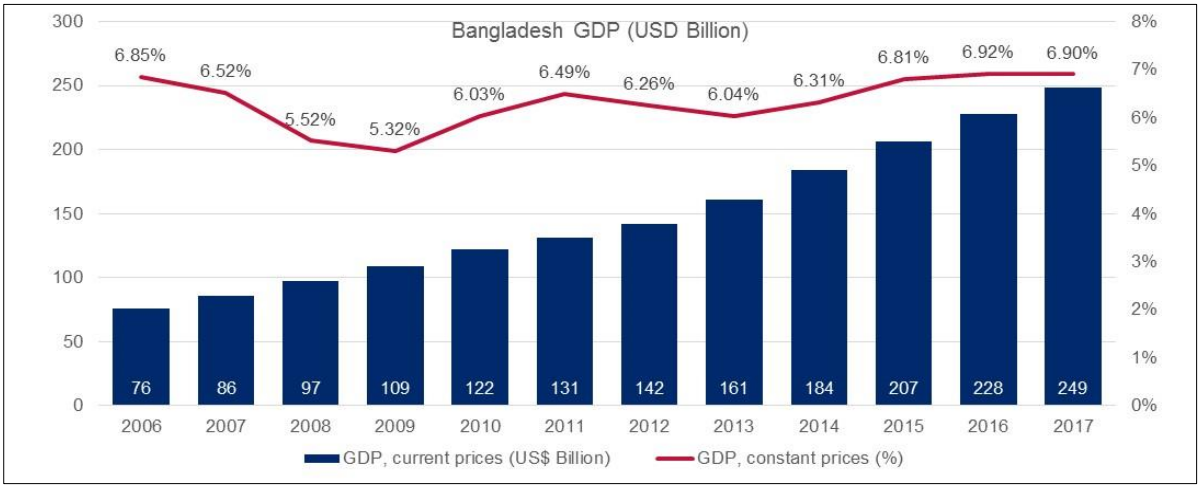
Bangladesh is bordered by India to its west, north and east, Burma to its southeast, and separated from Nepal and Bhutan by a narrow stretch of land located in Indian state of West Bengal (popularly known as Chicken's Neck or Siliguri Corridor). To its south, it touches the Bay of Bengal. The country is spread over a total area of 147,630 square kilometers, of which 17 percent is forest land. Bangladesh is the world's eighth most populous country with an estimated population of about 163 million (2016).

The country was mostly considered as an agricultural economy, however, due to continuous industrialization, the contribution of Industrial sector in the economy has improved over the years.

4.1.1 Economic overview

Bangladesh has been reporting steady growth rate of 6-7 percent in the GDP since 2011. The GDP, at current prices, in 2017 was around 249 billion (USD). Increasing domestic consumption and lower commodity prices have been the main drivers of the strong economic growth backed by favorable macro-economic policies of the government. Going forward, the economic outlook of the country appears to be moderate as the increase in commodity prices, which will increase inflation, may act as a drag on private consumption. *Figure 17* below provides the GDP growth for Bangladesh for the period 2006-2017.

Figure 17: Bangladesh - GDP growth



Source: World Development Indicators, 2017

Despite a challenging external environment that curbed remittances to Bangladesh, GDP growth accelerated to a six-year high in 2016. A stable political climate and sensible macroeconomic policies allowed for strong credit growth and higher private investment, which in turn fueled economic growth. Likewise, the economy also benefited from an increase in exports, as the all-important garment industry grew at a double-digit pace. Adding to the good news, tax collection improved significantly during 2016 while spending declined, leading to a reduction in the fiscal deficit.

4.1.2 Bangladesh energy sector overview

1 Resource potential

Commercial energy in Bangladesh includes natural gas, imported oil, coal, hydro and solar energy. Non-commercial energy sources such as wood fuel, animal waste and crop residues account for about 50 percent of the total energy consumption. Bangladesh had good deposits of natural gas, most of which has been exhausted. There has not been any discovery of new gas field in Bangladesh in the recent past. The resource wise potential for Bangladesh is shown in *Table 10* below.

Table 10: Bangladesh - Resource potential

Country	Coal (Million Tons)	Oil (Million Barrels)	Natural Gas (Trillion cubic feet)	Biomass (Million Tons)	Hydropower (Gigawatts)
Bangladesh	884	12	8.5	0.08	0.33

A. Coal

According to the Bangladesh Power System Master Plan - 2016, Bangladesh has reserves of bituminous coal, which is called Godwin coal, spread across five coal fields in Bangladesh, all of which are situated in between the Jamuna river and the Padma river in the northwestern part of Bangladesh. As per the estimates available, the probable coal reserves for Bangladesh total 3.3 billion tons, while 884 million tons of reserves have been identified. Coal in Bangladesh is generally characterized as having low ash content and low sulfur content and is thus more environmentally friendly.

At present, foreign companies, including Indian and South Korean companies, are aggressively engaged in coal development in the country. Bangladesh is betting on coal to support its fast-growing economy, even as other countries in Asia are moving towards cleaner sources of energy. The government hopes coal use will jump from 2 percent to over 50 percent of the Bangladesh's electricity supply by 2022, with large coal based powered plants in the pipeline, both on domestic and imported coal. Almost 43 percent of the coal generation capacity will be based on imported coal.

B. Oil and Gas

Bangladesh gas sector started up in the 1960s, but its rapid expansion and integration started to accelerate in the early 1970s, spurred by the rising oil prices. The natural gas reserves in Bangladesh have been declining with no new gas discoveries in recent years. To date, 26 gas fields have been discovered and around 20 gas fields are in production with 97 producing wells. Gas production from the current domestic gas fields in 2015 was approximately 2,700 mmcfd and is expected to reach peak production by 2018-19. However, the gas demand in Bangladesh will continue to increase and the demand and supply gap is likely to be met by LNG imports.

C. Hydroelectricity

Bangladesh has limited hydropower potential which can be economically exploited. The Karnafuly Hydro Power Station is the only major hydropower plant in the country with a capacity of 230 MW. It is operated by BPDB (Bangladesh Power Development Board) and is being considered for increasing the capacity to 330MW.

D. Renewables

Bangladesh's coastline has a high wind generation potential, which is estimated to be around 2 GW. Solar is also a potential resource for the country, but availability of land could pose a major challenge in developing large-scale projects. Average solar radiation in Bangladesh is about 4.5 kWh/m2/day and average peak sunshine hours per day is 4.5 hours, and the annual operational days is more or less 340 days[3]. Bio-mass is the other renewable resource that has a huge potential, given the agrarian nature of the economy.

The government has set ambitious targets for the development of renewable energy. An additional 3,100 MW of renewable energy capacity is targeted to be installed by 2021. Most of the new capacity will be provided by solar (1,676 MW) and wind (1,370 MW). There are also targets for waste-to-energy (40 MW), biomass (7 MW), biogas (7 MW) and hydro (4 MW).

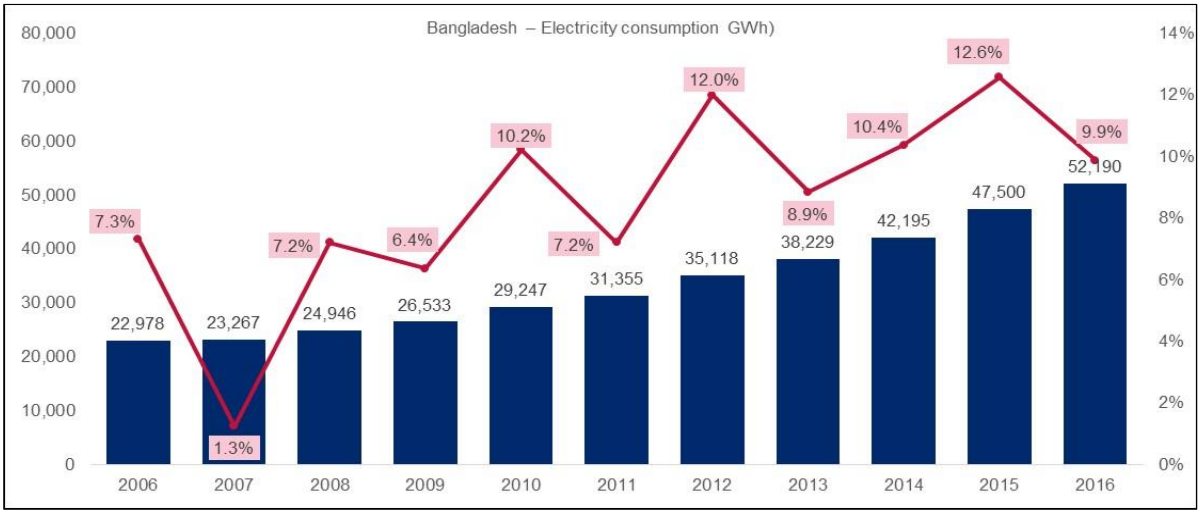
2 Electricity demand and supply

Electricity demand in the country is increasing rapidly due to enhanced economic activities in the country with sustained GDP growth.

The electricity consumption in Bangladesh has increased four-fold over past sixteen years from 12,461 GWh in 2000 to 52,190 GWh in 2016, owing to a sustained growth of about 6 percent per annum in the country's GDP. In the present scenario of rapid economic growth, increased urbanization, and industrialization, the electricity demand in Bangladesh is projected to increase tremendously. Nationwide, 83 percent of the population has access to electricity while electrification rates are higher in urban areas, where only about one percent lack access to electricity. In rural areas, 34 percent do not have electricity. Electricity access has improved in recent years because of rapid acceleration of grid connection to rural areas, coupled with the installation of solar home systems. *Figure 18* below shows the electricity consumption trends for Bangladesh.

[3] Energy Security Study, Power Division, Bangladesh

Figure 18: Bangladesh - Electricity consumption



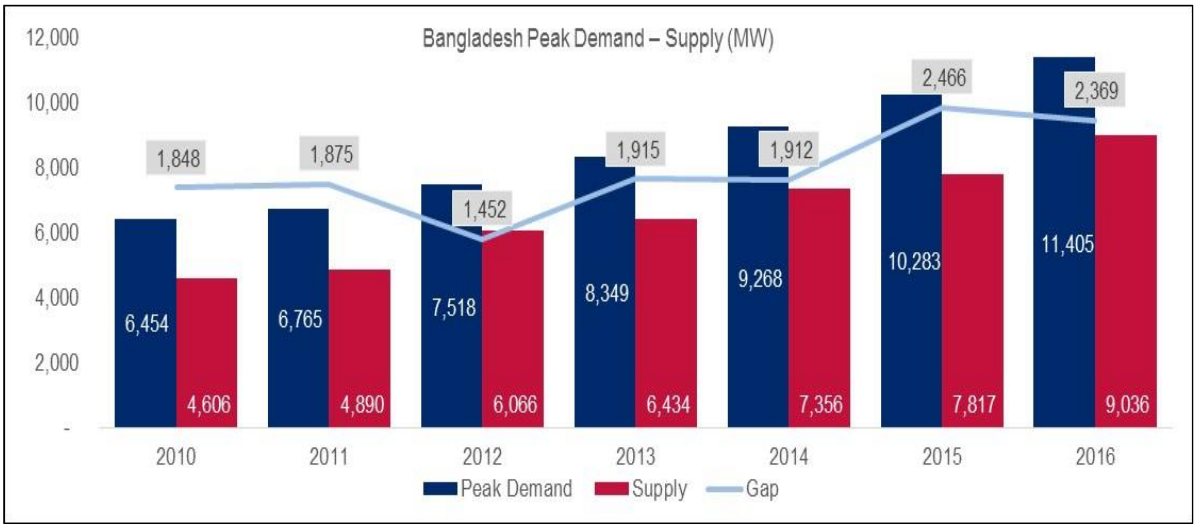
Source: BPDP Annual Reports

The existing electricity supply is not sufficient to meet the ever-increasing peak demand in Bangladesh, primarily because:

- A shortage in domestic natural gas supply has resulted in lower generation from both base load and peak load natural gas-based power plants in Bangladesh
- The public-sector-owned portfolio is dominated by old and ageing generation units. Several of them produce lower than rated generation and are often under outage

The peak demand recorded in 2016 was 11,045 MW while the deficit was 2,359 MW in 2016. The current supply-demand gap is partly mitigated by importing power to the tune of 600 MW from India. Additionally, excess demand is often curtailed through load shedding. The *Figure 19* below shows the demand-supply trends in Bangladesh.

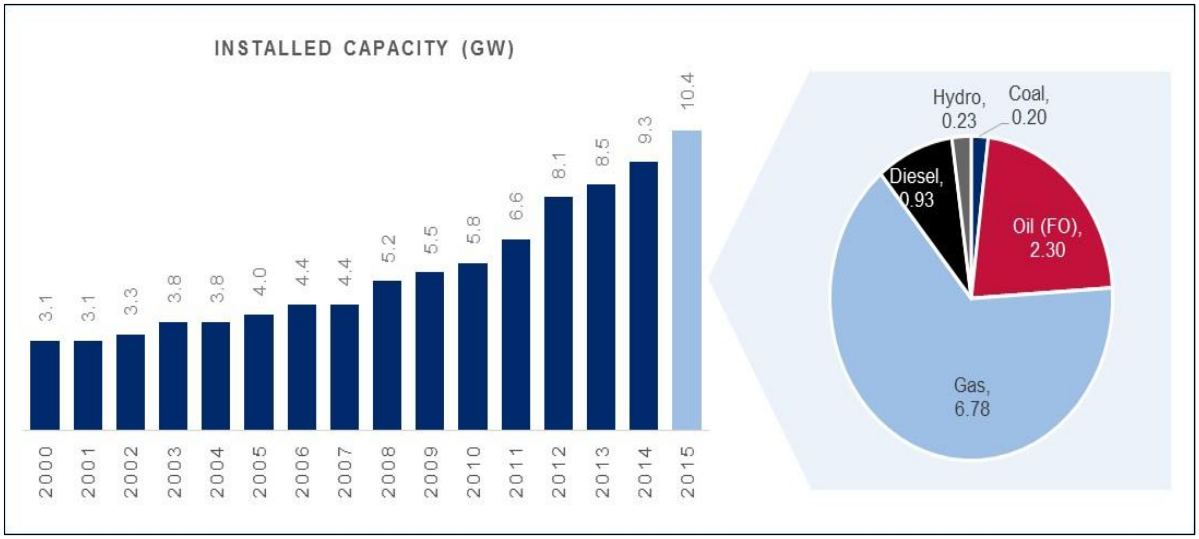
Figure 19: Bangladesh – Peak demand and supply



Source: BPDB Annual Reports

The installed generation capacity has more than tripled since 2000. The present installed generation capacity in the country, including public and private sector and imports, is 12,365 MW. The current generation mix is dominated by natural gas, which constitutes 62 percent of the overall fuel source, followed by furnace oil, which meets 22 percent of the country's electricity requirements. Diesel, hydro and coal meets 16 percent of the country's electricity requirements. The installed capacity growth and fuel-wise breakup for 2016 is shown in *Figure 20*.

Figure 20: Bangladesh - Installed generation capacity



Source: BPDP Reports

Bangladesh's domestic generation capacity addition plans are limited by the availability of gas and exploitation of coal resources. Meeting the future needs of the power sector will involve an optimal mix of exploiting limited domestic energy reserves and reliance on imports of electricity as well as energy resources such as imported coal and LNG for power generation.

Renewable energy plays a limited role in the electricity mix of the country. As of 2016, the overall renewables capacity was around 200 MW, including both on-grid and off-grid. Most of the installed capacity is based on solar home systems, which account for approximately 175 MW, followed by biofuels at approximately 6 MW and wind at approximately 2 MW. The GoB plans to add an additional 3,100 MW of renewable energy capacity in the next five years.

3 Sector reform and restructuring

To improve the electrification rate across the country, particularly in rural areas, the Government constituted the Bangladesh Rural Electrification Board (REB) in 1978. The decision to open the sector for private sector participation was made in 1985 when the government liberalized the electricity sector by excluding it from the reserved category. Private sector participation was only legalized in 1995 under a new energy policy, which also allowed for the functional separation of the integrated utility including generation, transmission and distribution.

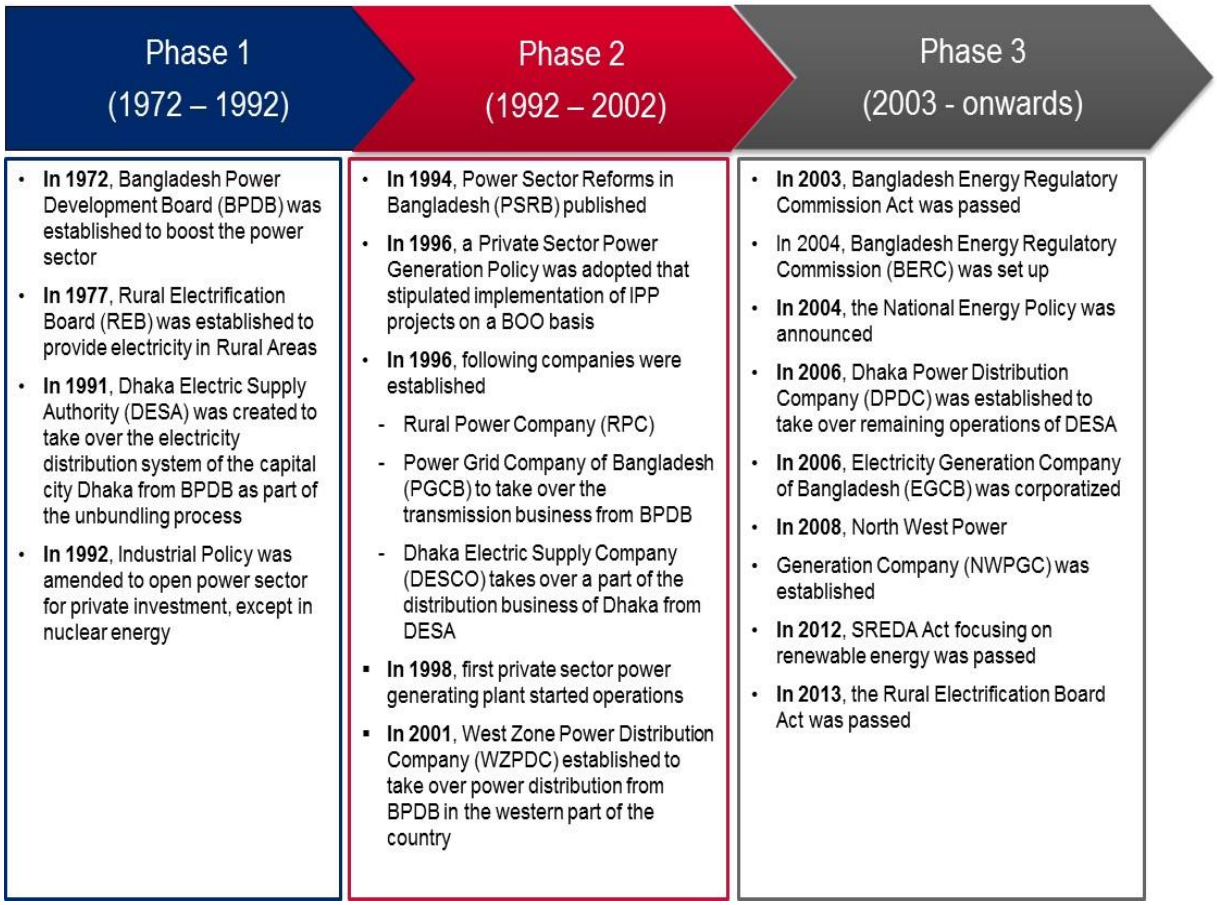
In 1996 the GoB began the first phase of reforms by separating the transmission function. Power Grid Company of Bangladesh (PGCB) was formed which took over 100 percent of the transmission assets from BPDP and was also responsible for construction of all new transmission assets. In 1998 the power division was established under the Ministry of Power, Energy and Mineral Resources (MPEMR) via Cabinet Division Notification No. CD-4/1/94- Rules/23(100), dated March 25, 1998. It was entrusted with the responsibility of overall management of the power sector in Bangladesh. Subsequently, Bangladesh Energy Regulatory Commission (BERC) was established on March 13, 2003 through a legislative act of the GoB. BERC is an independent commission with a mandate to regulate the energy sector (gas, electricity, and petroleum products) in Bangladesh, including fixation of electricity tariffs, pricing of gas & petroleum products, and drafting of regulations, codes & standards.

Because of this restructuring there have been notable changes in the electricity sector pattern. Bangladesh currently follows a single buyer model approach for power procurement and distribution. The BPDB, as a single buyer, procures electricity from various generating station based on negotiated rates and through power purchase agreements. The electricity procured is sold to consumers through various distribution companies at regulated wholesale tariffs.

The second stage of reforms involving unbundling of the BPDB and corporatization of successor entities has been discussed for some time but there has been no forward movement on this initiative. It is not likely that the institutional structure of power sector in Bangladesh will undergo any change in the near future. Similarly, the regulatory commission in Bangladesh has limited powers to decide on reform

related initiatives. An overview of the reform and restructuring initiatives in the Bangladesh energy sector is shown in *Figure 21* below.

Figure 21: Bangladesh – Sector reforms and restructuring



4 Institutional Framework

MPEMR in Bangladesh is responsible for the overall planning, development, and management of different types of commercial energy resources and the overall power supply value chain.

It also formulates power sector policies for the development of the power sector of the country. MPEMR, Bangladesh has the power division which is responsible for all policies and matters relating to electricity generation, transmission and distribution from conventional and non-conventional energy sources including hydroelectricity. In addition, Power Cell acts as its “Think Tank” and provides policy supports. The Sustainable Renewable Development Authority (SREDA) is the nodal agency for supporting sustainable and renewable energy development. MPEMR deals with the import, distribution, exploration, extraction, pricing and other policy related decisions concerning power sector.

The power sector is unbundled with generation, transmission and distribution. It has six generation, one transmission, and five distribution entities. The BPDB is responsible for a major portion of the generation and distribution of electricity, mainly in urban areas, except Dhaka and West Zone of the country. The Board is under the Power Division of MPEMR. The power generation utilities, namely, Ashuganj Power Station Company Ltd. (APSCL), North West Power Generation Company Ltd. (NWPGCL) and Electricity Generation Company of Bangladesh Ltd. (EGCB) are established as corporatized commercial entities, unbundled from BPDB.

The IPP cell within BPDB is primarily responsible for contracting, power procurement/bid process management and subsequent monitoring of IPP contracts. This cell has three divisions, namely IPP Cells 1, 2 and 3. IPP cell 1 and 3 oversee contracting with IPPs and PPAs for cross-border power purchase. IPP Cell 2 oversees procurement from Rental Power Plants (RPPs), Quick Rental Power Plants (QRPPs) and other commercial power generating entities, like North West Power Generation

Company Ltd. (NWPGCL), Ashuganj Power Station Company Ltd. (APSCL) and Electricity Generation Company of Bangladesh (EGCB).

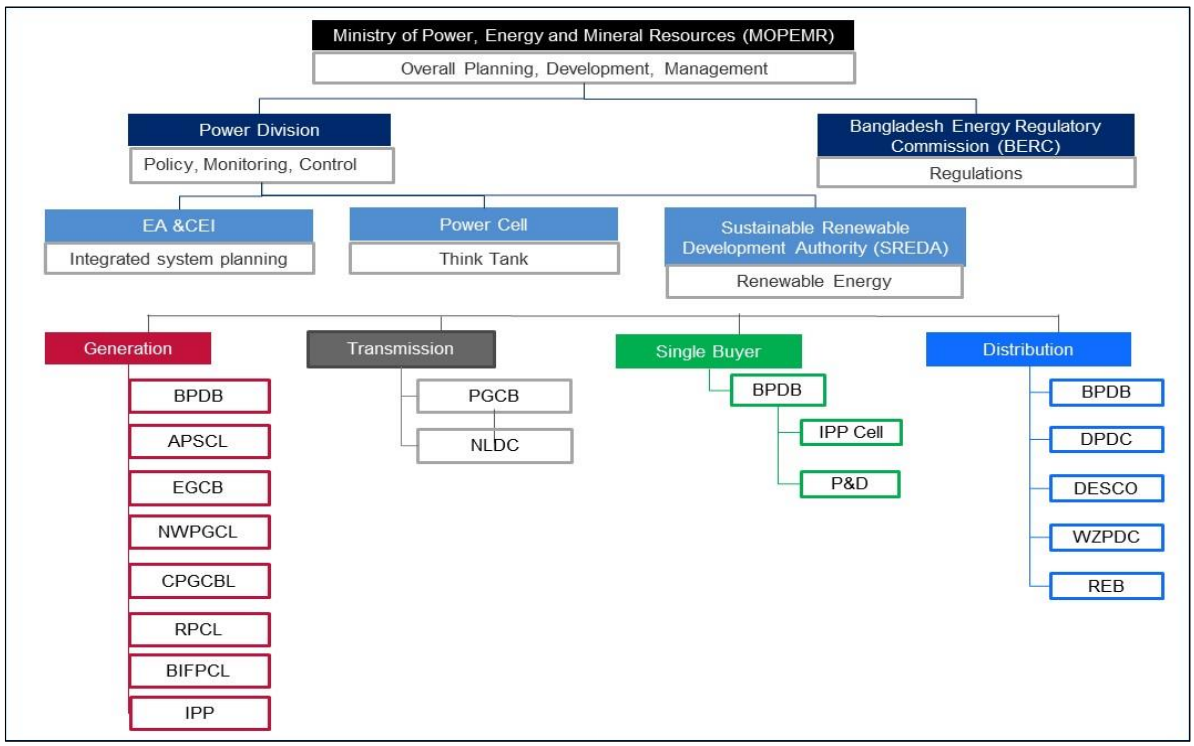
The planning & development (P&D) division within BPDB is responsible for overall power system planning and procurement for the whole country. The division is also in charge of procurement planning covering quantum of power purchase, catering base and peak load demands, and grid support, etc.

The generation sector is open for private sector participation and Bangladesh has several IPPs ranging from large combined cycle power plants (CCPP), RPP, QRPP, and other coal fired IPPs (awarded or under award stage). Bangladesh-India Friendship Power Company (Pvt.) Ltd. (BIFPCL), a Joint-Venture (JV) between NTPC Ltd., India and BPDB, and Coal Power Generation Company Bangladesh Ltd. (CPGCBL), established as an enterprise of the GoB, are the two other generation utilities presently under pre-construction stage. The Rural Power Company Limited (RPCL) was the first IPP of Bangladesh and the first non-BPDB entity to be licensed to take up power generation.

Bangladesh has one transmission utility namely, PGCB, which is responsible for transmission network, operation & maintenance, and development of transmission network. PGCB is responsible for wheeling of energy from BPDB to the distribution entities. PGCB recovers its energy wheeling charge from distribution entities at the tariff which is fixed by the Bangladesh Energy Regulatory Commission (BERC). The system operator National Load Despatch Centre (NLDC) dispatches electricity from generating entities following merit order dispatch principle and is part of PGCB.

There are five distribution companies (Discoms), namely BPDB, Dhaka Power Distribution Company (DPDC), Dhaka Electricity Supply Company (DESCO), West Zone Power Distribution Company Ltd (WZPDCL) and Rural Electrification Board (REB) which own and operate the country's distribution network and supply electricity to the end users. The institutional framework for Bangladesh's electricity sector is shown in *Figure 22* below.

Figure 22: Bangladesh - Electricity sector institutional framework

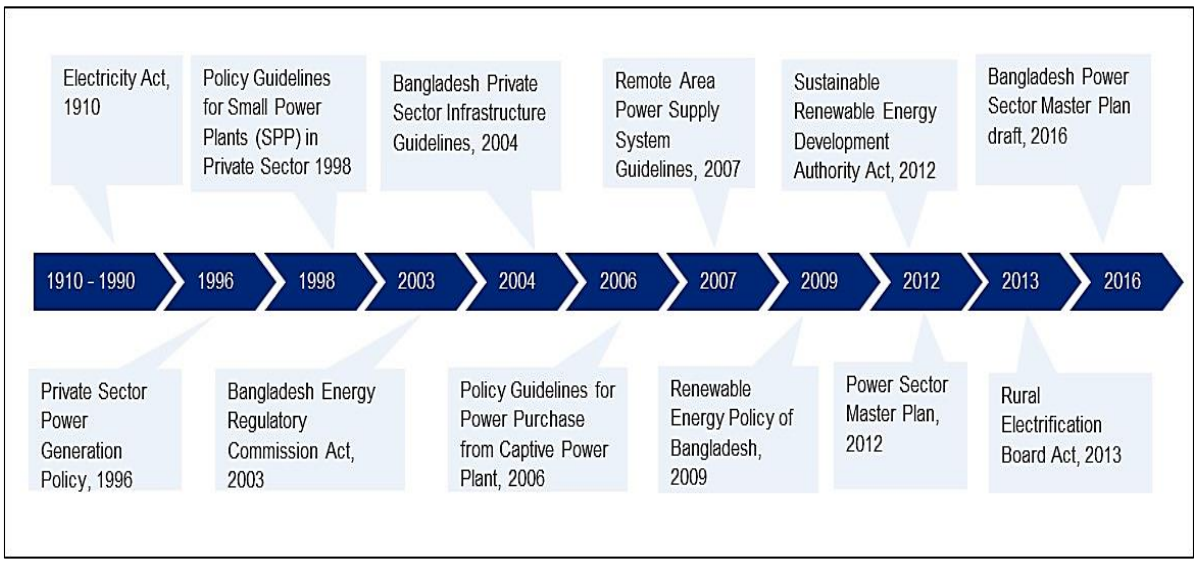


The current institutional framework is well suited for the purchase of in-situ generation assets in Bangladesh and addresses the requirement for the import of power from India on a medium-term to long term basis in a limited manner. In the emerging power market scenario, the regional market is likely to present more opportunities for Bangladesh to undertake transactions with other countries in the region including India, Nepal and Bhutan. While BPDB restructuring has been under consideration for some time now, the formation of a separate directorate within BPDB to undertake trading functions is also being actively evaluated.

5 Policy, legal and regulatory frameworks

The Bangladesh power sector is guided by a well-established legal and regulatory framework. The following key acts, policies and guidelines regulate the Bangladesh power sector as shown in *Figure 23* below.

Figure 23: Bangladesh – Policy and regulatory framework evolution



The power sector of Bangladesh is primarily governed by the Electricity Act of 1910, Bangladesh Electricity Regulatory Commission Act of 2003 and BERC Act of 2003. To promote private sector participation in the Bangladesh power sector, the GoB issued the Private Sector Power Generation Policy (PSPGP) in 1996. This marked the launch of private sector projects in the power sector which included the 450 MW Meghnaghat power project and the 360 MW Haripur power project. The policy for encouraging partnerships with the private sector continued throughout the 2000's with the introduction of Private Sector Infrastructure Guidelines (PSIG) in 2004. As a result, the share of private power supply in terms of installed capacity increased from 26 percent in 2008 to 46 percent in 2015. The Bangladesh Renewable Energy Policy, 2008, was issued by the government to scale up the grid connected renewable energy. The policy identified renewable energy sources that play a significant role in the Bangladesh power sector mix. The policy also strengthened the institutional structure for development of renewable energy by establishing the Sustainable Energy Development Agency (SEDA).

In 2010, due to critical power shortages and chronic delays in implementing power projects, the government amended procurement requirements to allow unsolicited bids and expedite the approval of power generation projects. The Public Private Participation (PPP) Policy of 2010 replaced the 2004 PSIG, The PPP Policy updated the policy framework and provided a transparent regulatory and procedural framework.

Key enablers for the facilitation of cross-border power trading were identified through a review of key legislations and regulations guiding the power sector in Bangladesh. These key enablers include:

- The Vision and Policy Statement on Power Sector Reform published in February 2000, outlined how access to electricity would be provided to the entire country by 2020 with increased reliability and quality of **electricity supply at reasonable and affordable price by pursuing least cost options**.
- The policy framework under the Bangladesh National Energy Policy (NEP) of 2005 included the possibility of regional cooperation in energy trade. Regarding electricity trade, NEP emphasizes the examination of the possibility of cross-border electricity trade among neighboring countries and establishing linkages between local utilities with those in other countries. These linkages would provide for exchange of experience in power development and training of human resources.
- The updated 3-Year Road Map (2008-2010), includes a statement that "The roles of regulation and operation would be segregated to evolving functional entities according to the structural needs of

the reformed power sector". The 3-Year Road Map states that BPDB would gradually move from a single- buyer model to a multi buyer or competitive model as the market becomes mature and stable.

- Under the Policy Guidelines for Enhancement of Private Participation in the Power Sector (2008), the possibility of Independent System Operators (ISOs) is mentioned to ensure and deal with efficient power flow in coordination with the National Load Dispatch Center. These policy guidelines were also developed to deal with the mismatch and imbalance in power trading under BERC regulations. They also provided that initially, PGCB would act as an ISO until the wheeled power under these guidelines reaches 500 MW. Thereafter, a newly created agency was to take over the functions of the ISO from PGCB.

6 Energy sector planning and investments

Only two-thirds of Bangladesh's population is currently connected to the electricity grid. This leaves an untapped market of up to 60 million people who could potentially be connected to the national grid in the coming years as Bangladesh continues its growth trajectory.

The power demand in Bangladesh is projected to reach 34,000 MW by 2030 and the required investment in the sector over the next 15 years is estimated at $70.5 billion (USD). The government of Bangladesh plans to increase power generation capacity beyond projected demand to 39,000 MW by 2030 to propel a fast-growing export-oriented economy that will also likely include greater domestic consumption correlating with the population's increased purchasing power. As of February of 2017, current installed capacity was at 13,199 MW. Private power generation capacity contributes around 47 percent of the total installed capacity.

To meet increased demand, all sources are proposed to be utilized. Around 11,250 MW are to be generated from domestic coal reserves; 8,400 MW from imported coal; 8,850 MW from domestically produced natural gas and imported LNG; 4,000 MW from nuclear; 3,500 MW from imports from neighboring countries due to enhanced regional grid connectivity; and another 2,700 MW from other sources, including renewables such as solar and wind.

Bangladesh's Power Sector Master Plan of 2016 highlights the importance of electricity imports to support economic development of the country. Geographical features limit the country's ability to exploit large scale hydropower potential and therefore Bangladesh intends to import electricity from hydropower stations located in neighboring countries such as India, Bhutan, Burma and Nepal. The electricity imported from the neighboring countries would be used for providing stable base load supply, energy fuel diversification, and climate change mitigation. Because electricity trade is of strategic, national and economic importance, restrictions or limits on generating reserve and on ten percent of all supply capacity have been proposed on capacity of imported power from any one country.

4.1.3 Role of civil society and media

Bangladesh is an electoral democracy with a parliamentary form of government. Except for two instances of military rule, the country has been following a democratic process for election. The opposition boycotted the last elections in 2014, ensuring the dominance of the ruling party. Bangladesh continued to experience political and social unrest in 2016. Although Bangladesh has experienced a series of political upheavals since it established its independence in 1971, it has gradually moved towards political stability,

The civil society in Bangladesh has played a vital role in the social and political development of the country. After the 1975 era, the civil society groups were involved in socio-economic development and several NGOs were established and registered by the government. In the 1980s most of the NGOs were involved with service related activities and that continues. In 2009, the Right to Information (RTI) Act was established. The RTI Act applies to all information held by public bodies and seeks to improve government transparency and accountability. Ongoing challenges include low response rates to requests for information and the need to increase awareness of the RTI Act among the public and the authorities.

In terms of private sector participation in the economy, the Federation of Bangladesh Chambers of Commerce and Industry (FBCCI), the apex trade organization of Bangladesh, plays a pivotal role in consultative and advisory capacity, and seeks to safeguard the interest of the private sector.

While NGOs and other trade associations play a role in the development of the country, restrictions continue to be imposed on the liberty of the press to voice issues that affect public at large. The media

in Bangladesh is a mix of government-owned and private media. The country has a tradition of diverse and independent newspapers run by owner-editors who have influenced politics since the country's independence in 1971. Over the past decade, however, large privately-owned Bangladeshi corporations have moved into the media market, and most of the national media is now owned by select few corporate groups in the country.

The constitution of Bangladesh guarantees press freedom and freedom of expression with some restrictions. The media in Bangladesh has a rich tradition of independence and can voice opinions on most issues. There are still criminal penalties for libel, defamation, and sedition as well as reporting on national security issues. Media outlets, particularly at the local level, still face pressure and intimidation from national and local administrative, commercial, and even criminal bodies. Self-censorship is common at every level.

The overall freedom enjoyed by media has been tested under various regimes and restrictions imposed on free and fair reporting during certain periods. In recent times, censorship of internet-based content has been on the rise, with periodic blocking of social media and messaging sites. Since 2015, there have been frequent instances of attacks on individuals expressing their views using the internet. There have also been politically motivated legal cases against journalists. Despite the restrictions on media and a concentrated media ownership with urban bias, Bangladesh has a tradition of mass political involvement and debate. According to the Press Freedom Index[4] report, Bangladesh was ranked at 118 out of 139 countries in 2002 and 146 out of 180 countries in 2016.

4.1.4 Key challenges and risks

The current power trading institutional framework in Bangladesh, while being well suited for the domestic power procurement and limited export from India, needs to be developed to align with a regional power market structure which could exploit trading opportunities with other countries in the region including India, Nepal and Bhutan. The present single buyer model is more suited for the procurement of cross-border power through long term contracts. Scaling up cross-border trading, would create additional opportunities for Bangladesh both in the short-term (real-time, day-ahead or week-ahead basis) as well as medium-term (one to three-year contracts) which cannot be addressed under the existing power trading institutional framework under BPDB.

Bangladesh has an inter-connected grid with India, whose capacity is likely to be enhanced from existing 500 MW to 1100 MW within next three years. Proposals for further increase in India's capacity are under active consideration. There are certain aspects of the harmonization of technical specifications and standards which need to be jointly worked on by stakeholders from Bangladesh and India. The *Table 11* below lists the key risk factors for the Bangladesh electricity sector.

[4] The Press Freedom Index is an annual ranking of countries compiled and published by Reporters Without Borders based upon the organization's own assessment of the countries' press freedom records in the previous year

Table 11: Bangladesh electricity sector - Risk assessment

Risk Factors	Description	Level of Risk
Business Environment	• Stable political regime • Policy and regulatory framework in place	Low Risk
Project Construction	• Defined environmental, social, rehabilitation framework but difficult in implementation • Allows technology transfer and import of equipment	Medium Risk
Off-taker	• PPAs for domestic off-take with single buyer backed by sovereign guarantees, • Financial condition of BPDB cause of concern	Medium risk
Commercial	• Forex risk addressed through Dollar denominated PPAs • High cost of financing	High Risk
Operational – Generation	• Focus on coal for future but limited reserves, challenges in availability of gas for current plants	High Risk
Operational– Transmission	• Weak east-west transmission link • No provision of open access on transmission system	Medium Risk
Operational – Distribution	• Electricity access for population is an issue, Weak distribution system, Tariffs are not cost-reflective	Medium Risk
Cross-border electricity trade	• Power transfer capacities with India being augmented both for west and east interconnections • Indian cross-border guidelines pose certain restrictions on ownership	Low Risk

4.2 BHUTAN

Bhutan is a mountainous country located in the eastern Himalayas. The country is landlocked between China in the north and India in the east, west and south and is spread over 38,394 square kilometers. Bhutan was home to about 797,765 people as of 2016. The country is subdivided into twenty districts or administrative regions.

4.2.1 Economic overview

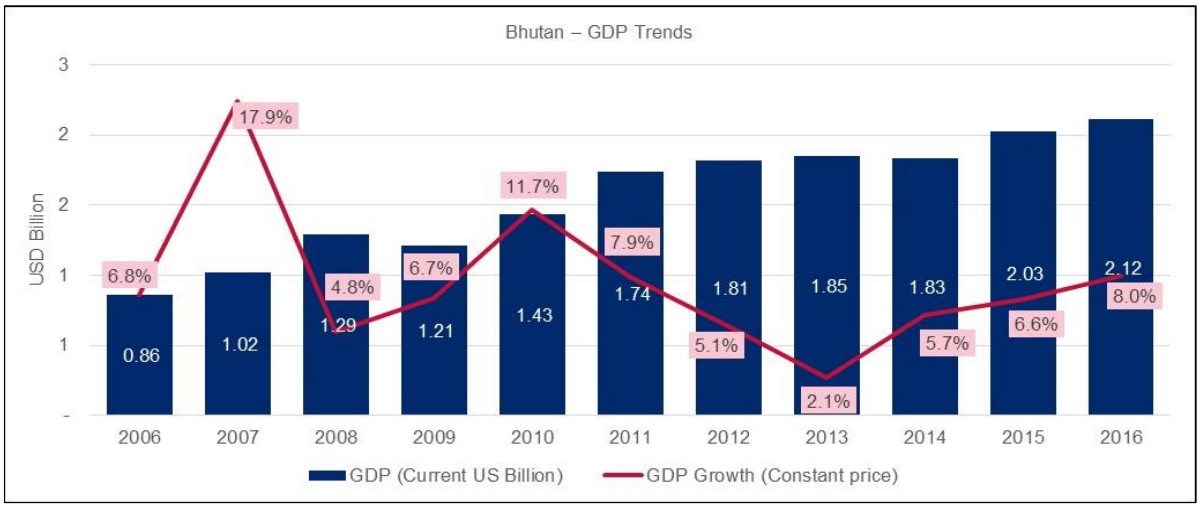
Development of hydropower in Bhutan has been a main engine of growth and has stimulated rapid socio-economic progress over the last decade. Hydropower fulfills 99 percent of Bhutan's total power requirements and is also exported to India. The development of hydropower in Bhutan speaks to successful bilateral cooperation with India and the evolution of electricity trade between the two countries. Financing provided by the Government of India, through a mixture of grants and loans, has made the construction of large hydropower projects possible in Bhutan. The tariffs for hydropower exported to India have been fixed on a cost-plus basis.

The GDP of Bhutan has more than doubled to USD 2.308 billion since 2007. However, the growth rate has fluctuated on year-to-year basis. the secondary and tertiary sectors contribute almost 80-85 percent of the overall GDP. The contribution of the primary sector in the GDP is low due to limited production of natural and other mineral resources in the country. Hydropower, tourism, and agriculture are the main sectors in the economy. Nearly 20 percent of the government's revenue comes from export of electricity to India. Hydropower is Bhutan's top export and accounted for more than 30 percent of overall exports in 2014. The government earns revenue from the hydropower sector through dividends and corporate income tax from Druk Green Power Corporation (DGPC) and Bhutan Power Corporation (BPC).

Macroeconomic imbalances have increased over the past few years as both government debt as a percentage of GDP and the current account balance as a percentage of GDP have inflated. The general government gross debt as a percentage of GDP has increased from 45 percent in 2000 to over 112

percent in 2017. Similarly, the current account deficit has also increased from 9 percent in 2000 to over 28 percent in 2017. *Figure 24* below shows the trends in GDP growth for Bhutan since 2006.

Figure 24: Bhutan - GDP trends



Source: World Development Indicators, 2017

4.2.2 Bhutan energy sector overview

1 Resource Potential

The resource potential for various natural resources is shown in *Table 12* below.

Table 12: Bhutan - Resource potential

Country	Coal (Million Tons)	Oil (Million Barrels)	Natural Gas (Trillion cubic feet)	Biomass (Million Tons)	Hydropower (Gigawatts
Bhutan	1.3	0	0	26.60	30.00

A. Coal

The kingdom has some 1.3 million tons of coal reserves, but extracts only about 1,000 tons of coal yearly, entirely for domestic consumption.

B. Oil and Gas

Bhutan does not have oil and gas resources and depends exclusively on importing refined petroleum products from India. Its total oil and petroleum product imports were 170 million liters during 2016.

C. Hydroelectricity

Bhutan has immense hydropower potential, estimated to be around 30,000 MW, of which 23,500 MW has been identified as techno-economically feasible. The total installed capacity in the country was 1606 MW in 2016, mostly hydro. This constitutes only 5.35 percent of the overall hydropower potential in the country. An additional 6,800 MW of hydropower plants are currently under construction. As mentioned earlier, most of the electricity generated in the country is exported and electricity exports contribute to approximately 20 percent of the government's revenue and constitutes 14 percent of the country's GDP. India is the biggest beneficiary of Bhutan's hydropower sector.

D. Renewables

Bhutan is endowed with various sources of renewable energy potential. Aside from the ongoing hydropower projects, Bhutan also has wind, biomass and solar as the main renewable energy sources. Based on initial estimates, it is believed that Bhutan has renewable energy potentials of 50 GW solar, 30 GW hydro, 4GW wind and 4 GW biomass. To harness the renewable potential in the country, the government of Bhutan set out, in the Renewable Energy Policy of 2013, a preliminary renewable energy target of 20 MW by 2025 to be achieved through mix of renewable energy technologies. This minimum

target may be increased following more detailed evaluations of resource potentials. Specific targets include 5 MW each of wind, solar and biomass.

2 Electricity demand and supply

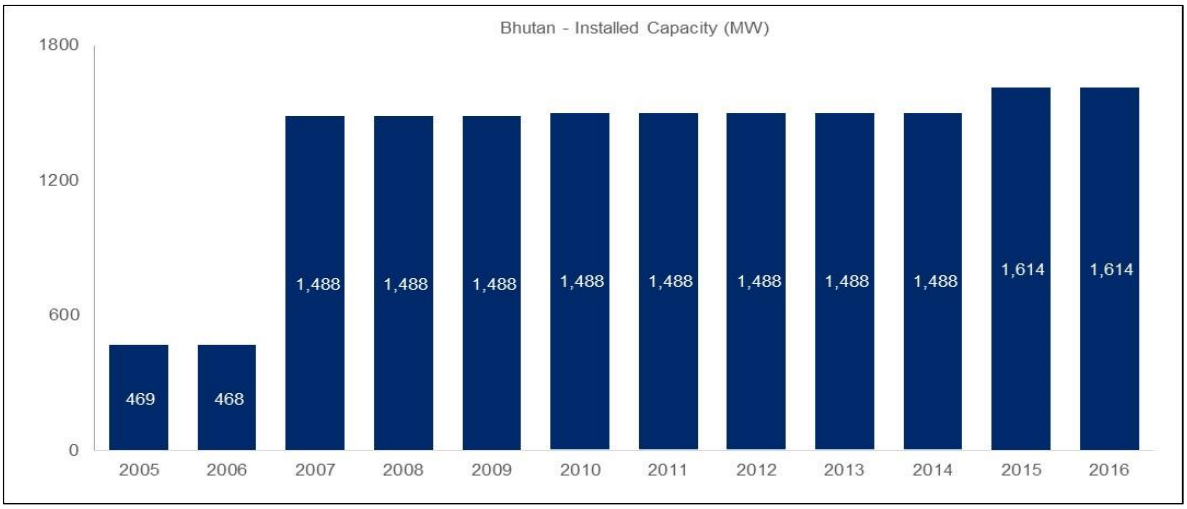
The electricity demand in Bhutan is increasing owing to the ongoing emphasis on rural electrification programs. Between 2011 and 2015 the per capita consumption of electricity increased from 2,419 kWh to upwards on 2,804 kWh. The demand for electricity is likely to increase further due to increased economic activity and because the government is committed to reduce the dependence on fuelwood as a source of energy. By 2030, the peak demand in the country is expected to increase to 2,500 MW. *Figure 25* shows the peak demand trends for Bhutan.

Figure 25: Bhutan – Peak demand

Source: BPC reports

The installed capacity in Bhutan has increased at an annual rate of 10 percent from 345 MW in 2000 to over 1600 MW in 2015 and is further likely to increase to 26 GW by 2030. Approximately 90-95 percent of the electricity generated in the country comes from Hydropower stations, with a marginal amount, 5-8 percent or 7.2 MW, being generated from diesel stations. While hydropower will continue to be the main source of electricity generation in the country, it is expected that the government will diversify its electricity mix by harnessing other sources of renewable energy such as solar, biomass and wind. To this end, the government of Bhutan has set a policy target of 20 MW of renewables to be achieved by 2025. The installed capacity growth for Bhutan is shown in *Figure 26* below.

Figure 26: Bhutan – Installed capacity



Source: BPC Annual Report

Since 1974 Bhutan has had a unique bi-lateral arrangement with India for developing its hydropower resources. Concessional funding from India has allowed Bhutan to bring into operation about 1,400 MW of new hydropower, which it now owns without having had to raise any equity. Further bi-lateral projects using the same model are at the planning or construction stage. While this approach has been

successful, the rate of development has not been fast enough to meet the Royal Government of Bhutan's (RGoB) Vision 2020 objectives. It has been necessary to adopt parallel strategies to promote the development of selected projects through other forms of partnership arrangements involving both public and private entities, and with increasing reliance on private financing.

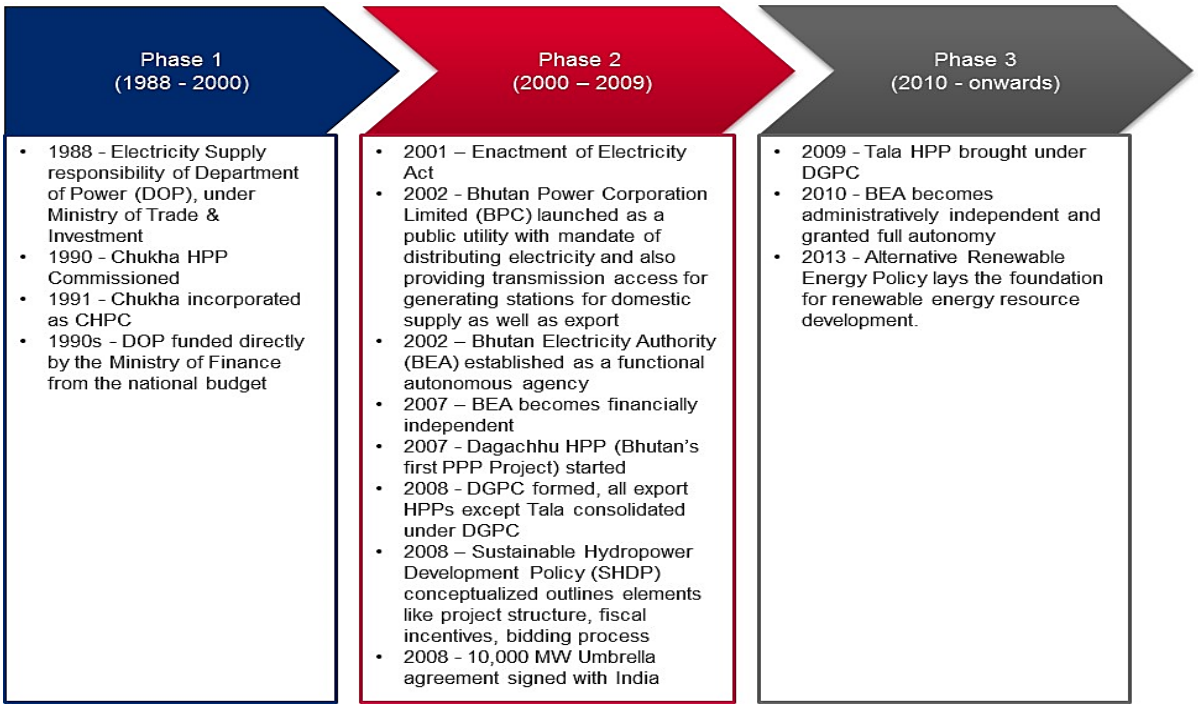
Electricity tariffs for domestic consumers are regulated and are determined by the Bhutan Electricity Authority (BEA). Basic principles were established for tariff determination for domestic consumers in the domestic tariff policy in 2016. Bhutan provides a high level of subsidy to domestic consumers, and the incentive schemes it operates for attracting power-intensive industries might adversely impact the growth of electricity exports from Bhutan. Contrary to this, industrial consumers may, upon approval of the BEA, opt to have a separate arrangement through a PPA with the service provider to ensure long-term predictability.

3 Sector reforms and restructuring

Reforms in Bhutan began with the promulgation of the Bhutan Electricity Act in 2001, which focused largely on the restructuring of the power sector. Since these reforms, the policy-making body on energy has been the Ministry of Economic Affairs, which includes three departments relevant to the sector: the Department of Hydropower and Power Systems (DHPS), the Department of Renewable Energy and, the Department of Hydromet Services (established on December 1, 2011). The state-owned BPC has had the main responsibility for transmitting and distributing of electricity, while the DGPC, also state-owned, is responsible for power generation. DGPC is the holding company of all existing hydropower companies. As the power sector regulator, the Bhutan Electricity Authority is responsible for setting tariffs; establishing and enforcing technical, safety, and operational standards; issuing licenses; and monitoring other regulatory functions. In 2010, BEA was granted full autonomy and made independent of government departments. While the electricity tariffs are regulated by BEA on a cost-reflective tariff structure, actual retail prices are cross-subsidized in the value chain of the power sector in a transparent manner. Before power exports take place, DGPC gives 15 percent of the power it generates as an energy royalty to the government, which sells it to BPC at discounted prices. Electricity is supplied to domestic consumers at affordable tariffs that are substantially cross-subsidized by power exports. Both BPC and DGPC have maintained efficient operations and healthy financial positions.

Bhutan's electricity sector has gradually moved from a vertically integrated state company to a more decentralized and unbundled structure. The results of unbundling are visible, and studies are underway to restructure the transmission and distribution sub-sector by unbundling them into separate entities and hiving off the system operator into a separate company. The evolution of the power sector in Bhutan is depicted in *Figure 27* below.

Figure 27: Bhutan – Sector reforms and restructuring



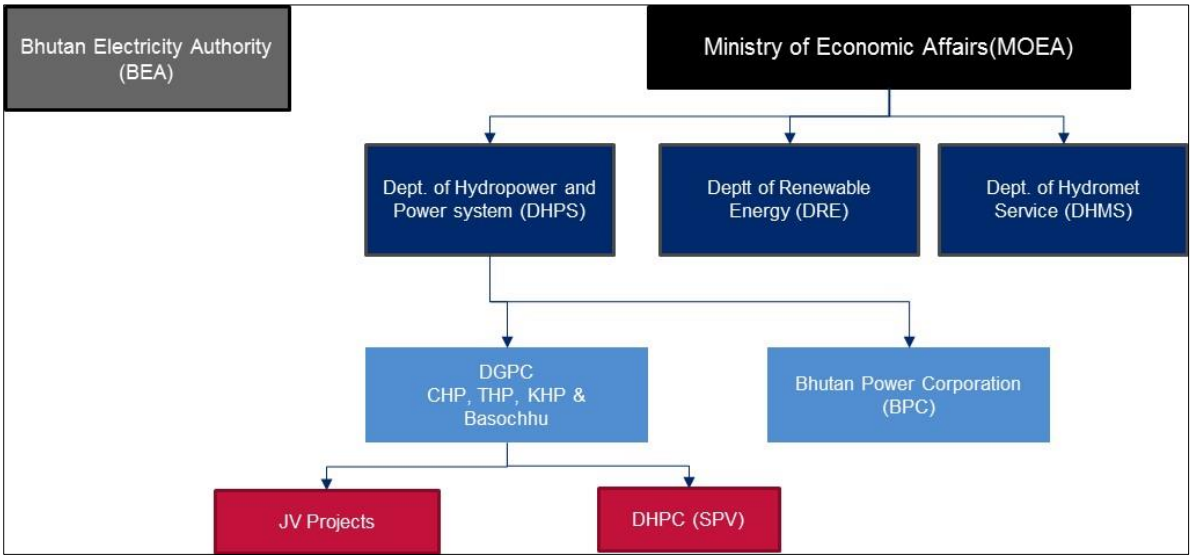
4 Institutional framework

In Bhutan, the DHPS is the government body leading and coordinating the activities of the various RGoB organizations involved in the planning and development of the country's large hydropower resources (> 25 MW). It is also responsible the formulation of national policies and guidelines related to hydropower development; implementing institutional reforms for efficient planning and management of the sector; providing an enabling environment for participation of public and private sectors in development of hydropower resources; and ensuring that hydropower exports generate maximum revenue for the nation. DHPS consists of three Divisions: Planning and Coordination, Hydropower Development, and Transmission and Power Systems.

Bhutan Power Corporation Limited (BPC) is responsible for distributing electricity throughout the country and for providing transmission access to generating stations for domestic supply as well as export. BPC is mandated to ensure that a reliable and adequate electricity supply is available to all consumers within Bhutan.

The DGPC is a wholly owned corporate entity of the RGoB. It is an autonomous body which is responsible for operating and maintaining the large hydropower assets and for promoting and developing new hydropower stations in the country. The *Figure 28* below shows the institutional framework for electricity sector in Bhutan.

Figure 28: Bhutan – Institutional framework



5 Policy, legal and regulatory framework

The Electricity Act of 2001 defined the legal framework of the power sector in the country and ensures the healthy growth of the power sector. The act defined the role of key stakeholders involved in the business of power generation, transmission and distribution. Under the Act, the Bhutan Electricity Authority was empowered to take the role of electricity regulator in the country. It is responsible for developing regulations, standards, codes, and procedures for performance standards; technical and safety requirements for construction and operations of generation, transmission, and distribution facilities.

Bhutan's has Hydro Development Policy, established in 2008, focuses on the development of hydro power in the country through public and private partnership. Policy related to off-take of electricity is dealt with in the Bhutan Hydro Sustainable Hydro Power Development Policy of 2008.

In Bhutan, tariff determination for power projects is governed by Tariff Determination Regulation established in 2007 and updated in 2013. This regulation determines tariffs for all power transactions except the import/export of power to other countries

Bhutan attracted its initial foreign investment in the form of grants from the Government of India. India provides both technical and financial support to the power sector in Bhutan. Bhutan is dependent on aid from donor agencies and other governments to realize its full power potential, mainly hydro. Bhutan government offers supportive policies for investors to invest in Bhutan, but regulatory institutions and

capital markets are not strong and need to be streamlined before more investors can rely on its capital market for financing and stability.

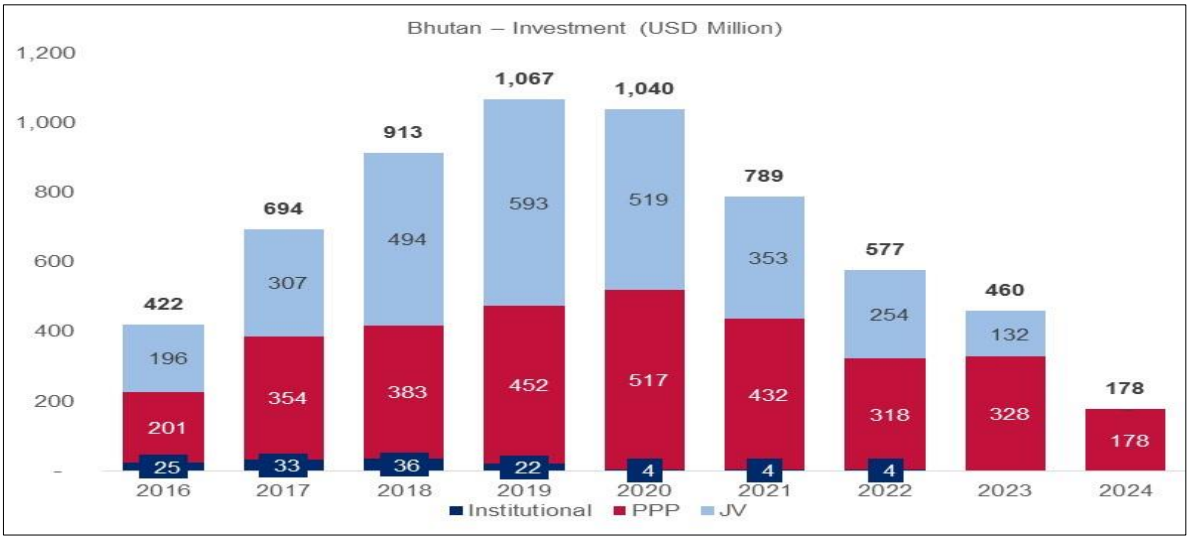
6 Energy sector planning and investments

The hydropower investment plan is comprised of six projects to be set up on an intergovernmental basis, four projects on joint venture basis, and five projects on a PPP basis.

- For the intergovernmental projects, the entire capital outlay will be contributed by the Government of India in the form of debt and equity. DGPC will not have any fundraising responsibility for this. It will take over the assets and liabilities from the Project Authority, two years from the commercial operation date.
- For joint venture projects, India's public-sector undertakings (PSUs) will contribute 50 percent of the equity except for Bunakha where DGPC will hold 72.12 percent based on the downstream benefit to Chukha, Tala and Wangchhu HEP. The DGPC Equity contribution to these Projects will be provided as grants by Government of India.
- For the PPP projects, the project developer will raise both the debt and equity components.
- DGPC will also be responsible for other institutional investments to the tune of Bhutanese Ngultrum (Nu) 9.30 billion (USD 143 million) from 2015-19. A key priority to finance hydropower investments is to tap all potential domestic sources.

Figure 29 below shows the investment plan for hydropower sector in Bhutan.

Figure 29: Bhutan – Hydropower investment plan



Source: Bhutan Electricity Authority

4.2.3 Role of civil society and media

The Government of Bhutan has been a constitutional monarchy since 2008 with the King of Bhutan as head of state. Executive power is exercised by the Council of Ministers headed by the Prime Minister. Legislative power is vested in the bicameral Parliament, both the upper National Council and the lower National Assembly. In 2008, Bhutan adopted its first modern Constitution, codifying the institutions of government and the legal framework for a democratic multi-party system. Bhutan has made a rapid transition from a system in which the monarch and his advisers had enormous influence over Parliament to one in which Parliament determines its own policies. Although the king retains some powers and influence, the party in control of Parliament selects its own cabinet.

Since 2007, Bhutan has moved decisively toward a system based on the rule of law, and its judiciary is now considered generally autonomous. An independent Judicial Service Council controls judicial evaluations and promotions. Senior judges are appointed by the king on the recommendation of the National Judicial Commission.

Local and international nongovernmental organizations (NGOs) must register with the government. They can work with reasonable freedom though some issues are not allowed to be debated. The

constitution protects the right of workers to form associations, but not for the purpose of conducting strikes.

Civil Society Organizations (CSOs) have existed in Bhutan for many years as community associations and organizations, even as the country transitioned from an absolute monarchy to a democratic constitutional monarchy in 2008. These organizations form an integral part of the society and have provided people with an opportunity to contribute to the decision-making process, especially in activities that have a bearing on people's day-to-day life. Perhaps one of the best know examples of the rich history and culture of the country is a cultural institution known as *kidu*. This institute has been in existence since the time of the first monarch. As a royal prerogative this institute provides for the well-being of the people, particularly the most vulnerable sections of society.

With a changing political landscape and growing awareness among people, new and more modern types of associations and organizations have also come into existence in various communities. Most of these associations or groups are more formal institutes and have been formed or supported by either industry or civil servants. These contemporary associations are unlike the traditional associations in the sense that they operate within defined boundaries of rules and norms and are also governed by written rules and regulations. In addition, these organizations are established to serve particular purposes, whether they be business or civil.

Bhutanese laws protect freedom of expression and belief, but substantial barriers remain, including freedom in the press. While there are multiple private media outlets, many depend on state advertisements for revenues. Nearly 40 percent of the population had internet access in 2015. Social media as well as online news outlets were available. Bhutan has ten newspapers, six radio stations, one online newspaper, and several magazines.

4.2.4 Bhutan - Key challenges and risks

The *Table 13* below shows the risk assessment for Bhutan.

Table 13: Bhutan – Risk assessment

Risk Factors	Description	Level of Risk
Business environment	• Stable political regime • Policy and regulatory framework in place	Low
Project construction	• Defined environmental, social, rehabilitation framework • High dependence on Indian market for sourcing equipment and labor	Low
Off-taker	• PPAs for domestic off-take with single buyer backed by sovereign guarantees, • Limited consumer base and increasing cost of supply	Medium
Commercial	• Bhutan's currency pegged to Indian Rupee which is also used for PPA and for supply of equipment. • Financing dependent on Indian market	High
Operational – Generation	• Most projects are run of the river and does not involve high level of complications	Low
Operational– Transmission	• Limited transmission system, difficult terrain • No provision of open access on transmission system	Medium
Operational – Distribution	• Electricity access for population is an issue, distribution system in rural areas needs to be improved	High
Cross-border electricity trade	• Power transfer capacities with India being augmented to allow additional 5000 MW of electricity transfer • New Indian cross-border guidelines pose certain restrictions on ownership	Medium

4.3 INDIA

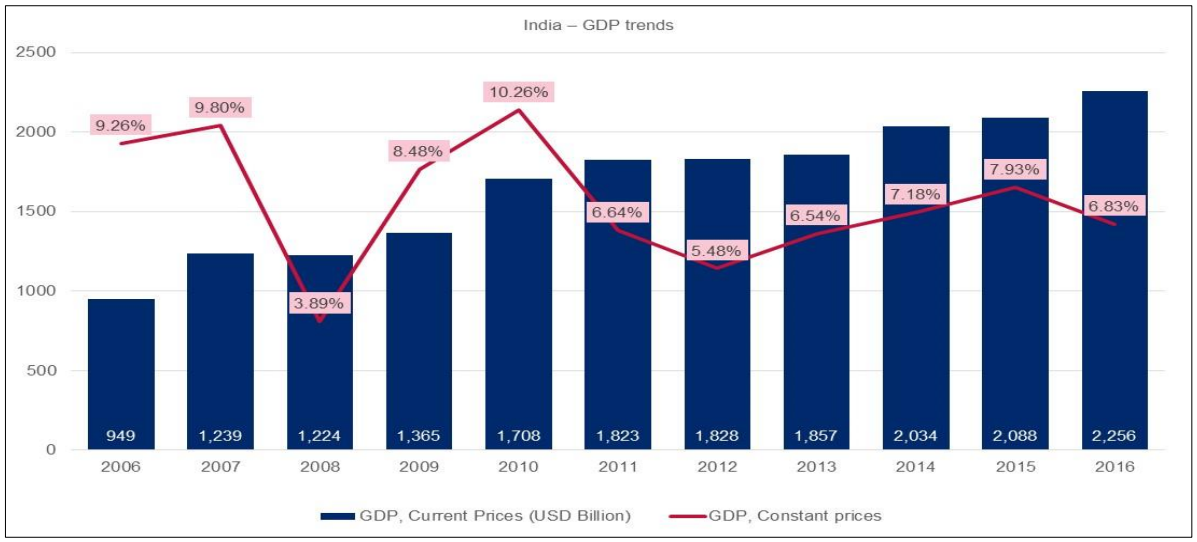
India is the fastest growing economy in the world and has been assigned a stable/positive outlook by various rating agencies. During a time when growth prospects of the world economy are bleak, the Indian economy offers sound and steady improvement.

4.3.1 Economic Overview

India's GDP has been increasing over the past decade and a half. The GDP, has been growing at an average rate of over six percent since 2013, and at 2016 prices, it stood at USD 2.25 trillion. As per the Economic Survey of 2016-2017, the Indian economy is likely to grow between 6.75 percent and 7.5 percent in 2017-2018. The improvement in India's economic fundamentals accelerated in 2015 with the combined impact of strong government reforms and the Reserve Bank of India's (RBI) inflation focus supported by benign global commodity prices.

Private consumption has been the main driver of the strong economic growth and is backed by the strong reform agenda of the government. The growth has also been supported by the conducive policy environment that has resulted in improved distribution of income, higher institutional efficiency, and entrepreneurial growth. *Figure 30* below shows the GDP trends for India.

Figure 30: India – GDP trends



Source: World Development Indicators, 2017

Macro imbalances have also been reduced over the years. First, the public debt has decreased markedly from 84 percent in 2003 to 67 percent in 2017, but its elevated level is still a concern. Second, the current account balance has shown strong improvement as it has been contained from over 4.8 percent in 2012 to under 1.5 percent in 2017.

4.3.2 India energy sector overview

1 Resource Potential

India is the largest country in the region both in terms of population (1.2 billion) and area (3,287,590 sq. km). It has substantial deposits of coal (90,085 million tons) and huge hydro potential (150,000 MW). It also plans to import natural gas through pipelines from the Middle East. It is investing heavily in nuclear power and solar energy. The northeastern grid of India is linked with those of Nepal, Bhutan and Bangladesh. The eastern region of India is also rich in hydro resources. If exploited, Bangladesh can share the hydro-electricity from the eastern region of India. India will need the cooperation of Bangladesh to transport hydro-electricity from its eastern states to West Bengal and beyond. Similarly, Bangladesh will need India's cooperation to import electricity from Nepal and Bhutan. Because of the physical locations of the major hydro-potentials in Nepal, Bhutan and the northeastern and eastern region of India, all the countries in the region will be net beneficiaries of the exchanges of electricity in the region. To implement the program, it will be necessary to expand the capacities of interconnection of the grids in the region and build new generating capacities. *Table 14* below provides the fuel-wise resource potential for India.

Table 14: India - Resource potential

Country	Coal (Million Tons)	Oil (Million Barrels)	Natural Gas (Trillion cubic feet)	Biomass (Million tons)	Hydropower (Gigawatts)
India	90,085	5,700	39	139.00	150.00

A. Coal

India has the third-largest hard coal reserves in the world (roughly 12 percent of the world total), as well as significant deposits of lignite. The estimated coal potential in the country is 308 billion tonnes (BT). 45 percent of this potential falls in the category of proven reserves, 45 percent is indicated reserves, and the remaining 10 percent is inferred reserves. In addition to coal reserves, the estimated total reserve of lignite is 56 BT of which 14 percent is proven reserve, 59 percent is indicated reserve, and the remaining 27 percent falls in the category of inferred reserves.

B. Oil and Gas

India has a modest amount of oil and gas reserves and depends on imports to meet its domestic crude and petroleum requirements. The estimated potential of crude oil is 621 million tonnes and that of Natural gas is 1,227 billion cubic meters. Most of the crude oil reserves are located in the western offshore followed by Assam in the eastern part of the country. Most of the natural gas reserves are located in the eastern part of the country followed by western offshore.

C. Hydroelectricity

India's total economically exploitable hydropower potential is estimated to be 150 GW as compared to the current installed capacity of 45 GW. Much of the untapped potential lies in the Himalayas in the north and northeast parts of the country.

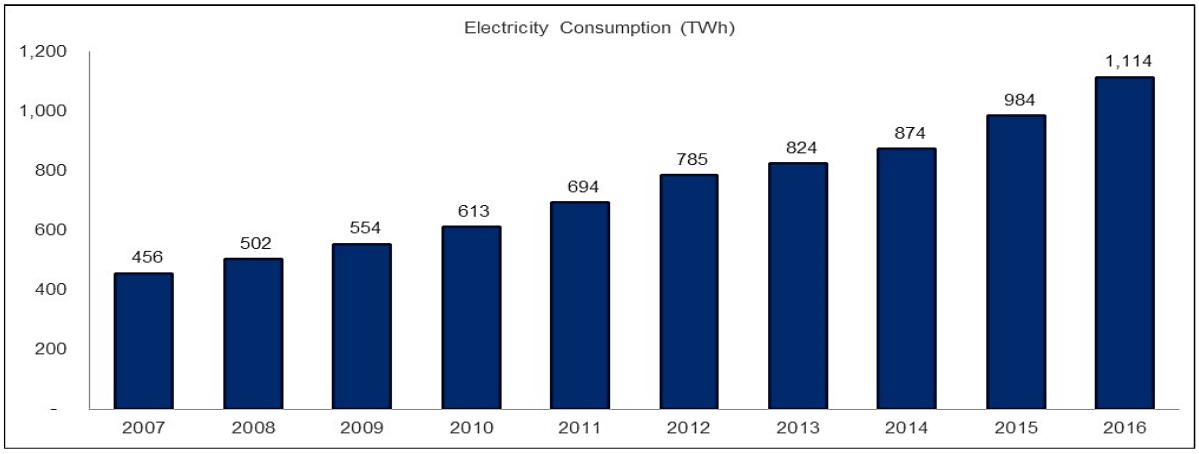
D. Renewables

India has abundant renewable energy resources including biomass, hydro (both large and small), wind, and solar power. There is technical potential for development of 405 GW of wind energy, particularly in the western and the southern parts of the country. The overall potential for development of solar power is estimated at 748 GW. Biomass development is estimated at 17 GW, and small hydro development potential is estimated at 19 GW.

2 Electricity demand and supply

While electricity demand has grown from 376 TWh in 2000 to 1114TWh in 2016, growing at an annual rate of more than six percent annually, the per capita consumption of electricity in the country is the lowest in the region, given the size of the economy. The per capita electricity consumption was 884 kWh at the beginning of 2012 and increased to 1075 kWh in 2016. The growth in electricity consumption in India is shown in *Figure 31* below.

Figure 31: India – Electricity consumption

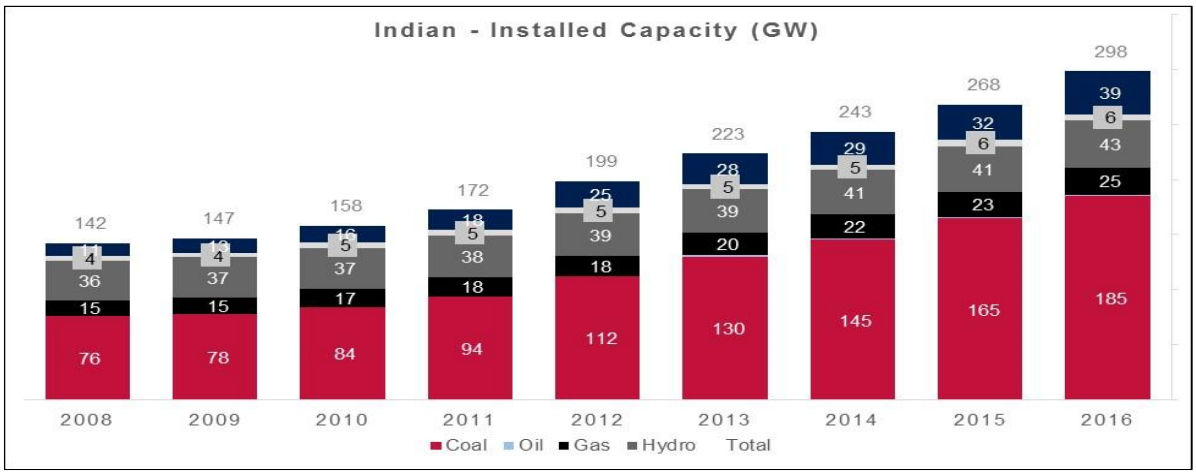


Source: India Energy Statistics Report, 2017

India has the world's fifth-largest electricity generation capacity and demand is expected to surge in the coming years owing to growth in the economy. The total installed capacity of power including renewable sources as of March 2016 was 298 GW. Approximately two-thirds of power generation is through thermal sources, including gas, liquefied fuel, and coal. constitutes the largest percentage of power generation, around two-thirds. Renewable energy sources are also picking up pace. Presently, of the total power being generated, 63 percent is coal based, 8 percent is gas based, hydro generates 14 percent of total power, nuclear production is 2 percent, and the rest 13 percent is collectively produced by renewable energy sources such as small hydro project, biomass gasifier, biomass power, urban and industrial waste power and wind energy.

Installed generation capacity in India grew significantly during the period 2008-2016. During this time the generation capacity in the country grew from 142 GW to 298 GW at compound annual growth rate (CAGR) of 9.7 percent. Coal continues to remain the mainstay of the country's electricity mix and constitutes almost 62 percent of the overall installed capacity. The share of renewables in the electricity mix has also increased. In the past 8 years the share of renewables has increased from 7.8 percent in 2008 to over 13 percent in 2016. Renewable energy capacity is likely to further increase to 35 percent by 2022. Per the National Electricity Plan, the country's grid size will more than double between 2016 and 2027 to 640 GW. Most of the additional capacity is expected to come from renewable energy followed by thermal and hydropower. The installed capacity trends for India is shown in *Figure 32* below.

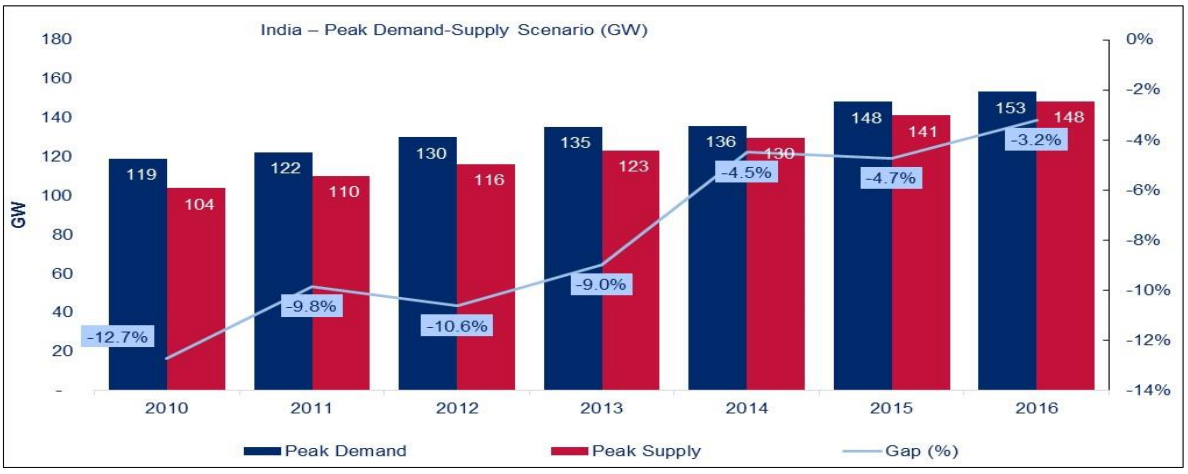
Figure 32: India – Installed capacity



Source: Central Electricity Authority (CEA) Annual Reports

As a result of rapid additions in generation capacity and a lower than expected growth in consumption, the deficit in peak demand and supply has narrowed rapidly over the last five years as shown in *Figure 33* below.

Figure 33: India peak demand-supply scenario



Source: CEA reports

3 Electricity pricing

Since the enactment of the Electricity Act 2003, the government has gradually phased out the cost- plus methodology to determine electricity tariffs at the generation level and instead have introduced competitive bidding guidelines to determine the tariffs. Electricity tariffs at the retail level are still regulated and are approved by appropriate state regulatory commissions. Although state commissions are considered as autonomous institutes, it is believed that state governments have the ability to influence electricity pricing at the retail level in the state. The suppressed electricity tariffs at the retail level have resulted in significant under recoveries for the distribution companies, as they are unable to recover their average cost of supply and have increased systemic risk in the sector. Though most of the distribution companies are state owned, the inflating losses of distribution companies' increases the credit risk in the system and can therefore act as a potential obstacle to private sector investment.

4 Sector reform and restructuring

Since India gained its independence, the importance of the role electricity plays in its growth and development has been recognized. This electricity supply act, 1948 cemented the sector's status as a "concurrent" subject (meaning that both central and state legislatures have a role in developing the policy framework). It established CEA as an advisory body responsible for national power planning, policy making, and monitoring progress, and created state electricity boards (SEBs). SEBs are the vertically integrated utilities in states responsible for power generation, transmission, and distribution and for setting most tariffs.

India implemented sweeping economic reforms in 1991 after facing a severe balance-of-payments crisis. At that time India had a generation capacity of 69 GW, a peak deficit of 16 percent, and an electrification rate of 42 percent[5]. The power industry was comprised of 19 SEBs and six electricity departments and the sector was in extremely poor financial condition, with losses of roughly INR 40 billion or 0.7 percent of GDP at the time—and a cost-recovery rate of only 79 percent[1]. The state dominated power sector was inefficient, facing operational issues and lacking the capability for adequate investment. Over a period, the sector started to incur huge financial loss due to consumer tariffs not being cost reflective. In addition, the installed capacity could not keep pace with the growing demand resulting in shortages. There was, thus, an urgent need to support growth and private sector participation was seen as a necessary complement to public investment.

The subsequent amendments to the Electricity Supply Act in 1991 opened the power sector to private participation in generation. The IPP policy had limited success due to challenges like the unhealthy financial condition of electricity boards and the lack of clarity on policy and regulatory instruments, to name just a few. As the country continued to face crippling power shortages, a few states like Orissa, Haryana and Andhra Pradesh initiated the process of restructuring their vertically integrated SEBs and subsequently established the State Electricity Regulatory Commissions (SERCs) under their own reform legislative initiatives to improve performance. The Electricity Regulatory Commission Act of 1998 set up the Central Electricity Regulatory Commission and brought regulatory consistency to the states. However, the commercial performance of state utilities continued to deteriorate, with losses increasing to INR 250 billion by 2001-2002. The total SEB debt to central public power suppliers had also continued to rise which threatened their financial solvency and a bailout package was designed for bailout of the state power utilities.

A. Electricity Act 2003

The crisis brought home the importance of power sector development, setting in motion the first phase of a power sector reform agenda. The agenda initially focused on boosting generation capacity, notably by opening the sector to foreign and private investment. Amendments to the Electricity Supply Act, passed in 1991, allowed private players, including foreign investors, to come in as independent power producers and enter into long-term supply contracts with utilities. But the reform agenda stopped there, doing nothing to address the underlying drivers of the sector's poor performance or to dilute state government control over the politically sensitive distribution sector.

As a response to these developments and to bring in a forward looking pro-competition policy and regulatory framework, the Electricity Act 2003 was established to focus on developing the power sector. It superseded the existing legislation. Some of the key features included delicensing of thermal generation, open access to transmission and distribution within defined time frame, and introduction of

[5] More Power to India: The Challenge of Electricity Distribution, The World Bank

power trading as a licensed activity to foster competition and encourage private sector entry into generation and transmission. The electricity act clearly mandated unbundling and corporatizing the SEBs, along with establishing independent central and state regulators and the Appellate Tribunal. The aim was to create a more accountable and commercial performance culture. The associated policies laid down the framework for competitive bulk procurement of power, multi-year tariff regime, thrust on rural electrification, and focus on renewable energy.

By recognizing trading as a licensed activity; opening entry into generation; permitting multiple distribution licensees; introducing a "smart" transmission tariff to relieve network congestion through point-of-connection pricing; separating transmission from dispatch, trading, and generation; and promoting open access, the electricity act has created an active power market and power exchanges that have eased the entry of latent (captive) capacity into the market. The move from negotiated memorandums of understanding with guaranteed rates of return to investors to market-driven competitive procurement brought forth a huge private response in generation and very low tariff bids (though recent experience indicates that allocating fuel-price risk to bidders may have been unrealistic and is now being adjusted). While achievements in distribution have been less widespread than those in generation and transmission, a major success has been the sharp increase in access to electricity. The public-private joint ventures in power distribution were adopted first in Orissa, with limited impact, then in Delhi (learning from Orissa's experience), with greater success. Recognizing the limited political space for such "privatization," the EA of 2003 established the concept of "distribution franchises".

B. Setting up regulatory commissions

As India's economy continued to face crippling power shortages, states started restructuring their SEBs and establishing SERCs under their own state reform legislative initiatives. The Electricity Regulatory Commission Act of 1998 set up the Central Electricity Regulatory Commission (CERC) and brought regulatory consistency to the states.

As of 2016, 28 regulatory commissions existed, covering all states. Unbundling was completed in all the states while 10 states have a single utility operating either as a corporation, power department, or SEB. The unbundled states vary in market structure: 10 have unbundled into multiple distribution companies (Discoms), six have unbundled into only one distribution company, and three have separated transmission but kept generation and distribution as one company.

An important milestone was the development of interstate transmission regulations. A robust transmission system is needed for the seamless flow of electricity across regions and states. The EA has thus mandated the CERC to regulate interstate transmission to serve the emerging needs of competition and a multiple player regime in the sector. In 2010 the CERC introduced the "smart transmission tariff," a point-of-connection system to replace the regional "postage stamp" method of allocating transmission charges among different users, with the added objective of relieving grid congestion.

C. Formation of power trading corporation

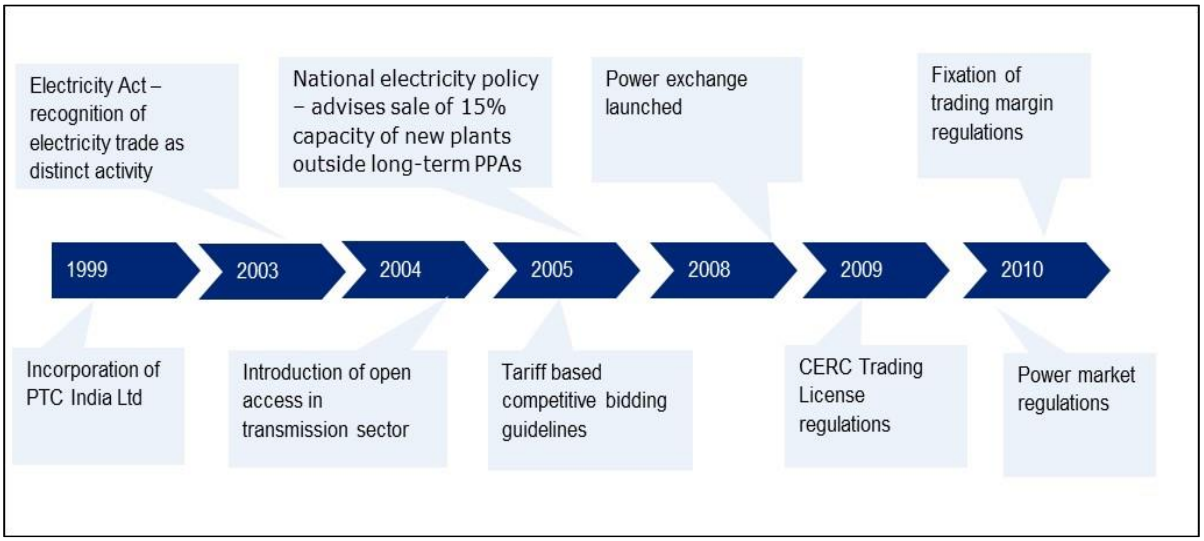
In 1998 the Government of India (GOI) issued the revised Mega Power Policy under which large projects (over 1000 MW and multi-state offtake) were proposed to be set-up. Mega Power Projects (MPPs) were provided various fiscal incentives and the projects were structured to sell power to multiple states. Since multiple states were involved it was felt that a central facilitating agency needed to be established, which could provide a single point contact for the MPPs and off-takers and smooth the process of development of these projects, while managing the credit risk for the developer. The policy also allowed for establishing a Power Trading Company (PTC) with majority equity participation by Power Grid Corporation of India Ltd. (PGCIL), along with NTPC, Power Finance Corporation (PFC) and other financial institutions. The PTC was tasked with purchase of power from the identified private projects and sell it to the identified State Electricity Boards.

D. Power trading perspective

Prior to issuance of the Electricity Act, 2003, PTC India Ltd. was the sole electricity trading company operating in India. The Electricity Act, 2003 laid down provisions for promoting competition in the Indian power market and introduced provisions for non-discriminatory open access. The Electricity Act recognized electricity trading as a distinct licensed activity, and triggered unbundling of all SEBs. After enacting the provision of the trading license in the Act, several private players also entered the trading business. As of March 31, 2017, the total number of CERC licensed inter-state trading licensees stood at 33.

CERC, through its regulations, specified terms and conditions for granting trading license and fixed trading margins. CERC's open access in inter-state transmission regulations established in 2004 enacted open access in inter-state transmission. Competition at the wholesale level was further promoted by issuance of tariff based competitive bidding guidelines issued by the Ministry of Power, GoI in 2005. The power exchanges IEX and PXIL were launched in 2008. These exchanges allowed buyers and sellers to participate online for electricity transaction and provided for price discovery through bidding. The power exchanges have established competition for traders. In its power market regulations of 2010, CERC established detailed procedures to be followed for electricity transactions through power exchanges or over-the-counter exchanges. The *Figure 34* below provides an overview of transition of the Indian wholesale power market.

Figure 34: India – Evolution of power market



5 Institutional Framework

The **Ministry of Power (MoP)** manages prospective planning, policy formulation; developing projects for investment decisions; monitoring power project implementation; training and manpower development; the administration and enactment of legislation related to thermal, hydro power generation; and the transmission and distribution of electricity.

The **Ministry of New and Renewable Energy (MNRE),** was formed in 2006, is the nodal Ministry of the GoI for all matters relating to Renewable Energy (RE). The MNRE is responsible for developing policies and programs for new and renewable energy, for ensuring RE implementation, and for coordinating and intensifying RE sector research and development.

The **Central Electricity Regulatory Commission (CERC)** is a statutory body established under Section 76 of the 2003 Electricity Act. It is responsible for determining and regulating tariffs, issuing licenses, approving the Grid Code, and for approving and enforcing service quality and reliability standards. At the inferior level, the State Electricity Regulatory Commissions (SERCs) are statutory bodies that replicate the work of CERC at the state level.

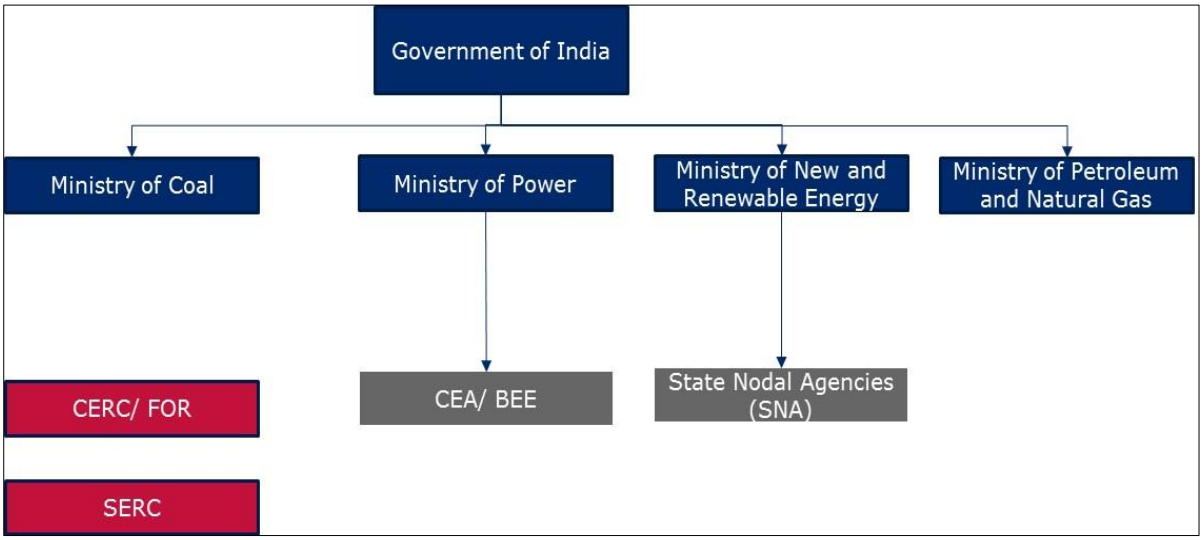
Central Electricity Authority (CEA) is a statutory organization established in 1951 as a part-time body. It was made a full-time body in 1975. The CEA advises the GoI on matters related to the National Electricity Policy and develops short-term and prospective plans for the development of electricity systems. The CEA is also responsible for ensuring the concurrence of hydro power development schemes of central, state and private sectors, considering the need for the efficient development of the river and its tributaries for power generation, as well as the need for drinking water, irrigation, navigation and flood control.

Indian Energy Exchange and the **Power Exchange India, Limited** provide online platforms for the trading of power and Renewable Energy Certificates (RECs).

The **National Load Dispatch Center (NLDC)** is responsible for scheduling and dispatching electricity over inter-regional links pursuant to grid standards.

The institutional framework for Indian electricity sector is shown in *Figure 35* below.

Figure 35: India – Electricity sector institutional framework



6 Policy, legal and regulatory framework

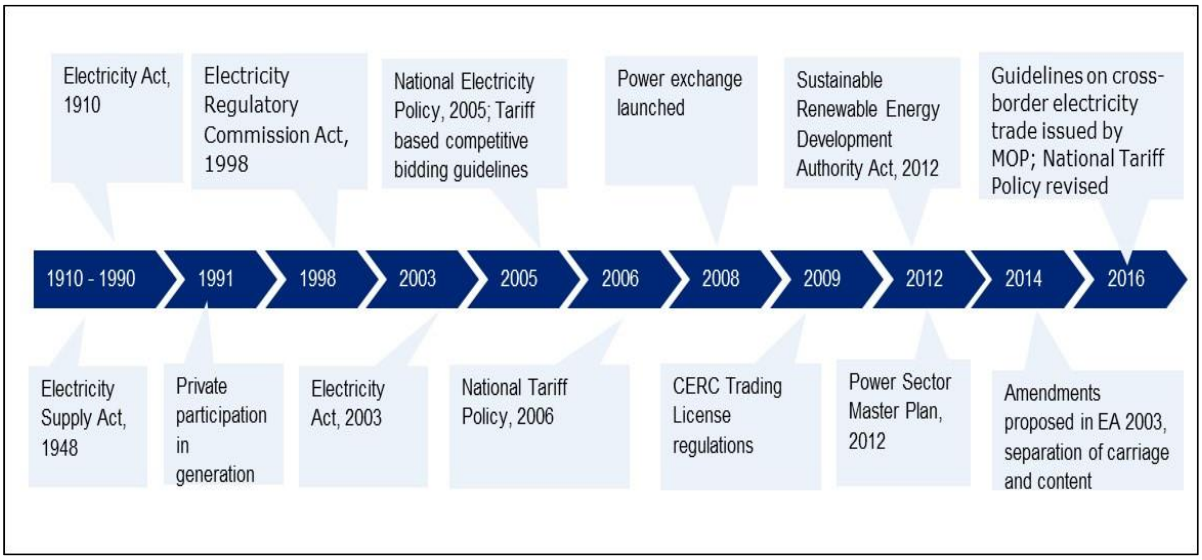
The Indian power sector has a federal structure where both the central and state level have power to make rules in their respective jurisdictions. The MoP is the apex body for decision making in the Indian power sector. At the central level, CEA and BEE are responsible for formulating policy and acting as the planning advisor to the MoP. CERC and SERCs are regulators at the central and respective states levels. The central level has both power generation and power transmission, but it doesn't have any distribution player under it. States have separate transmission, generation and distribution entities. Private players also have their presence in the transmission, generation and distribution sectors.

Power sector policies are developed by the MoP at the central level and by the state energy ministries at the state level. These policies become the governing blocks for the sector. Based on these policies, various rules and regulations are issued by the respective authorities, including the CEA, CERC, SERCs, etc.

India has the most evolved policy and legal framework for power generation, transmission and distribution amongst the South Asian countries. The Electricity Act of 2003 provides the legal foundation for the power sector in the country. The Electricity Act of 2003 was introduced to promote competition in the Indian power sector and its adoption triggered the process of changing the Indian power sector from a vertically integrated power market to an unbundled power market.

India has a robust policy framework that includes several policies aimed at the development of different sections of the power sector. Some of the key policies include the National Tariff Policy issued by the MoP in with the aim of adding new generation capacity and enhancing per capita availability of electricity to consumers. Further, it also focuses on development of RE in the country through enabling provisions for off-take and inter-state sales/purchases of RE. Under the National Action Plan on Climate Change, India is focusing on the development of RE capacity through renewable purchase obligation (RPO) targets. Further, India has set a 175 GW target to be achieved by 2022. To revamp the distribution sector, India recently introduced a scheme called UDAY, to ensure that everyone has unlimited access to power. The scheme focuses on the improvement of operational efficiencies and incentives based on reduction in transmission and commercial losses. The evolution of policy and regulatory framework in India is shown in *Figure 36* below.

Figure 36: India – Policy and regulatory framework evolution



7 Energy sector planning and investments

Both domestic and foreign private players participate in energy sector. The generation sector is the biggest beneficiary of private participation. The GoI has ambitious plans to increase its generation capacity and to fuel renewables-based power generation. The traditional (mainly thermal) and emerging renewables sectors have seen significant participation by the private sector. This can be attributed to GoI's clear policy stand and its understanding of the need for clear revenue streams in the generation business. Nuclear energy is totally state-owned and private players are not allowed to own or operate nuclear power assets. Though, India has the technical capabilities and the resources necessary to develop nuclear power, the progress has been slow because of various factors like availability of fuel. Power transmission within the states and inter-state is mainly owned by government organizations.

The transmission and distribution sectors struggle with inefficient structures, high transmission & distribution losses, inability of customers to pay in some areas, subsidization, and political inferences. To bring more private investment into the transmission and distribution sectors, it is imperative to introduce business friendly rules with investment protection and to distance politics from business. Because government companies essentially have a monopoly in the transmission and distribution sectors, it is difficult for private sector participants to enter into a market which is favorable to incumbents due to the steep learning curve new private sector participants would have and also because of economies of scale. Distribution utilities are facing huge debt and there have been many efforts by the state and central governments to improve their debt condition by restructuring and other means.

Table 15 below illustrates private investment by sector.

Table 15: Investments in Indian power sector

(in USD Billion at 2016 exchange rate)

Investment	Centre Sector	State Sector	Private Sector	Total
Thermal	7.17	8.21	25.50	40.87
Hydro	5.18	1.18	1.02	7.39
Nuclear	3.92			3.92
Biomass				1.55
Small Hydro projects				1.18
Solar				7.28
Wind				9.90
Captive Projects			9.57	9.57
Modernization of Plants	2.92	1.77		4.70
Transmission	14.73	8.10	3.68	26.51
Distribution	7.10	35.07	2.94	45.11
Energy Efficiency	1.10			1.10
Human Resources	0.61			0.61
R&D	0.61			0.61
Advance for 13th Plan (2017-2022)	24.36	2.27	13.52	40.15
Total Investment proposed				**202.18**

Source: Niti Aayog (Planning Commission)

4.3.3 Role of civil society and media

India is the largest democracy in the world and is guided by a constitution which provides for freedom of speech and expression. The federal structure is bicameral (with a Lower and Upper House) with multi-party participation. The judiciary is independent of the executive branch. Judges often display considerable activism in response to public interest litigation matters.

The civil society plays an important role in economic development and in preserving the culture and the environment of the country. The roots of its autonomous civil society can be traced back to the traditional or ancient history of the country. Cast panchayat or village panchayat or even trade associations are examples of institutes that remain outside the control of local and state government. In independent India, voluntary organizations have existed as community associations or cooperatives, and they are an integral part of the traditional Indian society. They have not only complemented government's effort to bridge the gap that is left in the development process, but also have assisted people to participate in making decisions related to activities that have a bearing on their day-to-day lives.

The shape and form of voluntary organizations have evolved as the country's political and democratic sphere became more mature. By the 1980's the voluntary groups became more specialized and the participation of civil society now started taking place primarily through three different groups. The first group is considered the traditional non-governmental organizations (NGOs) who undertook the tasks of running literacy programs in villages. The second group of NGOs were those who specialized in a area and then lobbied the government or within industries for the betterment of the citizens who were affected by the cause. The third and final group of NGOs were more activist than others and often engage a broader group of people to highlight an issue and often use the media, which has always been independent in its resolve. Perhaps Narmada Bachao Andolan (the Save Narmada Campaign) is one of the best-known examples of an NGO in this category. Through this campaign the organization opposed construction of a series of large dams in a large river valley of central India. The members of

this NGO believe that large dams worsen water scarcity for most of the people in the long run rather than solve the problem, and they oppose the displacement it creates upstream of the dam.

The economic liberalization that took place in 1991 brought more changes to how civil society engaged with the government. The role of the private sector in the country's development process became much more important as the government opened sectors that were once restricted for investment by the private sector. This change brought about new and emerging associations to act as intermediaries between the government and the people. These associations or group of experts assist the government in following due process through consultation and address concerns or hear public comments from a wider group of people before any policy, rule or law is implemented. The emphasis has been placed on transparency, consultation, and public engagement in policy formulation and decision making by the government.

The media in India is independent and much of it is privately controlled. While the state continues to dominate the radio, privately owned television and print sectors have expanded considerably over the past decade, with many new outlets targeting specific regional or linguistic audiences. Internet access is largely unrestricted, though officials periodically implement overbroad blocks on supposedly offensive content to prevent unrest. Section 66A of the 2000 Information Technology Act criminalizes the sending of offensive messages by computer, and this has been interpreted in a way that allows for censorship of critical commentary on political parties

4.3.4 India - Key challenges and risks

The risk assessment for electricity sector in India is provided in *Table 16* below.

Table 16: India – Risk Assessment

Risk Factors	Description	Level of Risk
Business environment	• Stable political regime • Well established policy and regulatory framework in place	Low
Project construction	• Defined environmental, social, rehabilitation framework • Land acquisition is a challenge • Established supply chain for energy within the country	Medium
Off-taker	• Financial condition of utilities in certain states is cause of concern though Government has introduced scheme to improve the condition • Utilities' tariffs regulated by state regulators	High
Commercial	• Power market framework is well established • Contractual framework for generation, transmission and distribution sectors is well defined	Low
Operational – Generation	• Focus on hydropower	Low
Operational– Transmission	• Competitive bidding for transmission assets to bring down the tariffs • Well-developed open access framework for the transmission system	Low
Operational – Distribution	• Distribution system in rural areas needs to be improved	Medium
Cross-border electricity trade	• New Indian cross-border guidelines and draft regulations to manage the bilateral trade with neighboring countries	Low

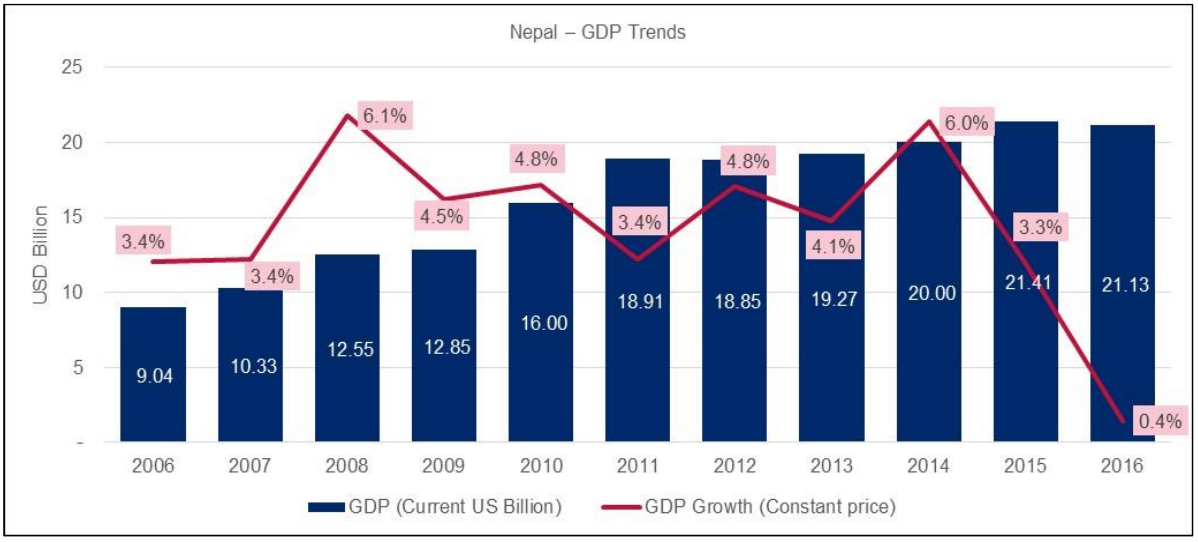
4.4 NEPAL

Nepal is a landlocked country located in Southern Asia. It is bordered by China on the eastern side (1,236 km) and by India on the western and northern side (1,690 km). It covers a total area of 143,351 sq. km. Forestland occupies 40.36 percent of Nepal's land mass and another 4.38 percent is covered by shrubbery.

4.4.1 Economic overview

The GDP of Nepal has more than doubled to 23.3 Billion (USD) since 2007. However, the growth rate has been fluctuating on year-to-year basis, within a range of three to five-percent. Macro imbalances have reduced over the years. First, the public debt has decreased markedly from 58 percent in 2000 to 25 percent in 2017. However, public debt may face additional increases as Nepal increases its macroeconomic footprint. Second, the current account balance, though it has been fluctuating, has shown strong improvement and has come down to under.3 percent in 2017. The GDP trends for Nepal is provided in *Figure 37* below.

Figure 37: Nepal – GDP Trends



Source: World Development Indicators, 2017

4.4.2 Nepal energy sector overview

1 Resource potential

Nepal has a high potential for renewable energy resources like hydro, solar, wind, biomass and other sources. The country has abundant hydroelectric potential. The theoretical hydroelectric potential has been estimated to be as high as 83,000 MW of which 42,000 MW are considered to be technically and economically feasible. Similarly, Nepal also has huge potential for solar energy. The country is located at a favorable latitude that receives ample amounts of solar radiation. From solar energy alone, around 2,920 GWh of energy per year can be harnessed with utilization of just 0.01 percent of the total land area of Nepal. Other renewable energy sources available in the country are biomass and wind. The sustainable supply of fuel wood from reachable areas of all land resources is around 12 million tons. The *Table 17* below shows the energy resource potential in Nepal.

Table 17: Nepal – Resource potential

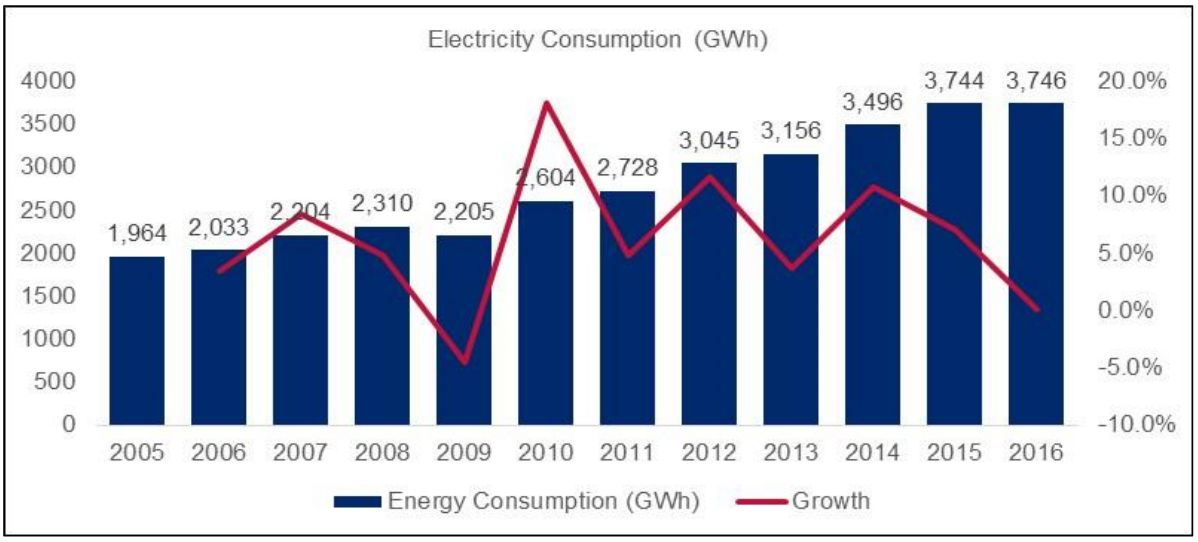
Country	Coal (Million Tons)	Oil (Million Barrels)	Natural Gas (Trillion cubic feet)	Biomass (Million Tons)	Hydropower (Gigawatts)
Nepal	0	0	0.0	27.04	42.00

2 Electricity demand and supply

The electricity consumption has been steadily increasing in Nepal over last decade. The growth in consumption has been constrained over past 5 years due to lack of availability of adequate supply. Still

the consumption has grown at an annualized rate of 6 percent over past 10 years as shown in *Figure 38* below.

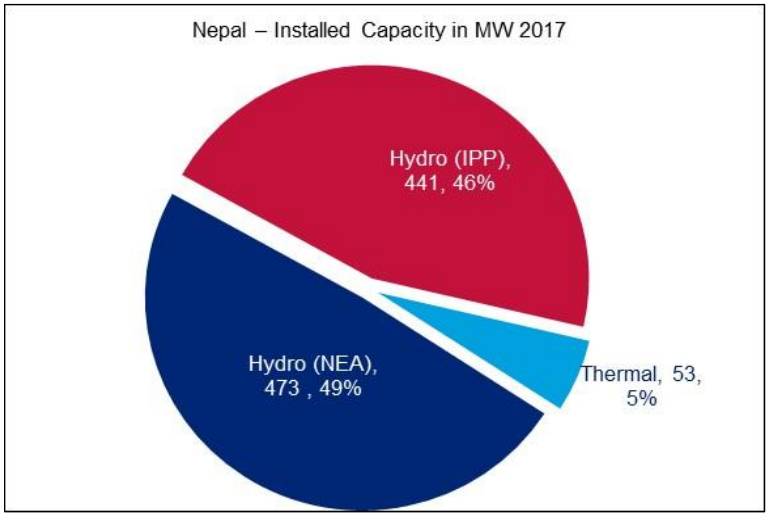
Figure 38: Nepal – Electricity consumption



Source: NEA Annual Report 2017

The present installed capacity of Nepal is 856 MW (NEA owned and IPPs). The power system in Nepal is dominated by hydropower which accounts for about 93 percent of the energy generated and the balance is met by multi-fuel plants. Until 1990, hydropower development was under Nepal Electricity Authority (NEA). However, with the enactment of Hydropower Development Policy in 1992, the sector was opened to the private sector. There are number of projects already built by private developers and several more are in various stages of development. The installed capacity of projects developed by private sector is 441 MW and the list of IPPs in Nepal is provided in Annexure 2. The total installed capacity at the end of 2017 was 972.5 MW. The breakup between hydro and thermal generation is shown in *Figure 39* below.

Figure 39: Nepal – Installed capacity



Source: NEA Annual Report 2017

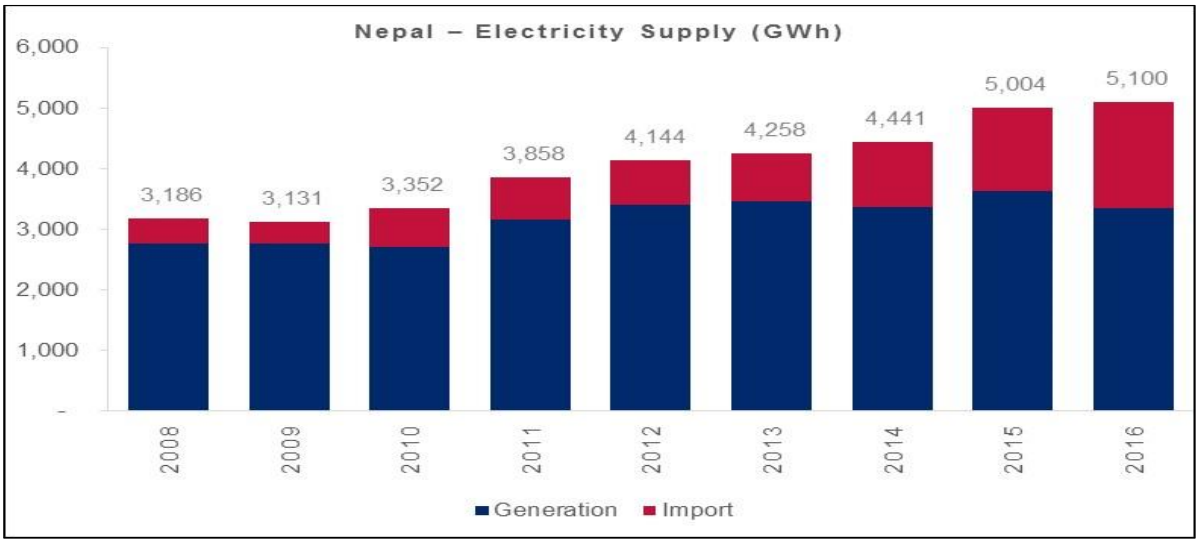
The total electricity generated in Nepal is not sufficient to meet the demand. The gap between demand and supply is partly mitigated by importing power from India to the tune of 350 MW from India and the rest through load shedding. The power exchange still takes place in radial modes between NEA and the utilities on the Indian side. Nepal receives power through three modes.

- River Treaties: Koshi Treaty, Gandak Treaty and Mahakali Treaty

- Border Town Exchange Program
- Commercial power trading through Indian power traders

The electricity generation and procurement of power from India has been increasing over last two years. Capacity additions have been delayed due to natural calamities, nevertheless, the purchase of power from India has witnessed an increase with the commissioning of interconnection between Muzaffarpur and Dhalkebar in 2016. The Government of Nepal is committed to promoting cross-border trade of electricity and is importing 27 percent (2016) of the electricity from India to meet the domestic needs. The *Figure 40* below shows the historical trends in electricity supply in Nepal.

Figure 40: Nepal – Electricity supply



Source: NEA Annual Report 2016

3 Electricity pricing

The current electricity tariff structure, in which prices are insufficient to cover costs, is one of the main deterrents to private investment. Electricity is highly subsidized, and this contributes to the present situation in which demand greatly outpaces supply.

4 Sector reform and restructuring

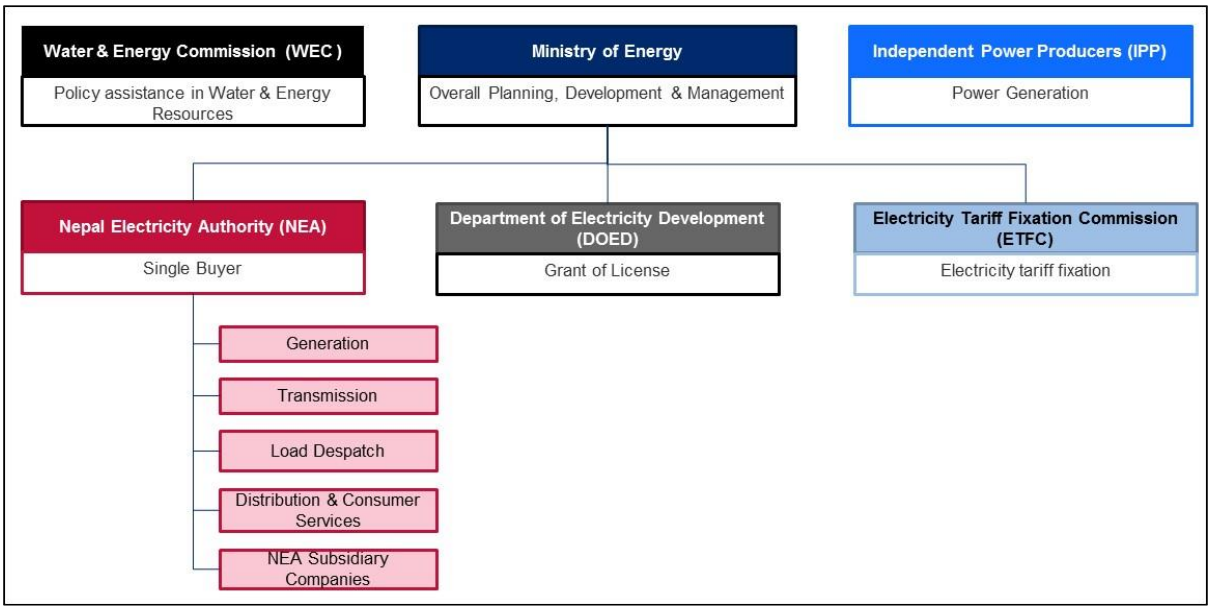
Nepal's electricity sector is comprised of state-owned vertically integrated Nepal Electricity Authority (NEA) which was established in 1984. The NEA is responsible for generation, transmission, distribution, and load dispatch functions. It is the sole buyer of electricity in the Nepali market and controls around 65 percent of the generation. It is also responsible for overall system planning and cross-border transactions with India. There is a plan to separate out the generation, transmission and distribution functions from NEA as part of overall reforms planned. A new transmission company, Rastriya Prasaran Grid Company Limited, has been formed in Nepal in 2015 to undertake the construction and operation of transmission line projects in Nepal.

5 Institutional framework

The power sector in Nepal is under the jurisdiction of the Ministry of Energy (MoE). The Department of Electricity Development (DoED) was formed in 1992 under the Ministry of Water and Resources (MOWR) as the Electricity Development Center. DoED is responsible for all matters relating to bilateral and multilateral dialogues, and any agreements and understandings regarding electricity. Consumer tariffs are regulated by the Electricity Tariff Fixation Commission (ETFC), which was formed in 2011. ETFC includes representatives from NEA, MOWR, Nepal Rastra Bank, consumer forums and independent experts, and is responsible for fixing the electricity tariffs to be charged and collected by the NEA. The water and energy commission (WEC), was established to develop water and energy resources in an integrated and accelerated manner and is primarily responsible for assisting the Government of Nepal, the Ministry, and other related agencies in the formulation of policies and the planning of projects in the water resources and energy sectors.

The NEA is a government institution and is responsible for the generation, transmission, and distribution of electricity in Nepal. It undertakes system planning studies including demand forecasts and generation planning. The power trade department of NEA is responsible for trading of electric power in both the domestic and cross-border market. The power trade department is single interface between the NEA and Independent Power Producers (IPPs) and is responsible for processing applications for PPAs. NEA is in the process of unbundling its vertically integrated structure to improve operational efficiency. Nepal is also characterized by private sector participation in electricity generation. The private generators sell power to NEA. The institutional structure of power sector in Nepal is provided *Figure 41* below.

Figure 41: Nepal – Institutional framework



6 Policy, legal and regulatory framework

The hydropower sector was opened for private sector participation in 1992 under the Hydropower Development policy and since then, around 100 IPPs form part of the generation sector and contribute around 35 percent of the installed capacity. The Electricity Act of 1992 provides that obtaining a license is mandatory for conducting surveys, and for generation, transmission or distribution of electricity where the capacity is above 1000 kW. The Department of Electricity Development (DoED) is responsible for granting these licenses.

Policy making and regulation in Nepal is a centralized process. The MoE is responsible for the formulation of policies. The Electricity Act enacted in 1992 and the Electricity Regulations Act enacted in1993 are the main laws governing the sector.

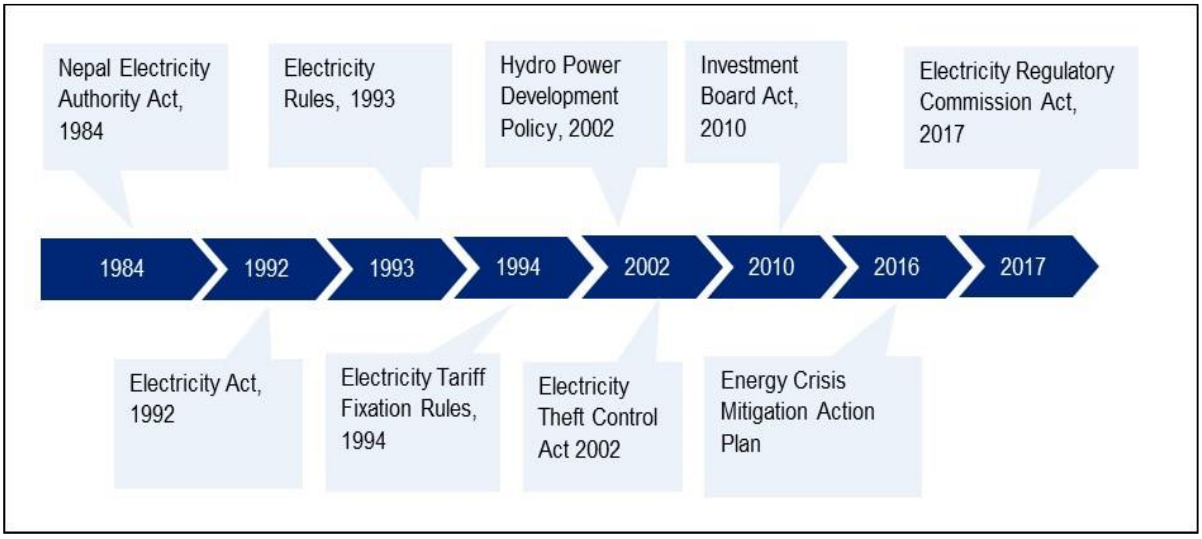
The hydropower policy announced in 1992 and subsequently revised in 2001 aims to develop existing hydropower potential as an exploitable commodity, seeks to promote private sector investment in hydropower, and aims to expand electrification within the country and establishes the basis for export.

In 2012, the Government of Nepal transferred the responsibility for negotiating concessions from MOE to Investment Board of Nepal (IBN) which reports directly to the Prime Minister. IBN has taken the lead in mobilizing resources to sign concession agreements or project development agreements (PDAs) for the two export-oriented hydropower projects (Arun 3 and Upper Karnali) in 2014. These PDAs are being used as a template for negotiating all future export-oriented hydropower projects.

An independent regulatory commission is proposed to be set up shortly after the enactment of Electricity Regulatory Commission Act in July 2017.

Nepal's power sector is governed by several Acts, Policies and Regulations which constitute the statutory framework under which public and private energy supply activities take place. The key acts rules and regulations are shown in *Figure 42* below.

Figure 42: Nepal - Policy and regulatory framework evolution



The Electricity Act which is currently applicable, requires key changes in order to facilitate reform and restructuring of the power sector. Some of these changes also relate to the key objective defined in Hydropower Development Policy, 2059 (2002) which is to develop hydropower as an exportable commodity by pursuing a strategy of bilateral and regional cooperation. The Electricity Act 2049 (1992) has no provisions for the following aspects of cross-border trading:

- Recognizing power trading as a separate activity
- Establishing a process for issuance of trading licenses
- Providing non-discriminatory open access for transmission
- Providing for bilateral resolution of disputes

The absence of any regulatory framework in the country also impacts the development of the power trading framework which, if in place, would support cross-border trading and facilitate overall development of the trading function. Having a regulatory framework in place can help fill the key gap areas noted below:

- Having appropriate guidelines, monitoring and approval mechanism for development of integrated power system which would focus on internal and cross-border requirements
- Having approved technical interconnection codes and standards for cross-border connectivity
- Having a mechanism for fixing of transmission and open access charges
- being able to determine the trading margin, fees, and other charges associated with cross-border trading
- Having a framework for arbitration for dispute resolution

The limitations in the current policy and regulatory framework pose significant challenges to the creation of an independent power market structure within Nepal. Countries like India, Bangladesh, and Sri Lanka are in various stages of restructuring their power sector while Nepal has yet to initiate a viable process which would facilitate cross-border trade. Currently, power trading activities are not recognized as a distinct licensed activity in Nepal and suitable amendments to the existing acts and regulations would be required to create a comprehensive enabling legal framework in Nepal.

4.4.3 Role of civil society and media

Nepal's economy is politically unstable with Nepal having had eight governments in the past decade. The country transitioned from autocratic rule in 1990 to military rule from 2002-2007, and now has become a republic. Nepal ratified its first democratic constitution in September of 2015. This established a bicameral parliament with the prime minister as chief executive and organized the state into seven new provinces. Under the new constitution, the Constituent Assembly (CA) was transformed into Nepal's parliament, with a term ending in January 2018. The CA has been replaced by a bicameral

legislature consisting of a 275-seat House of Representatives and a 59-seat National Assembly. The general elections in Nepal took place in November 2017 and a new government has subsequently been formed.

As stated above, Nepal's transition to democracy began in 1990. During this transition multiple civil rights movements were carried out with an aim to seek democracy and freedom. In addition, the country also witnessed an armed civil conflict. The emergence of the country from a monarchy to multi-party rule set the stage for increased citizens' participation not only in civil liberties and politics but also in terms of expressing dissatisfaction at some of the decisions undertaken by the then head of the state. The West Seti dam is one of the examples where the Kathmandu based Water and Energy User's Federation of Nepal voiced environmental concerns on the construction of this project and the loss of livelihood of communities that depend on it. The decision to construct the dam was put on hold in 2007 and was cancelled in the year 2011. The plan for construction of the said dam has been revived through a JV between NEA and China's Three Gorges Corporation.

The government recognizes that public policy is not the sole domain of the state and that state and non-state actors such as those in the private sector, international agencies, industry bodies, individual experts, and others play a substantial role in influencing and shaping public policies.

The 2015 constitution provides for freedom of expression and prohibits prior restraints on the freedoms of the press, though these rules can be suspended in cases of national emergency. The constitution also states that the prohibition against prior restraint does not forbid restraints on the press that impose reasonable restrictions relating to national security. There are a variety of independent radio and print outlets in Nepal. Internet usage and internet media are unrestricted, and their growth has provided unprecedented access to information and provided public space for debate. In practice, media workers have frequently faced threats at the local level.

4.4.4 Nepal - Key challenges and risks

The present single buyer model is more suited for the import of power but when cross-border trading is scaled up, there will be additional opportunities for Nepal both in the short-term (real-time, day-ahead or week-ahead basis) as well as medium-term (one to three-year contracts) which cannot be addressed under the existing power trading institutional framework. The Power Trade Agreement (PTA) signed between Nepal and India in October 2014 opens up new avenues of cooperation in the power sector. This will require realignment of various institutional, legal, and regulatory frameworks of the countries in the region. The current power trading institutional framework in Nepal is inadequate to exploit power trading opportunities at the regional level. While Nepal is likely to be a net importer of power in the short term, the commissioning of new hydro projects from 2017 onwards will make Nepal a power surplus nation in the medium- to long-term.

The current power sector institutional framework in Nepal lacks a full-fledged regulator to address the requirements of formation and operations of a trading company. The current regulatory framework only regulates the licensees including the fixation of tariffs. If the electricity trading were to be recognized as a distinct licensing activity, granting of trading license would be a pre-requisite. For an evolved power market structure, the regulators are responsible for regulating and monitoring the power trading activities. However, the existing Electricity Act of Nepal does not have provisions for a power trading license and the proposed amendments in the Electricity Act only provide for issuance of power trading license by the Government. The proposed bill includes a provision for the unbundling of NEA. It needs to offer greater clarity on the wholesale power segment and whether this function is to be undertaken directly by the successor distribution utility or through a single buyer structure.

Power trading activities require the independence of the transmission function to provide non-discriminatory open access for power traders to the transmission network. The determination of transmission charges and losses requires a sound regulatory framework. To avoid conflicts of interest, transmission entities should not be allowed to participate in power trading. The other key aspect would be to evolve a mechanism for cost segregation and earmarking so that there is no socialization of costs between the export-oriented transmission evacuation infrastructure and the transmission projects for the Nepal power sector. This is in addition to the guidelines to be established for the system operation. The separation of the transmission function is under active consideration under the proposed unbundling of NEA.

In Nepal, the generation, transmission and distribution of electricity are licensed businesses. The current legislative framework does not have provisions for licensing of the electricity trading. In this context, under the present legal regime, electricity cannot be considered as a commodity which can be

traded or exchanged in open market. The risk assessment for electricity sector in Nepal is provided in *Table 18* below.

Table 18: Nepal electricity sector - Risk assessment

Risk Factors	Description	Level of Risk
Business Environment	• Unstable political regime with constant changes in government • Policy framework needs to be updated to address the cross-border electricity trade • Lack of regulatory framework increases the risks	High
Project Construction	• Defined environmental, social, rehabilitation framework but limited processes to back it up, leading to delays in implementation	High
Off-taker	• PPAs for domestic off-take with single buyer backed by sovereign guarantees • Financial condition of single off-taker (NEA)	Medium
Commercial	• Forex fluctuation risk for the developer • Limited experience in PPP framework	Low
Operational – Generation	• Limited diversification in supply portfolio - Hydropower is the only source • Dependence on run of the river projects which have seasonal generation variation	High
Operational – Transmission	• Limitations in transmission system restricting transfer of power to various regions • No provision of open access on transmission system	Medium
Operational – Distribution	• Electricity access for population is an issue, Distribution system in rural areas needs to be improved	High
Cross-border electricity trade	• Power transfer capacities with India being augmented to allow additional 5000 MW of electricity transfer, • New Indian cross-border guidelines pose certain restrictions on ownership	Low

4.5 BURMA

Burma, officially the Republic of the Union of Burma, is a sovereign state in Southeast Asia bordered by Bangladesh, India, China, Laos and Thailand. About one third of Burma's total perimeter of 5,876 km, is made up of an uninterrupted coastline of 1,930 km (1,200 miles) along the Bay of Bengal and the Andaman Sea.

Burma has been reconnected with the world economy since it undertook major reforms in 2011. Its GDP growth increased from 5.6 percent in 2011 to an average of over eight percent during 2013- 2015, reflecting strong growth in construction, manufacturing, and services. Growth is expected to maintain the more than eight percent rate over the next few years. This optimistic projection is based on the country's abundant natural resources; strategic location at the crossroads of Asia; and a large, youthful population. To realize this continued growth the country needs to successfully implement extensive reforms, to integrate its policies, build basic infrastructure, and tackle its many bottlenecks.

The development of the energy sector is the key to Burma's future growth. The economy is predominantly agriculturally based, with agriculture contributing approximately 36 percent of the overall GDP, down from 57 percent in 2001 Liberalization of the economy and an opening to foreign direct investment has prompted rapid growth of the industrial sector, notably exports of natural gas. Thus, the growth of the industrial sector in the country's GDP has more than doubled to 26 percent.

Deep economic sanctions imposed by many countries in the late 1980s, in response to Burma's suspension of democratic liberties, clearly hampered development. For nearly three decades, Burma lost almost all access to international investment and assistance, including from the Asian Development Bank (ADB) and the World Bank. Consequently, development of Burma's energy sector has lagged greatly behind its potential.

Among the economic reforms Burma is undertaking, the new Land Law and Foreign Investment Law, 2016 address issues fundamental to development like right to use of land, guarantees by government to protect the interest of investors, expropriation of funds, and settlement of dispute. The unification of the former multiple exchange rate system is also an impetus to development. Investments in the energy sector is expected to be an important driver of the economy. This opens the possibility of extensive international assistance for Burma's energy sector, including the establishment of partnerships with the private sector.

Burma's economy is predominantly agriculturally based, with agriculture contributing approximately 36 percent of the overall GDP, down from 57 percent in 2001 while the contribution of the industrial sector in the country's GDP has more than doubled to 26 percent. Liberalization of the economy and opening up to foreign direct investment has prompted rapid growth of the industrial sector, notably exports of natural gas.

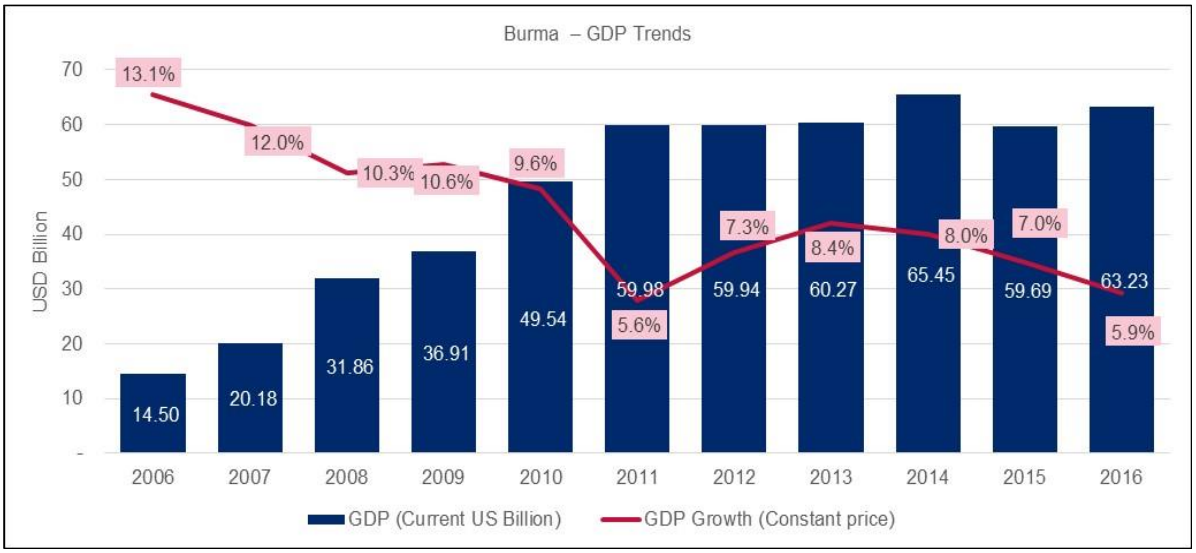
In the late 1980's, in response to Burma's suspension of democratic liberties, many countries imposed deep economic sanctions on Burma. This clearly hampered Burma's development. For nearly 3 decades, Burma lost access to most international investment and assistance, including from the Asian Development Bank (ADB) and the World Bank. Consequently, development of Burma's energy sector has lagged greatly behind its potential.

Among the economic reforms, introduction of new Land Law and Foreign Investment Law and unification of the former multiple exchange rate system addresses some of the key challenges in attracting foreign investments. This opens the possibility of extensive international assistance for Burma's energy sector, including in partnership with the private sector.

4.5.1 Economic overview

After witnessing a GDP growth rate of over 10 percent during the period from 2000 to 2007, the GDP growth rate has moderated to the 6-7 percent levels. The GDP of the country has increased seven-fold since 2000 and three-fold since 2007 to USD 63 billion in 2016. Favorable fiscal and monetary policies, positive investment flows, and wide-ranging reforms across various segments intended to open up the economy were largely responsible for this growth. The GDP is likely to grow further as the value of production within the boundaries of the country increases due to eased sanctions from the U.S. and an encouraging policy agenda from the new government. The GDP trends for Burma is shown in *Figure 43.*

Figure 43: Burma - Economic profile



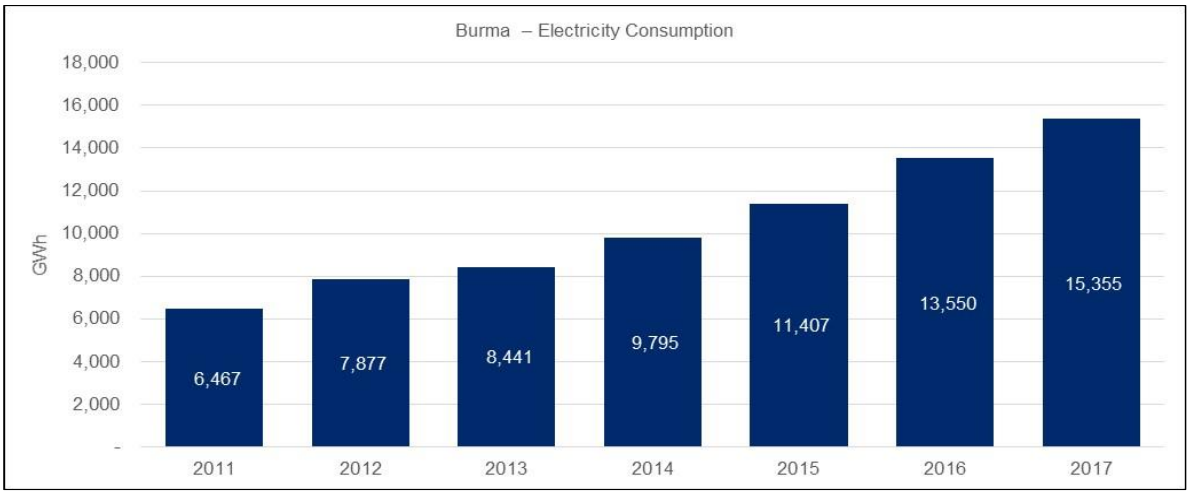
Source: World Development Indicators, 2017

4.5.2 Burma - Energy sector overview

1 Electricity demand and supply

The electricity demand in the country is likely to increase based on strong economic growth. The rate of increase in economic activity will raise demand for power or electricity services for consumption and production. The energy consumption in the country has grown at a health CAGR of 16 percent since 2011 as shown in the *Figure 44* below.

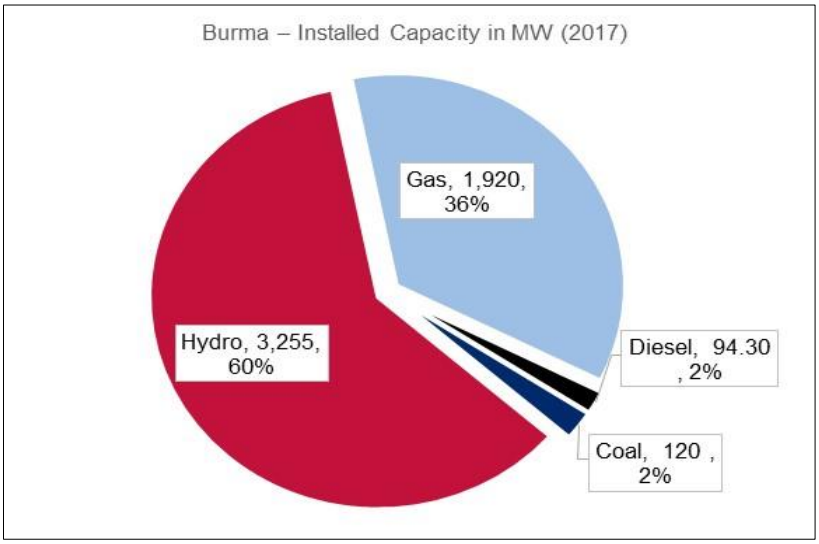
Figure 44: Burma – Electricity demand



Source: MOEE Presentation "Power Development Opportunities"- Myanmar Investment Forum 2017

As of 2017, the installed capacity in Burma was around 5,389 MW. The energy mix in the country is dominated by hydropower, which constitutes 70 percent of the overall energy portfolio followed by gas, which constitutes 36 percent. The installed capacity trends for Burma is shown in *Figure 45* below.

Figure 45: Burma – Installed capacity



Source: MOEE Presentation "Power Development Opportunities"- Myanmar Investment Forum 2017

While hydropower will continue to remain the mainstay of the country's electricity mix, contributing around 40 percent of the total capacity, the share of coal in the fuel mix is likely to increase to 33 percent while the share of natural gas will reduce from the current levels of 26 percent to 20 percent. This indicates a major shift in the fuel-mix for Burma.

It has been forecasted that the country's electricity demand is expected to grow to 9,100 MW by 2030. Household and Industrial growth are likely to be the key sources for the increase in demand for electricity in the country. While the growth in industrial consumption will happen because of increase in

economic activity, the growth in household demand will be due to increase in penetration of household electrification and because of increase in per capita consumption.

2 Cross-border trade of electricity

Burma is located between the geographic and political regions of South and Southeast Asia and China and is committed to promoting trade ties in energy and electricity with countries those regions. There is an ongoing electricity trade arrangement with India through which Burma imports 3 MW of electricity, and Burma has bilateral ties with neighboring countries in Southeast Asia and has signed a MOU for trade in electricity.

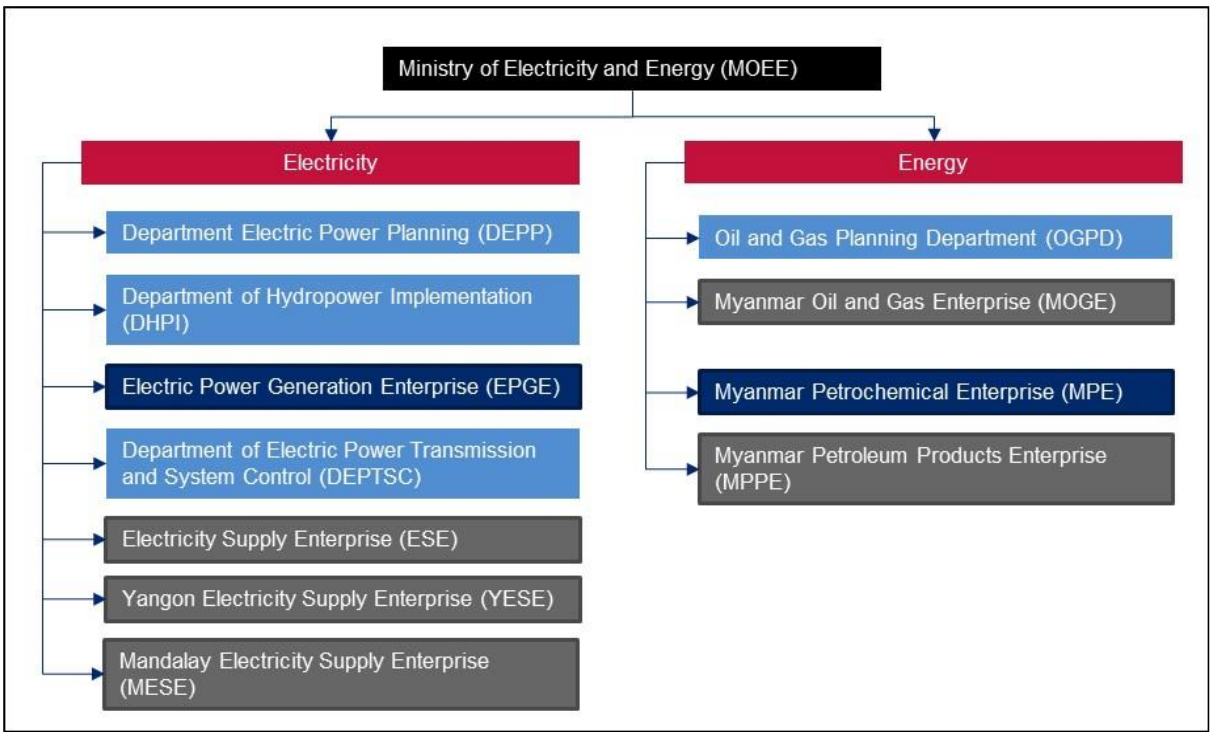
3 Electricity pricing

The MOEP has the right to set reasonable electricity pricing and service charges for a particular place and such rates are subject to change from time to time. Likewise, regional and state governments as well as the Self-Administrated Zones (SAZ)and the Self-Administrated Divisions (SAD) can set their own reasonable electricity pricing and service charges in their jurisdictions. Electricity is purchased by the Electric Power Generation Enterprise and distributed to consumers by Yangon Electricity Supply Corporation, Mandalay Electricity Supply Corporation, and Electricity Supply Enterprise ("single state-owned buyer model").

4 Institutional framework

In Burma, eight ministries are involved in various capacities in the overall functioning of the energy sector. These include the Ministry of Electricity and Energy (MOEE); Ministry of mineral resource & environmental conservation; Ministry of industry; Ministry of education and Ministry of agriculture, livestock and irrigation. MOEE was formed out of joining of the Ministry of Electric Power (MOEP) and Ministry of Energy (MOE) on April 1, 2016. MOEE is responsible for the petroleum, geothermal and electricity portfolios. It has four departments, five enterprises and two corporations under it. The *Figure 46* below shows the institutional framework for electricity sector in Burma.

Figure 46: Burma – Institutional framework



5 Sector reform and restructuring

The electricity sector in Burma was historically governed by the Electricity Law enacted in 1984 and amended in 1990) until it was replaced by the new Electricity Law enacted by the Burmese Parliament on October 27, 2014. The old electricity law was enacted during Burma's socialist period and lacked the legal framework to include private sector participation in power projects and IPPs. The old law empowered the government to grant rights to specified organizations, including foreigners to participate

in the sector. In addition, the old law placed a great deal of importance on the electricity inspector by making the Electrical Inspection Department responsible for settling disputes between producers and consumers of electricity.

The new law was enacted to introduce a new legal framework that would reflect current international standards and encourage foreign and domestic investments in power projects in Burma. One of the main features of the new law is the establishment the Electricity Regulatory Commission (ERC) which has the responsibility of supervising the monopolistic electric power entities. The new Electricity Law provides a limited grant of regulatory responsibilities to the ERC.

6 Policy, legal and regulatory framework

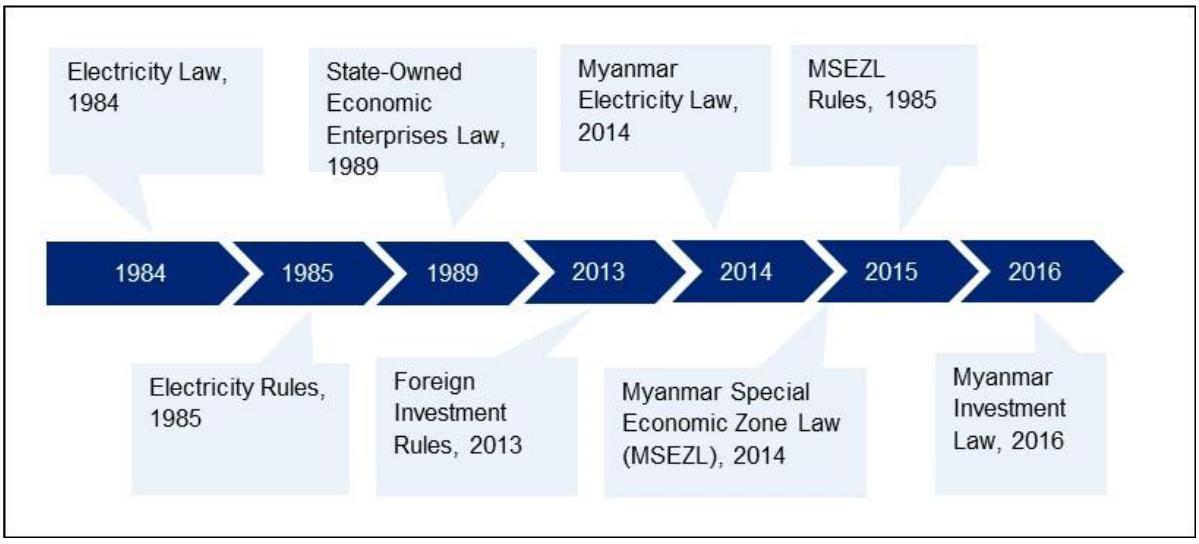
The Burma Electricity Law of 2014 governs the power sector of Burma. It institutionalizes ERC and awards them some regulatory duties. The law authorizes the MOEP, regional and state governments, and leading bodies of SAZ and SAD the power to grant permits to entities to engage in electricity-related works such as generation, transmission, and distribution.

The power sector of Burma is governed by the following policies –

- Effective utilization of the power generated from available resources such as thermal, hydro, solar, wind and other alternative resources by expansion of the national power grid
- Conduct an analysis of the social impacts of generation and transmission projects to minimize undesirable impacts
- Restructuring of the power sector to encourage participation of local and foreign investments and formation of competitive power utilities
- Boost the growth and development of power generation, transmission, and distribution throughout the country and the development of PPPs in each sector
- Conduct electricity generation, transmission, and distribution in accordance with progressive technologies, and develop private participation in regional distribution activities

The timelines of enactment of policies and legal framework for electricity sector in Burma is shown in *Figure 47*.

Figure 47: Burma – Policy and regulatory framework evolution



7 Investments in electricity sector

Burma's power sector presents several extraordinary opportunities for foreign investment in generation and transmission projects as the country seeks to move in line with the per-capita consumption rates and electrification rates of other Asian countries. Despite significant investment opportunities in the sector, there are challenges. While the government's policy has been to increasingly liberalize, decentralize, and open the power sector to foreign investment, investors in the sector face legal and regulatory challenges in a sector that is in full transition. Besides the wider economic considerations, the regulatory uncertainty associated with this transition is slowing down the conversion and the

implementation of power projects backed by foreign investments. This is one of the reasons why only a small number of foreign investment projects in the power sector were licensed by the Burma Investment Commission (BIC) in 2013. Burma still needs to develop contractual precedents and specific regulations and is at the stage in its development where it is still gaining experience and understanding on issues that are important to foreign investors in the power sector. According to the National Electrification Plan prepared by ministry, the total investment required for transmission and distribution sectors up to 2030 would be USD 40 billion for fulfilling the following electrification targets:

- 47 percent households to be electrified in 2020
- 76 percent households to be electrified in 2025
- 100 percent households to be electrified in 2030

The electrification will be achieved by achieving 99 percent electrification through national grid and remaining one percent through off-grid means.

In the generation sector, there are multiple opportunities for investments for foreign companies through JV or BOT route as identified by the government. This includes around 35 GW of capacity development in hydropower, around 10 GW for coal-based generation, 600 MW in gas-based generation and opportunities in renewables which are yet to be quantified.

8 SWOT Analysis

In the highly dynamic environment of an increasingly liberalized Burmese economy, economic laws and regulations play a pivotal role in the development of the sector. Over the past few years the government has worked towards strengthening the legal and regulatory framework in the country. The government and has also earmarked incentives and tax breaks for identified projects to facilitate the flow of foreign capital into the country. The *Figure 48* below provides the Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis for the investment scenario in Burma.

Figure 48: Burma - SWOT Analysis

Strength	Weakness
• Comprehensive legal framework to license foreign investment in the country. • Burma Investment Commission provides tax and other incentives on identified projects • Import tax exemptions, remittances of foreign currency, right to obtain work permits and right to extract profits are guaranteed under foreign investment law. • FDI limit is 100 percent in power sector	• The new electricity law is general in nature and therefore individual contracts are negotiated with the government. • Tariff structures are not well defined • Weak regulatory framework • Projects are structured on Build Operate and Transfer Model
Opportunity	**Threat**
• The demand and supply of electricity is likely to increase significantly by 2030 • The paying capacity of consumers will increase with projected increase in economic activity • Huge amount of investment will be required in both generation and transmission & distribution to meet the growing electricity needs.	• Evolving rules and regulation governing the power sector • The regulatory system lacks transparency and clarity • Inconsistent enforcement of regulations injects uncertainty into business decision-making • Inability to attract investments for electricity sector

4.5.3 Role of civil society and media

Burma's transition from military dictatorship toward democracy is ongoing. The relatively free parliamentary elections in 2015 ushered in a peaceful transfer of power to the National League for Democracy (NLD). The judiciary is not totally independent as appointment of judges are still approved by the government.

Following the military coup of 1988, the participation of broader stakeholders, including experts, NGOs and bureaucracy, in informing economic and investment decision making by the Government of Burma was severely limited. Following the coup public gatherings, speeches, publications of any documents in the state were banned. While Burma was under military rule, several other laws were passed that enabled further control over information dissemination. The rights of the media to express opinions and publish articles were curtailed and the country's media environment became one of the most restrictive in the world. Much has changed since the country's transition towards democracy in 2010.

The ban on internet was revoked, the media was granted freedom of expression, participation by the private sector in the economy was reinstated, and the private sector in now involved in the decision-making process when policies and rules are being formulated. The media is playing a role of an enabler by participating in debating and scrutinizing the policy and laws that are being proposed by the government. Reform that took place in the telecommunication sector is an example of the media's role in successful policymaking. The media highlighted that the members of parliament who were opposing a proposed draft telecommunications law were supporting the interest of the cronies and not the interest of the citizens. This led the president to warn the Parliament that Burma's credibility with international investors was at risk. The resulting law that was passed was favorable to the citizens of Burma.

The new investment law, passed by Burma's legislature and signed by President, is yet another example in which due process of consultation with government officials, private sector stakeholders, and civil society was carried out. Transparency, consultation, and public engagement in policy formulation and decision making by the government was emphasized.

While the above examples highlight the role being played by the civil society, the role of public and private sector and society at large in firming up policies and regulations and participating in issues that have a bearing on the day-to-day life of the citizens of Burma is an ongoing process.

Media freedoms have improved substantially since the official end of government censorship and prepublication approval in 2012. However, other restrictions limit journalists' freedom. Existing media laws allow authorities to deny licenses to outlets whose reporting is considered to have insulted religion or endangered national security, and the threat of prosecution under criminal defamation laws has encouraged a climate of self-censorship. Previous constraints on internet access have largely unraveled but is still subject to criminal punishment under broadly worded legal provisions. The Electronic Transactions Law, which has been used to criminalize political activism on the internet, mandates fines or prison terms of three to seven years for "any act detrimental to" state security, law and order, community peace and tranquility, national solidarity, the national economy, or national culture, including "receiving or sending" related information.

4.6 SUB-REGIONAL POLITICAL ECONOMY ANALYSIS

The electricity sector of South Asian countries shares a common historical legacy. The power sector in the region is evolving from a monolithic structure, where in the government was solely responsible for generation, transmission and distribution of electricity in the country, to segregated business functions. The reforms in the South Asian region were initiated in the early 1990's to address the inflating problem of power shortages and growing electricity requirements. The initial focus of the reform was to create space for private sector investment in the generation segment. India was the first country in the region to experiment with opening the sector for private sector by de-licensing the generation segment for both domestic and foreign investment. A year later, Bangladesh also de-licensed the generation segment for participation by the private sector.

Subsequently, the focus of reform was broadened to reduce dependence on state support for providing reliable supply, ensuring affordability, and to ensure that activities in the sector would be managed in an efficient and an effective way. The most effective way to ensure affordability and reliability of supply is to introduce competition in the distribution segment. India is the only country in the region which has been able to successfully introduce some degree of competition in the wholesale market by virtue of creating an energy market. However, the single buyer model still dominates the wholesale generation

market across the region. In Bangladesh, the power sector operates under a single buyer model. The BPDB acts as the single buyer of all the electricity generated in the country and sells bulk electricity to all the distribution utilities. There is no separate power trading entity and the role is being performed by BPDB. While partial unbundling has been undertaken in Bhutan, the government entity is still designated as the single buyer of electricity for all power projects, including the private ones.

In Burma, the enactment of new Electricity Law in 2014, replacing the old Electricity Law of 1984 has brought about significant changes and allows region and state governments to grant permits the entities to engage in electricity-related works such as generation, transmission, and distribution.

The transmission and distribution sectors continue to remain largely in the government's control across the region. While private sector participation in the transmission sector in India is being encouraged, the bulk of the inter-state and intra-state network is either owned by an entity owned by the central government or by the state-owned transmission entity. Several transmission links have been developed under the PPP framework in recent years, including the India-Bhutan transmission link constructed as part of a joint venture between private investors and the GoI. To improve the operational efficiency of the transmission sector and to remove the conflict between the network business and the operating arm, two functions of the transmission sector have been separated in India. Now there are two separate companies, one which is responsible for planning and creation of transmission lines and the other is an ISO responsible for efficient operation of the grid.

The distribution sector also remains largely under the control of the government. Even in India, most of the distribution companies are owned by the state governments, as electricity falls under the concurrent subject, with limited examples of privatization. Although it is unlikely that the government will dilute its ownership in the distribution sector, through government owned companies, an amendment has been proposed to separate the network and provide for retail ownership in the distribution sector. This move has been undertaken to bring in more efficiency in the sector and to arrest the mounting financial losses of the distribution companies by hiving-off the service element of the distribution business.

The provisions to establish independent regulatory commissions with clear mandates to bring stability to the sector have been introduced in most of the countries in the region. The regulator at the national level was established in India in 1998, while the provision of creating regulatory commission at the state level was introduced with the enactment of the Electricity Act 2003. The process of establishing an independent sector regulator is still pending in Nepal and Bhutan. The provision to establish a separate regulatory body is yet to be introduced in Bhutan. Presently, the BEA is responsible for setting tariffs; establishing and enforcing technical, safety, and operational standards; issuing licenses; and monitoring other regulatory functions in the country. Similarly, attempts are being made to establish an independent regulatory body through the passage of Regulatory Commission bill in Nepal. The bill was first introduced in 2007 and reintroduced in 2017. The bill is awaiting final approval from the members of the parliament, however there is a lack of political consensus in the country.

It is evident that electricity sector reforms in the region have been introduced with an objective to improve the operational efficiencies. There has been less emphasis on market-orientation wherein the shape of the sector is controlled naturally by the demand for goods and services rather than by government. India is the only exception to this in the region. India has introduced several market-oriented reforms, including the creation of short-term competitive power markets and provision of non-discriminatory open access. India has made numerous attempts to embrace broader market reforms that includes competition in the generation sector and to a marginal extent in the distribution sector. Unfortunately, the distribution sector continues to suffer from serious financial and operational inefficiency.

At the regional level, the lack of a cost reflective tariff and/or the ability of the distribution companies to recover the cost of supply are major contributing factors to the burgeoning financial challenges in the sector. The distribution sector is the only cash generating entity and ensures that liquidity is maintained in the system. The inability of the sector to recover the cost of supply has increased the systemic risk of the overall energy sector and has affected the ability of the electric utilities in many countries to invest the capital necessary to create additional infrastructure. The financial and operational inefficiencies in the distribution sector and the inability to implement corrective measures reflects the weaknesses in the structure and governance of the sector and reflects risks that need to be mitigated.

It is apparent that the electricity sector in the region is evolving at different rates and the stage of evolution varies from country to country. India is by far the most advanced country in the region and has successfully undertaken and implemented market-oriented power sector reforms. This disparity in the state of the sector across the region has implications on the development of cross-border electricity

trade and ultimately regional cooperation. In particular, incomplete power sector reforms can create barriers to electricity trade among the regional parties. Domestic policy distortions can erode incentives for stakeholders to expand generation and transmission capacity. Underpriced electricity not only increases the systemic risk in the sector but also makes it more challenging to attract private sector investment, including both domestic and foreign investors. Moreover, investment risks are higher when erstwhile partners in cross-border investment and trade are in a weak financial condition and may not be able to deliver on promised levels and quality of service.

Effective cross-border trade requires institutional capacities for tracking electricity flows, maintaining grid integrity, collecting and transferring revenues, and resolving disputes, among other functions. Inefficient and inertia-bound domestic electricity sector policies and regulatory institutions impede establishment of the desired quality of cross-border coordination.

Table 19 below shows the summary of sub-regional political economy analysis.

Table 19: Sub-regional political economy analysis

	Bangladesh	Bhutan	India	Nepal	Burma
Market structure - Generation	• Multiple sellers and single buyer	• Multiple sellers and single buyer	• Multiple sellers and multiple buyers. There is also competition with organized trading.	• Multiple sellers and single buyer	• Multiple sellers and single buyer
Private sector participation in generation and distribution	• Generation segment opened to private sector investment in 1992. • Distribution sector is still owned by government	• Generation segment opened to private sector investment in 2008. Distribution sector is still owned by government	• Generation segment opened to private sector investment in 1991. • Distribution sector is mostly state-owned, but there are states where distribution is partially privatized	• Generation segment opened to private sector investment in 1992. • Distribution sector is still owned by government	• Generation segment is open to private sector investment and has been further strengthened under the new electricity law. • Distribution sector is still owned by government
Ownership of transmission sector	• Independent government-owned transmission company	• Transmission sector is vertically integrated	• Unbundled transmission (separate network owner and system operator) and separate system operator in all states	• Transmission function is vertically integrated	• Transmission sector is vertically integrated as MOEP is both supervisor and facilitator of power sector
Provisions for regulatory independence	• Provision for establishing an independent regulator was introduced in 2003 with the passage of Energy Regulatory Commission Act 2003	• The provision to establish a separate regulatory body is yet to be introduced. Presently, the BEA is responsible for setting tariffs; establishing and enforcing technical, safety, and operational standards; issuing licenses; and monitoring other regulatory functions	• The provision for creating a separate regulatory body at the national level was first introduced in 1998. Subsequently, in 2003 with the enactment of Electricity Act of 2003, regulatory commissions at state level were also introduced	• Attempt to establish an independent regulatory body through the passage of Regulatory Commission bill. The bill was first introduced in 2007 and reintroduced in 2017 but is awaiting final approval.	• A new electricity regulatory commission was established in 2014 with the passage of Electricity Law of 2014. The commissions responsibility is to formulate policy, prepare tariffs, advise MOEP, set standards and perform inspections, but it has only very recently started operations.

	Bangladesh	Bhutan	India	Nepal	Burma
Cost reflective tariffs	• Electricity prices are subsidized, and lack of cost reflective pricing is one of the major contributors to the financial distress of the distribution companies	• Electricity prices are subsidized and there is a lack of cost reflective pricing	• Lack of cost reflective pricing is one of the major contributors to the financial distress of the distribution companies	• Electricity prices are subsidized and lack of cost reflective pricing	• Electricity prices are subsidized and lack of cost reflective pricing
Presence of wholesale or energy only market	• No wholesale or energy market	• No wholesale or energy market	• Electricity Act of 2003 allowed establishment of power exchanges in the country to promote competition in the power sector.	• No wholesale or energy market	• No wholesale or energy market
Responsiveness to the needs for cross-border electricity trade	• Supportive of cross-border electricity trade mostly driven by the country's growing electricity requirements and increasing gap between demand and supply of electricity	• Supportive of cross-border electricity trade as import of electricity is a big source of revenue for the government	• Supportive of bilateral electricity trade. The MoP has provided guidelines for the engagement of cross-border electricity trade.	• Politically supportive of cross-border electricity trade	• The new political system generally supports cross-border electricity trade as Burma is already importing 3MW of electricity from India and is an exporter of gas to China
Support for regional electricity trade	• Evaluating possibility of importing power from Bhutan through Indian interconnections	• Supportive. Have shown willingness to engage in trilateral agreements	• Cautiously supportive. As current transmission system may not have the bandwidth to be utilized for regional trade	• Supportive. Have shown willingness to engage in trilateral agreements	• Is interconnected with Southeast Asia. More interconnections have been proposed for future
Drivers for cross-border electricity trade	• Growing electricity requirements, limited availability of electricity and high cost of power	• An important source of revenue for the economy. Almost 70 percent of electricity generated is exported to India	• Willingness of other countries to procure power from the Indian market	• Limited availability of electricity	• Huge power deficits, limited installed capacity and growing electricity requirements

4.7 REGIONAL RISK ASSESSMENT

Huge amounts capital will be required to create the necessary infrastructure to improve the provision of electricity in the region and to support the projected economic growth. One of the biggest challenges in realizing these objectives is the lack of adequate financing available to the region. Two of the main reasons for the apparent decoupling of finance is the medium to higher overall riskiness of the region and the limited risk appetite of institutional and/or foreign investors to invest in risky projects.

From a project implementation perspective, the overall risk in the region ranges between moderate to high although the business sentiment has improved considerably over the past few years due to high stability on political, economic and policy front for India and steady improvements for other economies.

The factors that add to the risk in the region include business environment risk, delays in project completion, changes in the regulatory environment which impact the economics of the projects, honoring of contracts, and the number of approvals required for commissioning or starting a project. However, such risks vary from country to country. As an example, India has a very low risk in business environment. It has a sound democratic political structure in place with established legal, policy and regulatory frameworks. Contrary to this, business environment risk in some of the other Southeast Asian economies is relatively higher due to changing political landscape and evolving policy and regulatory framework.

On the macroeconomic level, exchange rate risk is one of the risks for which investors seek additional return. Given the unpredictability in the global macroeconomic environment the region is susceptible to the variability in the exchange rate risk and investors prefer to either hedge it or seek additional premium for exposing themselves to this risk element. Changes in regulatory frameworks, which are often implemented retrospectively, is another risk element that reduces the invest-ability index in the region. Long-standing structural problems including poor public financial management and underdeveloped legal and regulatory frameworks in Burma is another example of some of the higher political and regulatory risks in the region. In addition, fragile monetary stability largely reflects excessive money creation to fund fiscal deficits and arbitrary taxation policies and marginal enforcement of property rights have driven many enterprises into the informal sector.

Operational risks are also factors that have the potential to prevent the flow of investment into the region. An example of such a risk was the inability of the Bangladeshi government to provide a guaranteed supply of natural gas for a proposed 3 billion (USD) power project investment in Bangladesh by an Indian company resulted in the latter abandoning the business venture altogether. *Table 20* below shows the regional risk assessment.

Table 20: Regional risk assessment

Category	Key Risks	Risk Assessment
Macroeconomic, political and regulatory risk	• Foreign exchange risk • Discriminatory changes in law • General changes in law	High because of managing the foreign exchange risk
Construction risk	• Delay in project completion • Changes in law • Cost overturn	Moderate because of constant delays in project completion
Operational risk	• Demand risk • Local experience	Low
Credit risk	• Offtake risk	High because of difficult financial condition of utilities

5 BURMA: A BRIDGE BETWEEN SOUTH ASIA AND SOUTHEAST ASIA

The availability, accessibility, and affordability of electricity is the key to economic development. Without adequate power, the economic engine of a country is not sustainable. There is power deficit in the industrial, residential, and agricultural sectors in the countries in the South Asia region. Even though countries in the region are endowed with varied natural resources (mostly hydropower), they are still heavily reliant on bioenergy, particularly the rural consumers, as a means to meet their energy/electricity requirements. Despite ongoing efforts, the resource potentials in these countries have not been realized due to lack of investments and/or limited evacuation infrastructure within the region.

Over the past few years the region has made progress in establishing bilateral interconnection between the countries in South Asia. This has opened new demand and supply centers outside the national borders and has helped some of the countries in the region to utilize their otherwise untapped resource potential. Increasing economic growth and improving electricity supply in the region are two of the main drivers of increasing electricity demand in the region. The increasing demand–supply gap within the national boundaries of some countries and the availability of surplus generation in other countries of the region has fostered bilateral engagements for power trade.

This is evident in the progress that has been made over the past few years in the bilateral electricity trade in the eastern portion of South Asia. India and Bangladesh interconnections are now being linked in the eastern, western and northern sectors of Bangladesh and this has opened new vistas for cooperation. The interconnection between India and Bangladesh has helped Bangladesh to reduce load shedding from 1500 MW in 2009 to under 300 MW in 2015. In addition, it has also allowed Bangladesh to access cheaper sources of electricity from the Indian market – the average price of electricity imported from India is US¢ 6.77 per unit, whereas the average power purchase price in Bangladesh is US¢ 7.55 per unit. The power grids of Bhutan and India are also linked, and India is Bhutan's single largest taring partner, as the revenue from cross-border electricity trade provides for more than 40 percent of Bhutan's revenue and constitutes 25 percent of its GDP. Similarly, the interconnection between Nepal and India has been beneficial, as India is supplying 330 MW to Nepal to meet its electricity requirements. Discussions are also ongoing to create a series of trilateral cooperation agreements between India-Bangladesh-Bhutan and India-Bangladesh-Nepal. These concepts could eventually be triangulated to form a sub-regional grid.

The emergence of a parliamentary system in Burma have opened new opportunities to expand and provides connection of two political regions - South Asia and Southeast Asia – through Burma. It is a well-known fact that Burma is potentially a major energy consumer in the short- to medium-term. Burma is also a potential energy supplier in the long-term, as it is endowed with huge amounts of gas and hydro potential. Significant intra-regional energy trading already takes place within South Asia and Southeast Asia. Southeast Asia is more advanced having both large volume and institutional infrastructure. Currently, there is no electricity/energy trading between the two regions, other than shipments of coal and petroleum products. Linkages between the two regions will enable them to use diversified energy endowments to their advantage through sharing of resources, will improve energy consumption and supply, will allow access to cheaper power, will provide a means for greater integration of regional grids (SAARC, Greater Mekong, and the ASEAN Power Grid), and will also promote hydro power development in the region.

Success of cross-border trade depends on multiple factors. Political support from participating countries is the key enabler which can fast track the implementation of cross-border electricity trade. In addition, deeper levels of integration also require national power markets to be at similar stages of reform. This may not be a pre-condition to cross-border trade, but it does provide an enabling framework to address concerns and significantly improve regional interconnections and trade.

5.1 POLITICAL, SOCIAL AND MARKET DYNAMICS

The purpose of carrying out this analysis is to review key drivers and barriers to cross-border trade, the political will and desire of countries in the region for integration and trade, the performance of the country's power sector, and whether the institutional and structural frameworks of the country's power sector act as a catalyst in the integration process.

Deeper regional integration will ultimately depend upon political support, social acceptance, and whether it makes economic sense for countries to engage in cross-border trade rather than invest in

national level projects. Bilateral relationships between countries have improved significantly. The number of interconnections that have already been commissioned and the ones that have been proposed are promising results of these developing relationships. The social and market challenges must also be addressed to move towards a South Asia Regional Energy Cooperative, beginning with a favorable political landscape and market opportunities that present themselves in the eastern wing of South Asia. The section below reviews the political, social and market dynamics that currently exist in South Asian countries and what that means for regional integration. The analysis captures views expressed by stakeholders during our interactions. The key questions that were considered to assess the political, social and market dynamics are:

- How well do the countries' political systems respond to the needs for cross-border electricity trade?
- How receptive to change are the key stakeholders (e.g. politicians, bureaucracies, civil society)?
- What forces or factors govern the pace and direction of change in the system?

1 Country Overview

A. Bangladesh

Bangladesh has emerged from military rule as a fledgling democracy which is trying to build its economic and political institutions. Though there were political uncertainties from 2001-2010, and though there have been occasional unrests since that period, there has been some political stability for the past five years. There has been a marked change in the relationship with India and Bangladesh, the largest neighbor. Both countries have taken big strides in their mutual interests in building ties with Burma and evidence of this lies in the growing cross-border electricity trade that is taking place between the two countries. The GoI and the GoB signed a MoU on January 2010 to enhance bilateral cooperation in the energy sector. Since then, the export of power from India grew to 600 MW in 2017 and is likely to increase to 1,100 MW by 2018.

There is a consensus, both in the political establishments and in the general society, on the positive impact that cross-border trading of electricity is. The power outages have come down over last five years because of increased supply from India. This has also provided a boost to the economy and improved the power situation for all consumer categories in Bangladesh. The Joint Working Group formed between India and Bangladesh is identifying additional transmission interconnections between the two countries to further augment the transmission capacities. There is a concerted effort on part of both governments to encourage investments in the power sector and increase the share of cross-border power trade to address the following key issues:

- Bangladesh remains power deficit due to rising demand and limitations in generation from gas-based projects. Improving access to electricity is a key objective of the government's Vision 2021
- There needs to be improvement to overall energy access for the larger population. Despite its notable progress on the macroeconomic front, Bangladesh's electrification ratio is still low. Only about 70 percent of the population had access to electricity in 2015
- There needs to be diversification in the generation mix through sourcing power from hydropower projects in Nepal and Bhutan

Based on stakeholder consultations, we understand that there is now a serious push towards moving to trilateral arrangements to procure power from the hydropower projects in Nepal and Bhutan through India. This would facilitate creation of a power market pool in the sub-region.

B. Bhutan

Cross-border electricity trade is important for the growth of Bhutan's GDP, as almost a fifth of the government's revenue comes from electricity imports to India. Earlier, Bhutan had little willingness to look beyond established trade with India; however, it is now exploring the possibility to sell electricity to other neighboring countries such as Bangladesh via India. While projects are being identified through which power will be supplied to Bangladesh, the success of this arrangement depends on the pace with which new interconnections will be established between India and Bangladesh, as electricity to Bangladesh will be routed through India.

The contribution of electricity trade with neighboring countries is an important source of revenue for the GoB. This aspect will continue to drive the pace and direction of cross-border electricity trade in the country.

C. India

India is following a policy of 'Act East' to improve connectivity and relations with countries of Southeast Asia and East Asia. Several initiatives have been undertaken in the past few years to improve connectivity with Bangladesh, Bhutan, Nepal and even Burma for faster implementation of cross-border electricity trade. However, the progress made in improving or putting in place necessary enablers to the further strengthen electricity trade initiatives have been sluggish. This view was confirmed during our interactions with stakeholders, who mentioned that while India is cautiously supportive of cross-border trade, the perceived security risk that are associated with electricity trade has been a concern. While the overall progress has been slow, the initiatives to promote cross-border trade have recently picked up pace as institutional structures have evolved and become more functional. The GoI, with support from other countries, has constituted bilateral joint steering committees to address the concerns related to cross-border trade and to identify projects and interconnections to strengthen bilateral and trilateral trade deals. Each bilateral joint steering committee is jointly led by the Ministry of Power from India and the designated authority from the bilateral partner.

In addition to institutional machinery that has been put in place to promote joint coordination among neighboring countries, the GoI has recently issued guidelines on cross-border trade to facilitate cross-border trade with greater transparency, consistency and predictability. Some of the objectives of these guidelines include streamlining the regulatory approaches across various jurisdictions to minimize the perceived regulatory risk, ensuring reliable grid operations, and creating a robust and reliable electricity infrastructure for cross-border transactions. The guidelines also talk about the transmission system, scheduling and accounting, grid operation safety and security.

Several key factors will govern the pace and direction of change in the system, the willingness and support required by neighboring countries to meet their growing electricity requirement, the seasonal complements in electricity demand among the countries, and the growing need to support the power system due to an increasing share of renewables in the electricity portfolio. For example, during winter when the rivers become dry, Bhutan and Nepal import electricity from India. During the summer and monsoon seasons India exports electricity from Bhutan. Given the proximity of Bhutan and Nepal to the Northern and Eastern Grid in India, power exchange can be both cost and time efficient.

D. Nepal

Nepal has been going through a period of political instability and uncertainty over the past few years. Democracy in the country has been evolving since 2008 when the monarchy was replaced with a democratic government structure. The lack of political consensus on the key issues and constant changes in the government structure have had a huge impact on overall economic development and governance of the country. The foreign policy focus has been changing over past couple of years. The enthusiasm resulting from the signing of Power Trade Agreement (PTA) in 2014 changed quickly with the unannounced embargo by India on transportation of goods to Nepal in 2016. Nepal also initiated the development of a large hydropower project, the West Seti (650 MW) with Chinese assistance where it signed a joint venture partnership with Three Gorges Dam Company of China. Both parties are engaged in negotiations for the finalization of the joint venture agreement along with other arrangements.

The country also has large untapped hydropower potential that, once developed, can meet the long-term electricity demands in Nepal and provide opportunities for cross-border electricity trade in the sub-region. The political uncertainty and social issues on the ground have had a negative impact on the development of two large cross-border hydropower projects. The final closure of these two projects, proposed to be developed by Indian companies, have already been delayed by a year. This is creating uncertainty for the private sector developers even though there was a concerted push at the government level during 2017 to move these projects towards the implementation phase.

E. Burma

Burma's transition from a military dictatorship toward democracy is ongoing and relatively free parliamentary elections were held in 2015. Burma is committed to promoting cross-border energy and electricity trading with countries in South Asia and Southeast Asia. There is an ongoing electricity trading arrangement with India through which Burma imports 3 MW of electricity. Additionally, Burma has bilateral ties with its neighboring countries in Southeast Asia and has signed an MOU for electricity trade. Increasing electricity requirements to support economic growth, the increasing demand- supply deficit, the target to increase household electrification to 89 percent, and the need to diversify electricity

portfolio are some of the factors that will govern the pace and direction of cross-border electricity trade in the country.

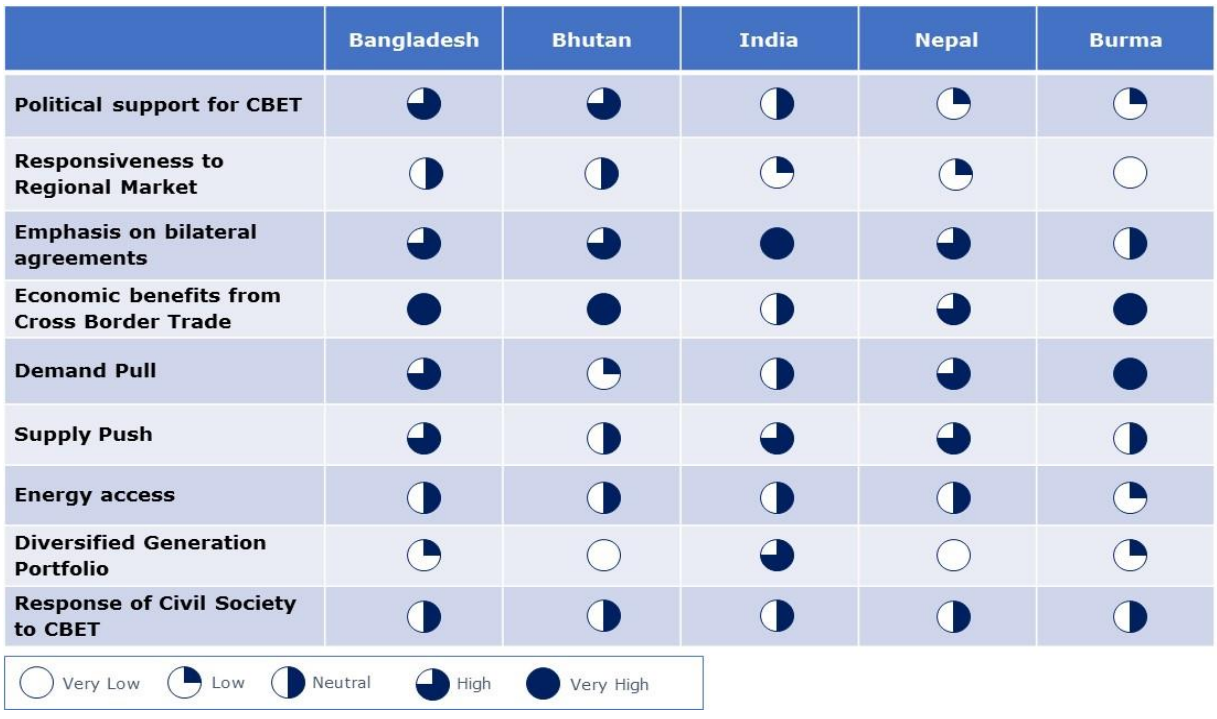
2 Key Inferences

Political will, availability and consumption of electricity, and economics of cross-border projects are the three most important factors that will enable the creation of a sustainable market for the faster implementation of cross-border electricity trade. The regions access to reliable, affordable, and cleaner energy remains a high priority to facilitate further economic development and to improve the welfare of the population in the South Asia region (SAR), unfortunately, multiple initiatives were undertaken in the past to promote cross-border trade, but they languished due to the lack of an implementation plan and the necessary political support. Two key factors will drive the SAR towards regional electricity trade:

- The increasing demand for electricity in countries such as Bangladesh, Burma and Nepal, the limited availability of domestic supply to meet the growing needs, and the government's desire to provide electricity especially to rural households will drive countries to consider procuring electricity from neighboring states and will govern the pace of the growth of cross-border electricity trade.
- The economics or tariff per unit of electricity will also drive electricity trade in the region. Most of the countries in the region have a high domestic tariff, e.g. in Bangladesh the cost per unit of electricity is high as the electricity mix in the country is dominated by liquid fuels. To reduce the cost burden on consumers, it will be economically beneficial for countries in the SAR region that have higher tariffs to consider engaging in regional or cross-border electricity trade.

Figure 49 below summarizes important elements of regional political, economic, social, and market dynamics among the identified countries involved in cross-border trade discussions. The political support for cross-border electricity trade is higher in Bangladesh and Bhutan when compared to other countries in the region. Bangladesh is reeling with power deficits and is highly dependent on liquid fuels to generate electricity. This has resulted in higher cost of electricity in the country. To meet the growing electricity requirements and to reduce the per unit cost of electricity procured, the political system in the country has been focused on improving the cross-border electricity trade with other countries in the region. Similarly, the government of Bangladesh and Bhutan has been more open towards the creation of a regional electricity market. This is apparent as Bhutan is willing to engage in cross-border electricity trade with other countries in the region, apart from India. In terms of economic benefit, countries such as Bangladesh, Bhutan and Burma are positioned to gain more from cross-border electricity trade. This is mostly due to the high per unit cost of electricity, e.g. Bangladesh and the contribution of electricity imports in the overall GDP, e.g. Bhutan.

Figure 49: Political, social and market dynamics



5.2 HARMONIZATION OF ENERGY POLICIES

Harmonization refers to establishing common norms and rules in technical, economic, and legal matters. Harmonization is not a precondition for regional power integration but is often the next step after simple coordination. Harmonization is particularly important when there is an intention to attract the private sector investments. Private investors will not invest without a high degree of certainty about transmission line access, revenue flows, and regulatory predictability. Public utilities should have the same concerns. Whether they are purchasers or sellers, utilities benefit from greater transparency, consistency, and predictability. This section reviews the existing energy and regulatory policies of the countries in the SAR and the progress made by each country in terms of the reform process. The analysis presented in this section presents views expressed by the stakeholders and attempts to address the following key questions:

- How do existing country energy policies advance cross-border trade?
- What is the status of power sector reforms in the focus countries?
- Is there political consensus to reforms that unbundle vertically integrated monopolies and address transmission bottlenecks?
- At a minimum, have the country authorities separated generation from transmission and established clear wheeling rights and market trading platforms to promote generator competition and accurate price signals at the wholesale and retail levels?
- Are there any specific social obligations to be addressed (e.g. requirements to subsidize or serve rural populations before exporting.)?

1 Country Overview

A. Bangladesh

The government-owned utilities in Bangladesh have taken steps to facilitate cross-border flow of electricity from India. The operations have been streamlined and institutional capacity created within BPDB, the single buyer of power in Bangladesh. The Government, however is yet to initiate the next phase of reforms of unbundling of BPDB that has been under consideration for quite some time. There seems to be divergent views within the setup on the level of restructuring that is required for a seamless cross-border electricity trade market. The unbundling of transmission system is there but enablers for transmission open access framework do not exist. Similarly, the single buyer model poses certain restrictions on the transaction of energy within the system.

B. Bhutan

Bhutan is still developing the integrated national energy policy framework which promotes competition in the power sector. However, this has not impacted the bilateral cross-border electricity trade with India that has been undertaken through government to government initiatives.

The state-owned BPC is responsible for transmission and distribution of electricity, while the DGPC, also state-owned, and is responsible for power generation. DGPC is the holding company of all existing hydropower companies. As the power sector regulator, the BEA is responsible for setting tariffs; establishing and enforcing technical, safety, and operational standards; issuing licenses; and monitoring other regulatory functions. While the electricity tariffs are regulated by the BEA on a cost-reflective tariff structure, actual retail prices are cross-subsidized in the value chain of the power sector in a transparent manner. Before power exports, DGPC gives 15 percent of the power it generates as an energy royalty to the government, which sells it to BPC at discount prices. Electricity is supplied to domestic consumers at affordable tariffs that are substantially cross-subsidized by power exports.

C. India

Existing energy and regulatory policies promote cross-border electricity trade with neighboring countries. However, there are certain restrictions that have been imposed in terms of long- term cross-border trade through power exchanges. The distribution companies or any other consumers from the neighboring state can procure electricity through exchange on a short-term basis without approval. However, the guidelines for cross-border trade make it mandatory to seek prior approval from the designated authority to procure power through exchange over a long- term basis. In addition, the guidelines have provisions for preferential treatment for the entities (generation projects, power trading companies) located outside of India that have majority equity investment in the Indian public and private sector to export power to India. However, the guidelines have not barred other companies from

participating in the trade of electricity, but prior approval is required before power is imported from such projects into the country.

While the guidelines on the cross-border electricity trade issued by the Indian authorities has received mixed reactions, improvements in domestic power sector performance through regulatory and institutional reforms have contributed significantly to improving regional inter-connection and trade in the region.

In the Southeast/South Asia region, the Indian power sector is the most evolved as far as reforms are concerned. Over the decades, the sector has moved from being mostly a vertically integrated structure with the SEBs owning the generation, transmission, and distribution businesses to a more unbundled corporate structure. The power sector reforms in India were introduced in 1991. The Ministry of Power published a notification permitting private entities to establish, operate, and maintain generating power plants of virtually any size and to enter long-term PPAs with SEBs. The first step towards reform included the unbundling of the erstwhile SEBs and the creation of an independent regulator at the national level.

Enactment of the Electricity Act in 2003 further lowered the market barriers by laying down provisions for promoting competition in the Indian power market and by introducing provisions for non-discriminatory open access in the transmission and distribution sectors. The Act recognized electricity trading as a distinct licensed activity, and triggered unbundling of all SEBs. The enactment of the Electricity Act paved the way for competition in the power sector by allowing licensed traders to operate in the market and by encouraging the creation of power exchanges to bring transparency in price discovery to the wholesale market. Two major amendments have been introduced in the Act to further the development of the power sector. The first amendment was introduced in 2007 permitting captive power generators to supply power directly to consumers. Second amendment was introduced in 2014 proposing the separation of wires and supply business.

D. Nepal

Nepal's electricity sector is comprised of state-owned vertically integrated NEA which was established in 1984 and is responsible for generation, transmission, distribution, and load dispatching functions. It is the sole buyer of electricity in the Nepali market and controls around 65 percent of the generation. It is also responsible for overall system planning and cross-border transactions with India.

There has been little progress in the unbundling of NEA which is still the single buyer and supplier for power. The proposal to reform NEA was introduced as part of the Hydropower Policy in 2001 which specifically mentions that "the existing institutions in the public sector shall be re-structured to create a competitive environment by encouraging the involvement of community/cooperatives institutions, local bodies, and private sector in generation, transmission, and distribution of hydropower". During the period 2002-2008, the country faced internal disturbances and high level of political uncertainty. As a result, the intended reforms took a back seat and while the successive governments continued the discussion on electricity sector reform, nothing concrete could be achieved. Finally, in 2008, the government tabled the corresponding legislation to the Hydropower Policy and the proposed Electricity Act of 2008, at the Legislative Parliament. This bill was submitted along with the Electricity Regulatory Commission bill. But the passage of bill was put on hold due to various political events and eventual dissolution of the parliament in 2013. Largely in response to the six-month long trade embargo by India that exposed the country's gap in energy security, the MoE released a revised roadmap to address key constraints in Nepal's electricity sector. In February 2016, it made public its position paper on National Energy Crisis Mitigation and Decade of Electricity Development. The government also announced an action plan (99-Action Plan) to establish new companies to carry out the current functions of the NEA in generation, transmission, and power trade. In 2015, the MoE registered a new transmission company, Rastriya Prasaran Grid Company Limited (RPGCL), and followed up with registering a generation company. The MoE is still working on registering a power trading company that is being established. The ultimate objective seems to be to unbundle and corporatize the public utility in Nepal. However, during the interim there will be several institutions performing overlapping activities. Once these companies become operational, the challenge will be the reallocation of human resources and assets.

There remains a lack of clarity among the key stakeholders regarding the end goal of this reform. While some have the intention of eliminating the "holding structure" and completely unbundling the NEA, others are less knowledgeable or uncertain of this longer-term structure.

E. Burma

Existing energy policies do not impede cross-border trading. Burma currently imports power from several neighboring countries, including India. Since the country's transition from military dictatorship to a democratic structure, the government has taken proactive steps to liberalize, decentralize, and open the power sector to foreign and domestic investment. However, foreign IPPs face a legal and regulatory framework that is in full transition.

Burma is at a stage in its development where it is still gaining experience in issues that are important to foreign investors in the power sector. Contractual precedents and specific regulations still need to be developed. In addition, the government is still adjusting its internal administrative and decision-making processes to accommodate the new needs, the volume of proposals, and the role of foreign investors. There are few laws and detailed regulations that are specific to investment in the power sector. The 1984 Electricity Law was replaced by the new Electricity Law, enacted in 2014, but the new law is rather general. At present, there are few detailed regulations for tariffs, legal terms, environmental aspects, or other aspects of power sector investments. Most of the rules governing power sector investments are found in the project contractual documentation that establishes the concession.

The most important aspect of the new electricity law is the establishment of the Electricity Regulatory Commission, however, the right to determine electricity pricing has been kept out of the preview of the Commission. The Commission will be responsible for advising relevant government departments and organizations on power sector development and the formulation of a national electricity policy. It will monitor, assess, and review the electricity sector to advise the MOEP departments, private organizations, and investors on actions needed to bring the sector up to international standards.

2 Key inferences

Countries in the region are at different stages of evolution in terms of power market design. There is minimal political commitment to liberalize the sector by undertaking market-oriented reforms in the region. Deeper levels of integration will require that national power markets be at similar stages of reform to address concerns regarding the benefits of integration. India is the only country in the region that has progressively implemented power sector reforms to an extent that the new amendments that have been proposed, but are yet to be approved, address further segregating the wires and supply businesses in the distribution sector. Although other countries in the region have undertaken power sector reforms, these measures were mostly on the institutional side and had limited impact on the design of the power market.

Guidelines to promote cross-border electricity trade to foster greater transparency, consistency, and predictability is another area which has remained passive over the past few years. While India has recently issued guidelines to promote cross-border trade, concerns have been expressed by the stakeholders of the neighboring states that the views of the external stakeholders have not been addressed adequately in the guidelines and that the guidelines offer some preferential treatment to projects where majority stakes rest with an Indian stakeholder.

Figure 50 below summarizes the current state of regional energy policies among South Asian countries. India has the political will and commitment to implement power sector reforms and has been able to introduce and implement reforms for efficient functioning of the electricity sector. Other countries in the region have not yet fully embraced market-oriented reforms in the electricity sector. In Bhutan, Nepal and Burma the generation, transmission, and distribution are still a bundled activity and are mostly state-owned. There is minimal to moderate private sector participation in the region except for India, where private sector participation is relatively high. Independence of the regulatory body is neutral in India and is lower in Bangladesh because regulators are unable to discharge their duty autonomously. In Bhutan, Burma, and Nepal an independent regulatory commission is yet to be established. The various aspects of harmonization of energy policies is summarized in the *Figure 50* below.

Figure 50: Harmonization of energy policies

	Bangladesh	Bhutan	India	Nepal	Burma
Political commitment to liberalize of the sector					
Power sector reforms and restructuring					
Separation of G-T-D functions					
Private Sector participation					
Independence of regulatory function					
Progressive tariff regime					
Social Obligation (subsidized electricity)					
Current energy policies for CBET					

Very Low | Low | Neutral | High | Very High

5.3 LEGAL AND REGULATORY FRAMEWORK

For interconnection, all countries will need to develop a regulatory driven common market design supported by a legally enforceable policy of open, non-discriminatory access to transmission systems. In the absence of harmonized legal and regulatory framework the regional integration efforts will continue to languish. This section presents our analysis of the legal and regulatory framework for promoting cross-border electricity trade between South Asia and Burma and attempts to address the following key questions

- How closely do existing laws reflect global standards?
- How well do the laws respond to commercial realities?
- Do the laws embed the realities of an optimal market design?
- Can clean energy policies drive cross-border trade?

1 Country Overview

A. Bangladesh

The government-owned utilities in Bangladesh have taken steps to facilitate cross-border flow of electricity from India. The operations have been streamlined and institutional capacity has been created within BPDB, the single buyer of power in Bangladesh. However, the Government is yet to initiate the next phase of reforms towards unbundling the BPDB. There seems to be divergent views on the level of restructuring that will be required for a seamless cross-border electricity trade market. The unbundling of the transmission system has taken place but the drivers to create a transmission open access framework do not exist. Similarly, the single buyer model poses certain restrictions on energy transactions within the system.

A review of the key legislations and regulations for the power sector in Bangladesh indicates that there are certain key enablers that have been put in place for facilitating cross-border power trading. These include:

- The Vision and Policy Statement on Power Sector Reform published in February 2000, which envisions that access to electricity will be provided to the entire country by 2020 with increased reliability and quality of electricity supply at reasonable and affordable price by pursuing least cost options

- The policy framework under the Bangladesh National Energy Policy (NEP) of 2005 includes the possibility of regional cooperation in energy trade. NEP emphasizes the examination of the possibility of cross-border electricity trade among neighboring countries and establishing linkages of local utilities with those in other countries for exchange of experience in power development and human resource training
- Under the Policy Guidelines for Enhancement of Private Participation in the Power Sector (2008), establishing an ISO to ensure and deal with efficient power flow in coordination with the National Load Dispatch Center and to deal with mismatch and imbalance in power trading under BERC regulations is mentioned. The guidelines also indicate that the PGCB will act as an ISO until the wheeled power under these guidelines reaches 500 Mega Watt (MW). At which time a newly created agency will take over the functions of the ISO from PGCB.

The regulatory framework in Bangladesh has seen limited progress over last few years. The scope and power of the regulator is still limited. BERC does not govern the terms and conditions of the PPAs which have been signed with Indian organizations and is also not mandated to regulate cross-border power flow.

B. Bhutan

The Electricity Act 2001 and the Sustainable Hydropower Development Policy of 2008 set out legal and regulatory frameworks for Bhutan's energy sector. Bhutan's electricity sector has gradually moved from a vertically integrated state company to a more decentralized and unbundled structure. The results of unbundling are visible, and studies are underway to restructure the transmission and distribution sub-sector by unbundling them into separate entities and hiving off the System Operator into a separate company. As a result, Bhutan's legal and regulatory frameworks closely reflect, or continue to progress towards, international energy sector standards. Cross-border electricity trade is decided at the government-to-government level and therefore the legal and regulatory frameworks are not focused on formal commercial transactions. Moreover, the electricity tariff for domestic consumers are regulated and are determined by the BEA. Basic principles for tariff determination for domestic consumers were laid down in the domestic tariff policy of 2016. Bhutan provides a high level of subsidy to domestic consumers and the incentive schemes it operates for attracting power-intensive industries might adversely impact the growth of electricity exports from Bhutan. Upon approval by the BEA, Industrial consumers may opt to have a separate arrangement through a PPA with the service provider to ensure long-term predictability.

C. India

India has introduced number of market-oriented reforms, including the creation of short-term competitive power markets, non-discriminatory open access etc. The Electricity Act of 2003 sets out the Indian central government's laws relating to the generation, transmission, distribution, trading, and use of power. These laws closely reflect global standards. The Act promotes transparency in the functioning of the sector by mandating the establishment of a separate state electricity regulatory commission. It also creates regulatory frameworks to ensure fair treatment between public utilities and private sector participants, sets performance targets for public utilities in terms of setting the trajectory for moving towards cost reflective tariffs and phasing out of cross subsidy surcharge, adopts commercial tariff policies, and establishes a competitive and stable fuel supply market. It addition, the Act also defines open access and encourages non-discriminatory open access for transmission and distribution system.

The rules and regulations outlined in the Electricity Act respond to commercial realities at the central level, but the implementation, in letter and spirit, vary at the state level. Most of the states in the country follow a bulk supply arrangement, wherein the electricity requirements of the utilities are met through bilateral PPAs signed with generating companies. These agreements are long-term arrangements and therefore do not leave much bandwidth for utilities to participate in the exchange-based market, which constitutes only - three percent of the overall electricity market in the country.

As far as electricity pricing is concerned, the government has gradually phased out the cost-plus methodology and has instead introduced competitive bidding guidelines to determine electricity tariffs at the generation level. Electricity tariffs at the retail level are still regulated and are approved by the appropriate state regulatory commissions. Although state commissions are considered to be autonomous institutes, it is believed that state governments have the ability to influence electricity pricing at the retail level in the state. The suppressed electricity tariffs at the retail level results in

significant under recoveries for the distribution companies, as they are unable to recover their average cost of supply and this has increased systemic risk in the sector.

D. Nepal

The Nepal's power sector is governed by several acts, policies and regulations which constitute the statutory framework under which public and private energy supply activities take place. Key changes in the Electricity Act which is currently applicable, are required in order to facilitate reform and restructuring of the power sector. Some of these are also linked to the key objective of Hydropower Development Policy, 2059 (2002) which is to develop hydropower as an exportable commodity by pursuing a strategy of bilateral and regional cooperation. The Electricity Act 2049 (1992) has no provisions related to the following aspects of cross-border trading:

- Recognizing power trading as a separate activity
- Providing for a process for issuance of trading license
- Providing non-discriminatory open access for transmission
- Creating a policy for bilateral resolution of disputes

There is now an increasing discussion on the need for a similar agency to regulate Nepal's electricity sector. NEA has a formidable monopoly in the electricity market. Currently, the regulatory functions are spread across a variety of institutions, including the Electricity Tariff Fixation Commission (ETFC) and the Ministry of Energy (MoE)/ Department of Electricity Development (DoED). For example, ETFC regulates consumer retail tariff and MoE/ DoED regulates the licensing of projects. Even NEA bears some of the regulatory functions of negotiating the PPA and establishing the grid codes.

The absence of any regulatory framework in the country also constrains development of the power trading framework which can support cross-border trading and facilitate overall development of the trading function. The key gap areas where a regulatory framework can be of benefit include:

- Appropriate guidelines, monitoring, and approval mechanisms for the development of integrated power systems which can cater to internal and cross-border requirements
- Approved technical interconnection codes and standards for cross-border connectivity
- Mechanisms for fixation of transmission and open access charges
- Determination of trading margins, fees, and other charges associated with cross-border trading
- Framework for arbitration for dispute resolution

The limitations in the current policy and regulatory framework pose significant challenges to the creation of an independent power market structure within Nepal. Currently, the power trading activity is not recognized as a distinct licensed activity in Nepal and suitable amendments to existing acts and regulations will be required to create a comprehensive enabling legal framework in Nepal.

The discussion on establishing a regulator for Nepal's electricity sector can be traced back to the Hydropower Policy of 2001. Subsequently, the government, with assistance from several development partners, drafted a corresponding legislation in the form of the NERC Act. With the nation transfixed on other discussions of political importance, this bill, along with the proposed Electricity Act, received very little attention. In 2008, these bills were forwarded to the legislative committee for discussion, and several amendments were subsequently proposed. However, given the technicalities associated with this reform, this bill received far less interest from legislators than the Electricity Act. Despite repeated commitments from the bureaucracy and the parliament, these bills languished within the country's legislative maze for years. Following a new government after the second CA elections, these bills were taken back by the MoE. After some reworking, the MoE has now decided to pursue this bill separately from the Electricity Act. Below are some of the key functions that have been discussed for NERC. However, not all of them have made it to the latest version of NERC Act.

- Setting consumer electricity retail tariff
- Setting wholesale power purchase process
- Issuing licenses
- Setting wheeling charges

- Establishing grid code
- Settling disputes among stakeholders

E. Burma

The legal and regulatory framework for the development of the power sector in Burma is in transition. Some progress has been made in terms of the development of rules and regulations governing the electricity sector, however a lot of ground must be covered to bring the policy and regulatory framework to match those of the global standards.

The Electricity Law of 2014 sets out the laws relating to the generation, transmission, distribution of power in Burma. The new law has been enacted with an aim to liberalize the market to encourage private sector investments. However, the current legal and regulatory framework does not promote non-discriminatory access to transmission and distribution network. This can become a challenge in the long-run for the government as it undertakes measures to improve supply of power in the country.

2 Key inferences

The laws and regulations in the region that promote competition in the electricity sector are still evolving. Most of the countries in the region have implemented laws that do not promote the establishment of a competitive power market framework. Apart from India, where 3-4 percent of the overall generated electricity is traded over exchange, the provision of a wholesale market or energy only market has not been passed in the overall legal and regulatory frameworks governing the electricity sector of the respective countries. Thus, the evolution of the power market has not yet gained momentum in the region. In the absence of harmonized and predictable legal and regulatory frameworks, regional energy trade in South Asia will continue to be constrained. The region as a whole has cumbersome regulatory processes which causes decision making to be time consuming for governments and investors. There is a tendency to modify policies and regulations retrospectively and the policies and regulations sometimes favor public sector enterprise and there is discriminatory treatment in the application of laws, regulations, taxes, and required technical or operational standards.

The laws governing the power sector are more progressive in India than those of other countries in the region. This is due to the market-oriented reforms that have been introduced in the country and the current operational model which promotes competition in the sector. The Indian government is running one of largest renewable energy programs in the region and has set a target to add 175 GW of renewable energy by 2022. India is also committed to increasing the share of non-fossil fuels in the electricity mix to 40 percent by 2030. Thus, the need for additional spinning reserves to manage the intermittency in the system is expected to be higher in India compared to other countries in the region. *Figure 51* below provides summary of legal and regulatory framework for the countries in the sub-region and their impact on power trade.

Figure 51: Legal and regulatory framework

	Bangladesh	Bhutan	India	Nepal	Burma
Progressiveness of laws governing electricity sector					
Market structure that promotes competition					
Evolved Power Market					
Contractual Framework (PPAs)					
Power market operation (settlement of energy imbalances)					
Progressiveness towards interconnections (S&I)					
Licensing of CBET					
Need for additional spinning reserves to manage power system					
Rationalization of taxes and duties for regional trade					

Very Low Low Neutral High Very High

5.4 STRUCTURAL AND INSTITUTIONAL FRAMEWORK

Cross-border energy trade in South Asia will require harmonized structural, institutional, and legislative frameworks to establish the relationship between government and other participants in the power sector industry and ensure fair regulatory treatment for all parties. In this section we have attempted to analyze the requirements for advanced and real-time coordination among the countries' transmission system operators including:

- Grid standards
- Carrying and transfer capabilities
- Open-access tariffs
- Congestion management
- Regional grid expansion
- Dispute resolution procedures
- General operating standards

1 Country Overview

A. Bangladesh

The Bangladesh power system has established grid standards and processes which are sufficient to meet existing power requirements. However, to connect to the Indian system, the available grid standards must evolve. The Joint Working Group, along with the transmission utility in India, is working on regional grid expansion to help resolve technical issues with interconnections. The tariff structure in Bangladesh is not cost reflective and therefore puts a huge burden on the BPDB which is the single buyer. Power purchase costs incurred have increased the outstanding debt for BPDB.

B. Bhutan

Most of the structural and institutional framework necessary for efficient grid operation, transparent pricing, and regulatory approaches for efficient functioning of the sector is yet to be established. The BEA has full autonomy, but the power sector is overseen and regulated by Ministry of External Affairs through the Department of Energy.

The transmission system in Bhutan is still in its infancy. There is no central or national load dispatch center. The Bhutan Power Corporation is responsible for establishing the transmission network in the

country. The Central Electricity Authority of India is responsible for transmission planning for cross-border electricity trade.

C. India

Procedures for tariff setting, grid operation, dispute resolution, and carrying and transfer capabilities are well established in India. However, the procedures established in the regulatory framework are not followed as per the intent of the Electricity Act 2003, at least at the state level due to political influence. For instance, the distribution companies are unable to pass on the cost of supplying power to the consumers resulting in under recoveries and increasing financial liabilities.

The grid codes for the National Level grid are issued by the Central Regulator and are moving towards global standards as the frequency bands are tightening. To create more transparency in the operation of the grid, the GoI has separated transmission ownership from the network operator.

D. Nepal

The NEA is currently responsible for transmission system planning, infrastructure development, and operations within Nepal. The NEA is also responsible for planning the evacuation system for IPPs and coordination with India for the transmission connectivity. As the implementation agency for transmission projects, NEA is responsible for the construction of transmission lines within the country and undertakes planning for future hydropower projects. The Joint Working Group, along with the transmission utility in India, is working on regional grid expansion to help resolve technical issues with interconnections. However, the execution of interconnection projects, like Muzaffarpur-Dhalkebar transmission line, have experienced significant delays from Nepal's side and this has limited the overall transfer capacity for bilateral electricity trade.

Nepal's grid code is an internal document of NEA and specifies the technical standards for planning, development and operation of the country's transmission network. The grid code lacks details on the regional benchmarks for generation planning and operations.

E. Burma

Most of the structural and institutional frameworks for efficient grid operation, transparent pricing and regulatory approaches for efficient functioning of the sector are yet to be established. The MOEP is both the supervisor of and facilitator for the power sector in Burma. It assumes all operating and management responsibility relating to power generation, transmission and distribution.

2 Key inferences

Cross-border energy trade in South Asia will require harmonized structural, institutional, and legislative frameworks to establish the relationship between the government and other participants in the power sector and to ensure the fair regulatory treatment of all parties. Presently, the region lacks proper planning and development initiatives for cross-border interconnections. This has not only limited the quantum of trade among countries, but also has delayed the implementation of cross-border initiatives. The lack of proper planning and coordination stems from the inadequate institutional structure that exists in some of the countries. Most of the countries in the region have the same system and network operator which can hamper the ability of the system operator to efficiently and independently discharge its functions in these countries.

There is a lack of proper implementation of the structural procedures that have been established to bring about transparency and efficiency in the power market. Countries in the region have implemented open access regulations, regulatory tool that can unlock the potential of cross-border trade, but the operational underpinning have constrained the ability of players in the sector to avail benefits of such provisions. Thus, the rules and procedures assuring access to and stable operation of interconnected transmission systems are acting as a limiting factor for regional integration. While the provisions for open access are available in the countries, there are operational hurdles which cause limitations in fully realizing the benefits that open access offers. This is mostly due to cross subsidy surcharges, network constraints, and lengthy and complex regulatory procedures.

One of the key enablers for cross-border electricity trade is the existence of dispute resolution framework. A comparative analysis of the dispute resolution framework reveals that India has the strongest dispute resolution framework compared to other countries in the region and therefore the ability of the system to resolve disputes in an equitable way is higher in India.

Figure 52 below shows the assessment of structural and institutional framework for the countries in the sub-region.

Figure 52: Structural and institutional framework

	Bangladesh	Bhutan	India	Nepal	Burma
Independence of System Operator	○	○	●	○	○
Independent Transmission Operator	◕	◔	◕	◔	◔
CBET interconnection planning and development	◔	◔	◕	◔	◔
Grid standard and operating procedures	◑	◔	◕	◔	◔
Framework for dispute resolution	◔	◔	◕	◔	◔
Non-Discriminatory Open Access Framework	◕	◕	◕	◕	○
Operational underpinnings of Open Access	◕	◕	◕	◕	NA

○ Very Low ◔ Low ◑ Neutral ◕ High ● Very High

5.5 SUPPORTING INSTITUTIONS

A functional energy market requires consistent and transparent methods for settling transactions, raising capital, and allocating capital. The presence of supporting institutions such as power exchanges, traders, and private sector participation can lead to improvement in domestic power sector performance and can advance the progress towards regional integration. In this section we have attempted to provide an assessment of the presence of supporting institutions such as government agencies; energy trading organizations; generation, transmission and distribution utilities; financial institutions; private investors; the business community; and civil society (as consumers) and their impact on the functioning of the power sector.

1 Country Overview

A. Bangladesh

The current institutional framework is well suited for the purchase from in-situ generation assets in Bangladesh. The framework addresses the requirement of import of power from India on medium- to long-term basis in a limited manner. In the emerging power market scenario, the regional market is likely to present more opportunities for Bangladesh to undertake transactions with other countries in the region including India, Nepal and Bhutan. While BPDB restructuring has been under consideration for some time now, the formation of a separate directorate within BPDB to undertake trading functions is also being actively evaluated. There are a limited number of domestic financial institutions which are funding the power sector. Government agencies mobilize their own resources. The role of the private sector in the generation sector has been growing along with cross-border investments from India, China and Japan.

B. Bhutan

Supporting institutions play a limited role in the power sector in Bhutan. The Electricity Act of 2001 and the Sustainable Hydropower Development Policy of 2008 establish the legal and regulatory frameworks for Bhutan's energy sector. However, the laws, rules, and regulations proposed in the sector do little to address market-oriented reforms. The umbrella Act under which the power sector operates has not mandated a separate function for power traders. The responsibility to generate, supply, and distribute

power rests with the BPC. In addition, there is no provision in the Electricity Act to establish a separate power exchange. Stated differently, there is no wholesale market in Bhutan.

The power sector is open to private sector investment to in a limited manner through joint venture participation in generation projects. India is assisting Bhutan in harnessing the hydropower sector in the country and one of the largest private players in India has invested in the development of a hydropower plant in Bhutan.

C. India

Supporting institutions play an important role in the Indian power sector. The enactment of the Electricity Act in 2003 paved the way for competition in the power sector. This was achieved by allowing licensed traders to operate in the market and by encouraging the establishment of power exchanges. The presence of power traders has enhanced market dynamics. Power traders have created awareness by hand holding small generators and open access consumers regarding the regulatory frameworks, procedural requirements, electricity requirements, and market dynamics. The presence of a power exchange has also brought transparency in price discovery and has allowed market participants to benefit from the prevailing market conditions.

The introduction of the private sector into generation, transmission and distribution has also increased competition in the market. This has not only brought about efficiency in electricity pricing, but also has improved supply conditions in the country. Though the distribution sector is mostly state-owned, there are a few states where a few distribution circles have been privatized. The performance of private players even in the distribution sector has been stellar, and the technical and commercial losses in these areas have decreased significantly. Considering the successes of private companies in the distribution sector, the government, in some states, has outsourced the service element of the business to private players.

Financing of the power sector is supported by both public and private sector banks and the exposure of banks in the sector has increased significantly over the past few years, given the increase in installed capacity. Though a lot more needs to be done, the presence of private sector players and financial institutions in the sector has curtailed some of the inefficiencies in the sector and has also brought transparency in the functioning of the sector. Consumer participation in public meetings held by regulatory commissions across the central and state level provides consumers an opportunity to air their grievances and provides the regulators an opportunity to reflect on the issues in the sector and to undertake appropriate measures to address the concerns. The regular process of interacting with public has also improved access to electricity in the country.

D. Nepal

Nepal lacks an institutionalized power trading structure for cross-border electricity trade. The function is being performed by NEA. The involvement of local financial institutions has been limited to small and mid-sized hydropower projects and there is a lack of a sector specific financial institution in the country. In August 2011, the government created IBN to serve as a “one window” facility for domestic and foreign investors pursuing projects worth more than USD 100 million or large-scale projects in priority sectors such as civil aviation, tourism, or hydroelectric. The IBN is chaired by the Prime Minister and has the authority to formulate investment policies, prioritize and approve projects, facilitate the signing of agreements among different ministries, provide financial and nonfinancial facilities, procure land, monitor project progress, order government agencies to issue necessary project approvals, and bypass existing regulations in the name of investment promotion. IBN was created to cut through bureaucratic red tape and expedite investments coming into Nepal.

E. Burma

To promote private sector investment in the power sector, Burma revamped its Foreign Investment Law and its implementing regulations in 2012. This was considered a crucial step in Burma’s economic liberalization. These rules provide a comprehensive legal regime to license the investment of foreigners in the country. The investments with 100 percent foreign ownership is permitted for most business activities, including power generation. Several activities are deemed “restricted”, which means that a foreign investor will need a joint venture with a Burmese partner or with the Burma Government.

2 Key inferences

The lack of market-oriented reforms in the region have restricted the entry and establishment of supporting institutions. The presence of supporting institutions such as power exchanges, traders, and

private sector participation can lead to improvement in domestic power sector performance and can advance the progress towards regional integration. There is limited presence of such institutions in the region except for India where the presence of supporting institutions is prevalent. Countries in the region have limited to no exposure to the functioning of trading and power exchange. The existence of a tribunal for dispute settlement is also absent, except for India. The success of regional integration depends on the presence of supporting institutions and the strongest institutions are those that grow organically from local initiatives rather than those that imposed from outside. *Figure 53* shows a comparative analysis of supporting institutions for the five countries.

Figure 53: Supporting institutions

	Bangladesh	Bhutan	India	Nepal	Burma
Presence of trading institutes /Exchanges	○	○	◕	○	○
Provision and existence of a Tribunal for dispute settlement	○	○	◕	○	○
Mechanism to address consumer grievances	○	○	◕	○	○
Openness to private sector participation in distribution	◔	◔	◑	◔	◔
Private sector participation in generation	◔	◔	◕	◔	◔
Private sector participation in transmission	○	○	◔	○	○
Sector specific financial institutions	○	○	◕	◔	○
Public Participation in regulatory process	◑	◑	◕	◑	◔

○ Very Low ◔ Low ◑ Neutral ◕ High ● Very High

6 ROADMAP FOR PROMOTING CROSS-BORDER ELECTRICITY TRADE

The emergence of Burma, which straddles both South Asia and Southeast Asia, as energy supplier as well as a potentially major energy consumer has significant implications for the growth of regional energy trade among the countries on the eastern wing of the Indian subcontinent. Regional sharing and diversifying the use of available energy resources would address many of the growing energy security concerns and accelerate economic development in the region.

The existence of several structural factors e.g. widening gap between demand-supply situation, depleting resource potential among countries, lack of access to electricity etc. have a major influence on current dynamics and institutions. These need to be properly recognized and incorporated into the design of strategies for integration of South Asia and Southeast Asia. The political dynamics in South Asia have already pushed the cross-border electricity trade towards the eastern part of the sub-continent, which is comprised of Bangladesh, Bhutan, India and Nepal. There is a consensus and alignment of political and social interests amongst these countries for furthering the electricity exchange. India, which is the largest economy and energy consumer in the region, also has interest in developing the hydropower potential in the North eastern part of country which can have better interconnectivity with Burma and Southeast Asian countries.

Multi-lateral agencies can play an important role in building the institutions for promoting the connectivity. The wok undertaken by USAID under SARI/EI for South Asia and of the ADB in standing up GMS in Southeast Asia can be integrated for extending the cooperation across the regions.

The key interventions, including policy, regulatory, transmission interconnection, system operations, and markets required to further promote cross-border electricity trade in the region, especially with perspective of connecting South Asia to Southeast Asia via Burma, are listed in *Table 21* below.

Table 21: Key interventions for linking SA and SEA through Burma

	Short Term	Medium and Long Term
Policy and Regulatory initiatives to promote cross-border electricity trade	• Develop guidelines to facilitate cross-border electricity trade in a transparent, predictable and consistent manner • Harmonize guidelines on technical standards for interconnection of power systems • Gradually move towards rationalized tax regime for all transactions related to cross-border electricity trade	• Establish fair and transparent procedures determining the grant of open access • Develop a common and consistent framework for dispute resolution for bilateral and regional electricity trade • Develop a common set of procedures for Imbalance Settlement for cross-border electricity transactions
Develop a framework for the evolution of regional electricity market/wholesale market	• Establish nodal agency to facilitate operational issues • Promote trade on commercial strengths • Constitute a regional coordination forum to coordinate with various stakeholder	• Undertake power sector reforms to remove disparity in the state of the sector • Establish supporting institutions such as traders and exchanges. to promote efficiency in the functioning of the sector • Establish efficient and independent institutions for effective functioning of the integrated market
Strengthen Institutional Mechanisms – Role of Multi-lateral agencies	• Create a platform for knowledge sharing • Commission studies for capacity building	• Develop institutional capacities in regional institutions

1 Develop Regional Policy and Regulatory Guidelines

Regional regulatory guidelines should be developed to establish a clear regulatory environment for accelerating cross-border electricity trade between Burma and South Asia and beyond with Southeast Asia. The objective of these guidelines should be to empower national regulators/ entities in South Asia and Southeast Asia, including Burma, with a common course of action that can be referred to for decision making on cross-border electricity trade in their respective countries. This will ensure consistency in cross-border electricity trade transactions and will remove the constraints that often cause challenges or delays because of unclear and complicated regimes.

Short Term Initiatives:

A. Formulate Guidelines for Cross-border Electricity Trade

Currently, cross-border electricity trade in the South Asia region is being facilitated through MOU/ PTA. To promote electricity trade across the region, including Burma and Southeast Asia, with greater transparency, consistency, and predictability and to minimize regulatory risks, each country should develop guidelines to facilitate cross-border electricity trade.

B. Harmonize policy and regulatory framework

It is imperative that the regulatory frameworks across jurisdictions in the region be harmonized. While respective countries in the region would have their own national policies and regulations, it is important to achieve a certain level of harmonization in policy and regulatory framework concerning cross border trade of electricity. Standardization of technical standards for grid operation and security, pricing calculation, energy accounting, energy banking and operational parameters, and grid security is especially important. This will create long-term linkages for bridging South Asia and Southeast Asia for the development of cross-border electricity trade in the region. Coordination among national regulators would also bring clarity to project developers and investors for the investments in regional power projects.

C. Harmonization of Taxes and Duties

It is imperative that the tax structure on purchase and sale of electricity for all transactions related to cross-border electricity trade gets harmonized across the region. While there is no tax incidence – custom, export, transit etc. – on the sale and purchase of electricity in the South Asia region, particularly BBIN countries, there is a need to ensure complete synchronization of tax structures as the region transcends into more complex trade forms (bilateral, trilateral and multilateral).

Medium to Long Term Measures:

D. Ensure non-discriminatory open access

Success of cross-border electricity trade largely depends on the availability and accessibility of transmission interconnection. In the current context most of the power is traded through a dedicated corridor at a price which is pre-defined at the start of the contract. When cross-border electricity trade moves to a centralized trading or power exchange network, the lack of clearly defined processes and rules could result in additional risks for buyers and sellers. For this reason, it is imperative that countries in the region recognize the criticality of open access and introduce necessary provisions in their power system to ensure standardization.

E. Regional Settlement Mechanism for Cross-border Transactions

There is a need to establish a regional dispute settlement mechanism or forum to address the imbalances in cross-border electricity trade transactions. This would ensure that the rules and procedures to address imbalances in the system are common among member countries. Presently, most of the imbalances in cross-border electricity trade are being addressed bilaterally between the participating countries per the power purchase agreements and this is both challenging and time consuming.

2 Develop frameworks and institutions for evolution of regional electricity market

The establishment of regional electricity or wholesale markets will provide the drivers necessary to expand and sustain electricity trade and will also allow countries in the region to minimize trade risks in the medium to long-term period. The regional electricity market should be designed in such a way that it is able to give correct price signals to incentivize investment in both power generation capacities and cross-border transmission infrastructure. It should also give enough incentive with clear rules to balance

the interconnected grid and therefore maintain its stability and reliability. In this way, power grid interconnection in the region will not only deliver cheaper and cleaner power supply but it will also enhance energy security in the power sector of the region. It is therefore important for countries in the region to undertake sectoral reforms and create appropriate sector structures with financially stable entities for better transparent and predictable environment.

Short Term Initiatives:

A. Promote trade on commercial strengths

Trade among countries in the South Asia region is mostly structured on inter-governmental coordination rather than on formal commercial contracts. The existing electricity trade between India and neighboring countries is somewhat informal. No formal PPA has been signed between countries engaged in electricity trade, and even price points are determined through government negotiations. There is some uncertainty regarding the volume of supply as well. The electricity trade arrangements between countries allows the exporting countries to consume whatever it needs and has the obligation to supply only whatever turns out to be the surplus. Sustainable large volumes of electricity trade would be possible only with a strong formal and commercial footing, involving an explicit contract between the buyer and seller. The contract needs to spell out the volume and pattern of supply, metering and billing arrangements, and price details, as well as the parameters and formula for price revisions. In addition, there is a need to specify the obligations of buyers and sellers and to spell out the process that needs to be followed in the case of a payment default or in the case of a failure to supply or receive agreed volume of power, and most importantly return on investments and insurance against political or security risks.

B. Establishment of supporting institutions

A functional energy market requires consistent and transparent methods for settling transactions, raising and allocating capital. Thus, the presence of supporting institutes such as power exchanges, traders, and private sector participation can lead to improvement in domestic power sector performance and can advance the progress towards regional integration. An integrated power pool, especially one that involves cross-border electricity trade between South Asia and Southeast Asia, will require an independent operator who can oversee and sanction activities of participants to prevent aggressive pricing, non-disclosure of generation or transmission capacity or any other form of indiscipline by the constituents.

Medium to Long Term Measures:

C. Power sector reforms and restructuring

The electricity sectors in the South Asia region vary from country to country and are at different stages of evolution. This disparity in the state of the sector across the region has implications on the development of cross-border electricity trade and ultimately regional cooperation. Incomplete power sector reforms can create barriers to the electricity trade in the region. Domestic policy distortions can erode incentives for stakeholders to expand generation and transmission capacity. Countries in the region should undertake power sector reforms with an aim to bring more competition, efficiency, transparency, and independence in the functioning of the sector.

D. Set-up a regional coordination forum for coordinated system planning and development

There is a need to create a regional coordination forum whose membership would be drawn from each member country in the region. The neutral body would be responsible for coordinating with various stakeholders to undertake regional system planning, integrated system/network development and the development of a regional master plan for faster implementation of cross-border electricity trade across South Asia and Southeast Asia.

E. Encourage private participation through PPP framework

For faster development of infrastructure, it is important for member countries to involve the private sector in the identification, financing, and implementation of projects in the region. To achieve this, two key interventions will be required. First there is a need to establish a clear, predictable, and legitimate institutional framework supported by competent and well-resourced authorities. Second, countries should use the budgetary process transparently to minimize fiscal risks, ensure the integrity of the procurement process, and ground the selection of PPPs in value for money.

3 Strengthening Institutional Mechanisms – Role of Multi-lateral agencies

A. Create a platform for knowledge sharing

Regional institutions, particularly BIMSTEC, with the help of USAID or ADB should strive to create a platform for sharing of best practices in policy and regulatory practices followed by countries in South Asia and Southeast Asia in the power sector. Such a platform will further the objective of bringing harmonization of the policy and regulatory frameworks. The program can support skill development programs to prepare personnel for hands-on training in areas such as power trading, techno-commercial appraisals of large infrastructure studies, and power flow studies. The skill development programs could also be in the form of short-term exchange programs.

B. Commission studies covering BBIN and the countries in the western part of Southeast Asia

It is understood that incomplete power sector reforms can create barriers for facilitating wider electricity cooperation among countries. Therefore, to better understand the differences in the reform agenda in the power sector in BBIN and in countries in the norther region of Southeast Asia, USAID and ADB could commission studies that not only report the status of power sector reforms in these countries, but also highlight long-term prospects of cross-border electricity trade among these countries and the drivers required to create a regional electricity market.

C. Develop institutional capacities

USAID and ADB along with other institutes in the region could support programs in the South Asia and Southeast Asia regions to build institutional capacities in areas such as power trading, the role of institutions, power financing.

D. Engage Civil Society

USAID and ADB could cooperate with local institutions to create a working group in respective countries in South Asia to engage civil society in advocating the role of cross-border electricity trade in economic development. Such Groups could be tasked to work with policy makers, media, and civil society to promote cross-border electricity trade and to create hard evidences on its role in improving the region's economy.

E. Facilitate Coordination among supporting institutions

Efforts should be made to explore options to hold joint working group meetings between regional institutions such as BIMSTEC and ASEAN to promote collaboration between the regional groupings for faster implementation of a common regional electricity market.

7 ANNEXURES

1 Annexure 1: Regional groupings

1.1 South Asian Association for Regional Cooperation (SAARC)

A. Introduction

The South Asian Association for Regional Cooperation (SAARC) was established with the signing of the SAARC Charter in Dhaka on 8 December 1985. Its seven founding members are Bangladesh, Bhutan, India, the Maldives, Nepal, Pakistan, and Sri Lanka. Afghanistan joined the organization in 2007.

The objectives of the Association as outlined in the SAARC Charter are:

- to promote the welfare of the peoples of South Asia and to improve their quality of life;
- to accelerate economic growth, social progress and cultural development in the region and to provide all individuals the opportunity to live in dignity and to realize their full potentials;
- to promote and strengthen collective self-reliance among the countries of South Asia;
- to contribute to mutual trust, understanding and appreciation of one another's problems;
- to promote active collaboration and mutual assistance in the economic, social, cultural, technical and scientific fields;
- to strengthen cooperation with other developing countries; to strengthen cooperation among themselves in international forums on matters of common interests;
- to cooperate with international and regional organizations with similar aims and purposes

SAARC has established new institutions such as

- SAARC Arbitration Council (SARCO) with a view to resolve cost-effective settlement of disputes via arbitration within the region
- South Asian University (SAU) with the mandate for the MS to recognize the Degrees and Certificates awarded by the SAU at par with the respective Degrees and Certificates awarded by the National Universities / Institutions
- SAARC Development Fund (SDF) as a comprehensive funding mechanism with the provision of three Windows (Social, Economic and Infrastructure).
- SAARC Regional Standards Organization (SARSO) to harmonize standards and promote cooperation in the fields of metrology, accreditation and conformity assessment for enhancing the capacity of the respective national institutions in carrying out their technical tasks.

Eleven areas were initially identified by the member countries for potential collaboration and cooperation. These included agriculture; education; culture; sports; health; population; child welfare; the environment and meteorology; rural development (including the SAARC Youth Volunteers Program); tourism; transport; science and technology; communications; women in development; and the prevention of drug trafficking and drug abuse.

B. Institutional mechanism for energy cooperation

The SAARC Framework Agreement for Energy Cooperation was signed in October of 2014. The agreement is a crucial step towards a single SAARC Market for Electricity (SAME) on a regional basis. The key objective of this agreement is to improve power availability in the entire region by providing and facilitating integrated operation of the regional power grid. In addition, the framework also promotes an unrestricted cross-border trade of electricity on a voluntary basis subject to regulations of the respective member countries. The payment security mechanism and coordinated procedures for the secure and reliable operation of the inter-connected grids of the member states for cross-border electricity trade were also part of the agreement.

The energy sector was initially not identified as an explicit area of cooperation during inception. The process of regional cooperation in the energy sector began in January 2000 with the establishment of a Technical Committee on Energy. The Council of Ministers recognized that this vital area requires focused attention and they approved the creation of a specialized Working Group on Energy in January

2004. The Working Group on Energy constituted expert groups on (I) Oil and Gas; (ii) Electricity; (iii) Renewable Energy; and (iv) Technology/Knowledge Sharing (including energy efficiency, coal, etc.).

The SAARC Energy Centre in Islamabad was established to promote the development of energy resources (including hydropower), energy trade, and energy efficiency and conservation in the region, and to develop renewable and alternative energy resources. This platform involves officials, experts, academics, environmentalists and NGOs who work together to tap potentials of cooperation in the energy sector including development of hydropower, renewable and alternative energy, promoting technology transfer, energy trade, and energy conservation and efficiency improvement in the region.

The Working Group established in 2004, formed Expert Groups for different commodities and services to further the objectives of energy cooperation. The following Expert Groups were established:

- Oil and Gas (Lead Country - Bangladesh and Sri Lanka)
- Electricity (Lead Country – India)
- Renewable Energy (Lead Country – Pakistan)
- Technology/Knowledge Sharing including energy efficiency, coal, etc.

C. Cross-border electricity trade in South Asia

Cross-border electricity trade in South Asia has evolved through bilateral arrangements with India. While several initiatives have been undertaken under the SAARC framework, the focus on cross-border electricity trade has shifted to the BBIN sub group, which consists of Bhutan, Bangladesh, India and Nepal. The bilateral arrangements between India-Bhutan, India-Bangladesh and India-Nepal are well established now and are being further strengthened. A brief profile of the cross-border electricity trade inter-connections in South Asia are provided in *Table 22* below.

Table 22: Transmission interconnections in South Asia

Countries	Details	Capacity (MW)	Status
Bhutan-India	Grid reinforcement to evacuate power from Punatsangchhu I and II	Reinforcement of 2,100 MW	Under implementation
Nepal-India	Dhalkebar - Muzaffarpur 400kV line	1,000 MW	Completed, to be strengthened
Sri Lanka-India	400kV, 127 km HVDC line with submarine cable	500 MW in the short term	Planning
Bangladesh -India	400kV HVDC back-to-back asynchronous link	500 MW in Block-I and 500 MW in Block-II	Block-I Completed, Block-II awarded on 16th June 2016 and expected completion by 2018.
India-Pakistan	220kV in the short term (could be upgraded to 400kV later)	250-500 MW	Yet to be formally discussed

1.2 BIMSTEC

A. Introduction

The Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) is a regional organization comprised of seven Member States around the Bay of Bengal. The regional group establishes a bridge between South Asia and Southeast Asia and represents a reinforcement of relations among these countries. BIMSTEC has also established a platform for intra-regional cooperation between SAARC and ASEAN members.

This sub-regional organization came into being on June 6, 1997 through the Bangkok Declaration. It has seven Member States: five from South Asia, including Bangladesh, Bhutan, India, Nepal, Sri Lanka, and two from Southeast Asia, including Burma and Thailand. Initially, the economic bloc was formed with four Member States with the acronym 'BIST-EC' (Bangladesh, India, Sri Lanka and Thailand Economic Cooperation). Following the inclusion of Burma on December 22, 1997, during a special

Ministerial Meeting in Bangkok, the Group was renamed 'BIMST-EC' (Bangladesh, India, Burma, Sri Lanka and Thailand Economic Cooperation). With the admission of Nepal and Bhutan at the 6th Ministerial Meeting (February 2004, Thailand), the name of the organization was changed to 'Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation' (BIMSTEC).

As stated in the Declaration of BIMSTEC, its objectives are:

- To create an enabling environment for rapid economic development through identification and implementation of specific cooperation projects in the sectors of trade, investment and industry, technology, human recourse development, tourism, agriculture, energy, and infrastructure and transportation.
- To accelerate the economic growth and social progress in the sub-region through joint endeavors in a spirit of equality and partnership.
- To promote active collaboration and mutual assistance on matters of common interest in the economic, social, technical and scientific fields.
- To provide assistance to each other in the form of training and research facilities in the educational, professional and technical spheres.
- To cooperate more effectively in joint efforts that are supportive of and complementary to national development plans of Member States which result in tangible benefits to the people in raising their living standards, including generating employment and improving transportation and communication infrastructure.
- To maintain close and beneficial cooperation with existing international and regional organizations with similar aims and purposes.
- To cooperate in projects that can be dealt with most productively on a sub-regional basis and make best use of available synergies among BIMSTEC member countries

Member states of the BIMSTEC reached a consensus to sign a MoU for trans-power exchange and grid interconnection, hydropower development, and the energy security of the region. The proposed MoU will provide a broad framework for the member countries to cooperate towards the implementation of grid interconnection for the trade in electricity based on bilateral building blocks with a view to promoting rational and optimal power transmission in the BIMSTEC region. The BIMSTEC trans-power exchange and development projects will be implemented through strengthening of bilateral and intra-regional cooperation within the framework of respective member countries' environmental and electricity laws and regulations.

B. Institutional mechanism for energy cooperation

At the first BIMSTEC Summit held in 2004 it was agreed that the group would promote sustainable and optimal energy utilization through development of new hydro-carbon and hydro-gas, the inter-connection of electricity and natural gas grids, and renewable energy technologies. This sector is led by Burma.

At the first BIMSTEC Energy Ministers Conference, held in 2005, it was agreed to set up a BIMSTEC Energy Centre in India for sharing experiences in reforms, restructuring, regulation and best practices in the energy sector.

1.3 Bangladesh Bhutan India Nepal (BBIN) Sub-regional Grouping

A. Introduction

The Bangladesh, Bhutan, India, Nepal (BBIN) Initiative is a sub-regional architecture of countries in South Asia. It meets through official representation of member states to formulate, implement, and review quadrilateral agreements across areas such as water resources management, connectivity of power, transport, and infrastructure.

South Asia Sub-Regional Economic Cooperation (SASEC) was initiated in 2001 with four member countries, Bangladesh, India, Bhutan and Nepal under an Asian Development Bank (ADB) initiative. ADB serves as the Secretariat for SASEC which focuses on regional cooperation in the areas of energy, transport, and trade facilitation (and tourism in the initial years). With accession of Maldives and Sri Lanka to SASEC in March 2014, the footprint has expanded. ADB has since been providing both

technical and investment assistance under the SASEC framework for capacity building and cross-border investment in roads and transmission interconnections.

Together, Bangladesh, Bhutan, India and Nepal are home to 21 percent of the world's population. The region predominantly depends on fossil fuel to meet its energy needs despite being endowed with abundant clean energy resources such as natural gas and hydropower. With sustained economic growth in the BBIN countries, as forecasted by many studies, there will be an increase in the demand for electricity in the region. To be able to handle the increasing need for energy in the future and to address sustainability concerns, there is an urgent need to explore opportunities for cross-border energy cooperation in the BBIN region. This will help to attain the following objectives, among others:

- Improving regional energy security
- Lowering energy costs for the end consumer
- Diversify the energy mix by promoting clean energy and thereby address climate change concerns

1.4 ASEAN Framework

A. Introduction

The Association of Southeast Nations (ASEAN), considered a community of opportunities, is a regional grouping that was formed to promote political, economic, and security cooperation among its ten member states: Cambodia, Brunei, Laos, Indonesia, Burma, the Philippines, Malaysia, Singapore, Thailand and Vietnam. The member countries represent a market of more than 662 million consumers (people) and a combined GDP of 3 trillion (USD) with a realized trade of more than 2.5 trillion (USD).

It is believed that the ASEAN region is likely to grow at a projected average pace of four percent per year for the next four-five years. The projected growth rate could be as high as six percent provided that the region undertakes measures to further integrate economically and to implement structural reforms to raise their productivity and competitiveness under the framework of the ASEAN Economic Community.

B. Institutional mechanism for energy cooperation

The ASEAN Centre for Energy (ACE) is an independent intergovernmental organization within the Association of Southeast Asian Nations' (ASEAN) structure that represents the 10 ASEAN Member States' (AMS) interests in the energy sector. It was established on January 1, 1999. The ACE accelerates the integration of energy strategies within ASEAN by providing relevant information and expertise to ensure that necessary energy policies and programs are in harmony with the economic growth and the environmental sustainability of the region. It is guided by a Governing Council composed of senior officials on energy from each AMS and a representative from the ASEAN Secretariat as an *ex-officio* member. Hosted by the Ministry of Energy and Mineral Resources of Indonesia, ACE's office is located in Jakarta. In 2015 the ACE Governing Council endorsed the business plan of an enhanced ACE; a high-performing institution and a regional center of excellence which builds a coherent, coordinated, focused and robust energy policy agenda and strategy for ASEAN. The three critical roles of the enhanced ACE:

- As an ASEAN energy think tank to assist the AMS by identifying and surfacing innovative solutions for ASEAN's energy challenges on policies, legal & regulatory frameworks and technologies.
- As a catalyst to unify and strengthen ASEAN energy cooperation and integration by implementing relevant capacity building programs and projects to assist the AMS develop their energy sector.
- As the ASEAN energy data center and knowledge hub to provide a knowledge repository for the AMS.

ACE assumes a central role in the ASEAN energy sector. It works closely with energy authorities/ministries in the 10 AMS called the Sub-Sector Networks (SSN) and the Specialised Energy Bodies (SEB), as well as with the ASEAN Secretariat which acts as the custodian and administrator of the Endowment fund. Together, they implement the ASEAN Plan of Action for Energy Cooperation, which serves as a blueprint for better cooperation towards enhancing energy. Keeping the region's development sustainable and environmentally friendly is an important concern of ASEAN's energy sector.

The APAEC is a series of guiding policy documents designed to support the implementation of multilateral energy cooperation to advance regional integration and connectivity goals in ASEAN. It serves as a blueprint for better cooperation towards enhancing energy security, accessibility, affordability and sustainability under the framework of the AEC for the designated period.

- APAEC 1999-2004:

  The first 5-year APAEC supported the energy cooperation agenda of the Hanoi Action Plan (HPA) under the ASEAN Vision 2020. Six fundamental program areas were identified, namely the: 1) ASEAN Power Grid (APG); 2) Trans-ASEAN Gas Pipeline (TAGP); 3) Energy Efficiency and Conservation; 4) New and Renewable Sources of Energy; 5) Coal and Clean Coal Technologies; and 6) Regional Energy Outlook, Energy Policy and Environmental Analysis.

  This laid the foundation for sound policy frameworks and implementation modalities for energy cooperation within ASEAN and for cooperative partnerships with relevant dialogue partners and international organizations.

- APAEC 2004-2009

  The second APAEC supported the energy cooperation agenda of the Vientiane Action Plan (VAP) under the ASEAN Vision 2020. Cooperation focused on capacity building to enhance the integration of regional energy infrastructure, promote energy security, create frameworks to progressively enhance market transformation and ensure sustainable energy supply. Notable achievements included the signing of the MoU for the ASEAN Power Grid (APG) and the introduction of the annual ASEAN Energy Awards (AEA) on energy efficiency. The Regional Energy Policy and Planning Sub-Sector Network (REPPSSN), which replaced the Regional Energy Outlook, Energy Policy and Environmental Analysis, was established to oversee the overall implementation of the APAEC and to undertake policy reviews and recommendations towards deeper and closer regional energy cooperation.

- APAEC 2010-2015

  The third APAEC supported the energy cooperation agenda of the ASEAN Economic Community (AEC) Blueprint 2015. Of note, the ASEAN Energy Ministers and the Executive Director of the International Energy Agency (IEA) signed a MoU in 2011 in Brunei Darussalam and established an annual ASEAN Ministers on Energy Meeting (AMEM)-IEA Energy Dialogue. In 2013, the Ministers signed the “Instrument to extend the TAGP” MoU for another term of 10 years till May 20, 2024.

- APAEC 2016-2025,

  With the theme, “Enhancing Energy Connectivity and Market Integration in ASEAN to Achieve Energy Security, Accessibility, Affordability and Sustainability for All”, the plan will implement the outcome-based strategies and action plans through the seven program areas.

ASEAN established the electricity interconnecting arrangements within the region through the APG under the ASEAN Vision 2020 adopted in the Second ASEAN Informal Summit in Kuala Lumpur on December 15, 1997. HAPUA, as an SEB, is tasked with ensuring regional energy security by promoting the efficient utilization and sharing of resources. The construction of the APG is first done on cross-border bilateral terms, then expanded to a sub-regional basis and finally to a total integrated regional system. It is expected to enhance cross-border electricity trade which would provide benefits to meet the rising electricity demand and improve access to energy services in the region.

ASEAN recognizes that energy plays a key role not only in unlocking regional growth and development, but also in realizing the objective of a well-integrated, competitive, and resilient region. To realize these objectives, the demand for electricity/energy in the region is likely to increase significantly and would therefore require huge amount of investment in the power generation capacity to address imbalances between the demand and supply of energy. These imbalances and the willingness to cooperate provide opportunities for the countries in the region to expand power cooperation with neighboring countries in the regional grouping.

2 Annexure 2: IPP projects in Nepal

S No	Project Developer	Location	Capacity (kW)
1	Himal Power Ltd.	Khimti Khola	60,000
2	Sinohydro-Sagarmatha Power Company (P) Ltd.	Upper Marsyangdi "A"	50,000
3	Bhotekoshi Power Company Ltd.	Bhotekoshi Khola	45,000
4	Madi Power Pvt. Ltd.	Upper Madi	25,000
5	Chilime Hydro Power Company Ltd.	Chilime	22,100
6	Sanima Mai Hydropower Limited	Mai Khola	22,000
7	Panchthar Power Company Pvt. Ltd.	Hewa Khola A	14,900
8	Butwal Power Company Ltd.	Jhimruk Khola	12,000
9	United Modi Hydropwer Pvt. Ltd.	Lower Modi 1	10,000
10	Panchakanya Mai Hydropower Ltd.	Upper Mai Khola	9,980
11	Synergy Power Development (P.) Ltd.	Sipring Khola	9,658
12	Butwal Power Company Ltd.	Andhi Khola	9,400
13	Api Power Company Pvt. Ltd.	Naugadh gad Khola	8,500
14	Ankhu Khola Jal Bidhyut Co. (P.) Ltd.	Ankhu Khola - 1	8,400
15	Sanvi Energy pvt. Ltd.	Jogmai	7,600
16	National Hydro Power Company Ltd.	Indrawati - III	7,500
17	Sanima Mai Hydropower Ltd.	Mai Cascade	7,000
18	Daraudi Kalika Hydro Pvt. Ltd.	Daraudi Khola A	6,000
19	Mailung Khola Hydro Power Company (P.) Ltd.	Mailung Khola	5,000
20	Aadishakti Power Dev. Company (P.) Ltd.	Tadi Khola (Thaprek)	5,000
21	Ruru Hydropower Project (P) Ltd.	Upper Hugdi Khola	5,000
22	Nyadi Group (P.) Ltd.	Siuri Khola	4,950
23	Gandaki Hydro Power Co. Pvt. Ltd.	Mardi Khola	4,800
24	Himal Dolkha Hydropower Company Ltd.	Mai Khola	4,500
25	Barun Hydropower Development Co. (P.) Ltd.	Hewa Khola	4,455
26	Bhagawati Hydropower Development Co. (P.) Ltd.	Bijayapur-1	4,410
27	Radhi Bidyut Company Ltd.	Radhi Khola	4,400
28	Khani Khola Hydropower Company Pvt. Ltd.	Tungun-Thosne	4,360
29	Unique Hydel Co. Pvt.Ltd.	Baramchi Khola	4,200
30	Khudi Hydropower Ltd.	Khudi Khola	4,000
31	Bhugol Energy Dev Compay (P). Ltd	Dwari Khola	3,750
32	Nepal Hydro Developer Pvt. Ltd.	Charanawati Khola	3,520
33	Arun Valley Hydropower Development Company (P.) Ltd.	Piluwa Khola Small	3,000
34	Alliance Power Nepal Pvt.Ltd.	Chaku Khola	3,000
35	Bhairabkunda Hydropower Pvt. Ltd.	Bhairab Kunda	3,000
36	Joshi Hydropower Development Company Limited	Upper Puwa -1	3,000
37	Sanima Hydropower (Pvt.) Ltd.	Sunkoshi Small	2,500
38	Sayapatri Hydropower Private Limited	Daram Khola A	2,500
39	Ridi Hydropower Development Co. (P.) Ltd.	Ridi Khola	2,400
40	Bojini Company Private Limited	Jiri Khola Small	2,200

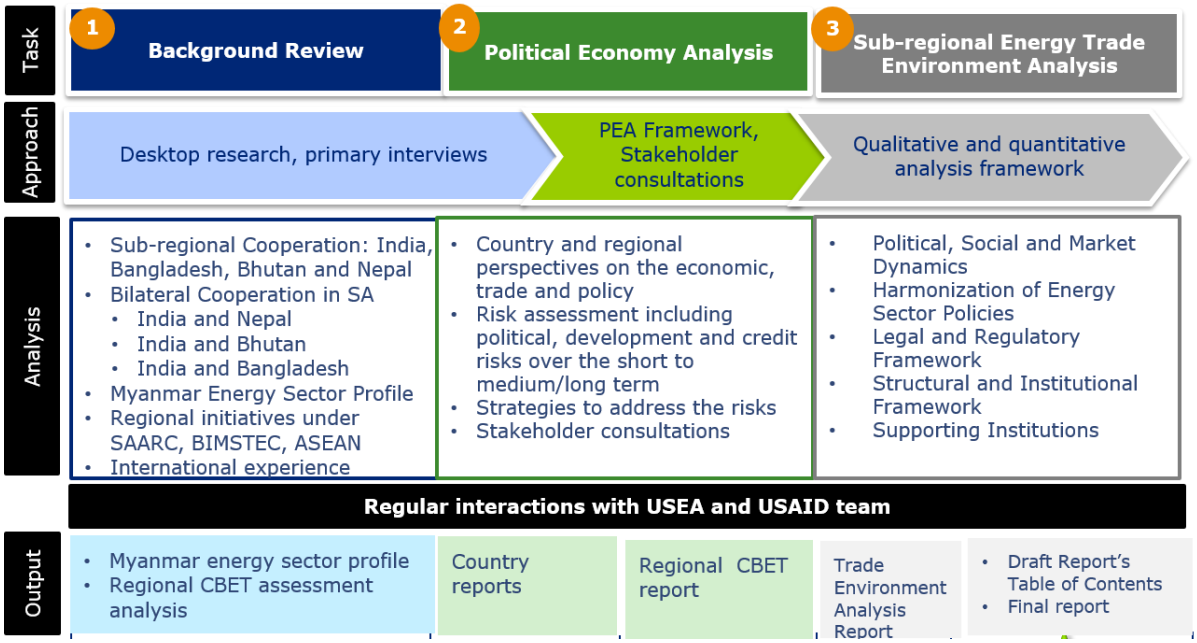
S No	Project Developer	Location	Capacity (kW)
41	Chhyangdi Hydropower Limited	Chhandi	2,000
42	Electro-com and Research Centre Pvt. Ltd.	Jhyadi Khola	2,000
43	Khani Khola Hydropower Company Pvt. Ltd.	Khani Khola	2,000
44	Laughing Buddha Power Nepal (P.) Ltd.	Middle Chaku	1,800
45	Laughing Buddha Power Nepal Pvt. Ltd.	Lower Chaku Khola	1,800
46	Thoppal Khola Hydro Power Co. Pvt. Ltd.	Thoppal Khola	1,650
47	Kutheli Bukhari Small Hydropower (P). Ltd	Suspa Bukhari	998
48	United Hydropower (P.) Ltd.	Pati Khola Small	996
49	Sapsu Kalika Hydropower Co. Pvt. Ltd.	Miya Khola	996
50	Khoranga Khola Hydropower Dev. Co. Pvt. Ltd.	Pheme Khola	995
51	Pashupati Environmental Eng. Power Co. Pvt. Ltd.	Chhote Khola	993
52	Centre for Power Dev. And Services (P.) Ltd.	Upper Hadi Khola	991
53	Baneswor Hydropower Pvt. Ltd.	Lower Piluwa Small	990
54	Task Hydropower Company (P.) Ltd.	Seti-II	979
55	Gautam Buddha Hydropower (Pvt.) Ltd.	Sisne Khola Small	750
56	Kathmandu Upatyaka Khanepani Bewasthapan Board	Solar	680
57	Prime Hydropower Co. Pvt. Ltd.	Belkhu	518
58	Rairang Hydro Power Development Co. (P) Ltd.	Rairang Khola	500
59	Kathmandu Small Hydropower Systems Pvt. Ltd.	Sali Nadi	250
0	Syange Electricity Company Limited	Syange Khola	183

Source: NEA Annual Report, 2017

3 Annexure 3: Approach and Method

The overall approach for this assignment included three phases. These phases are depicted in *Figure 54* below.

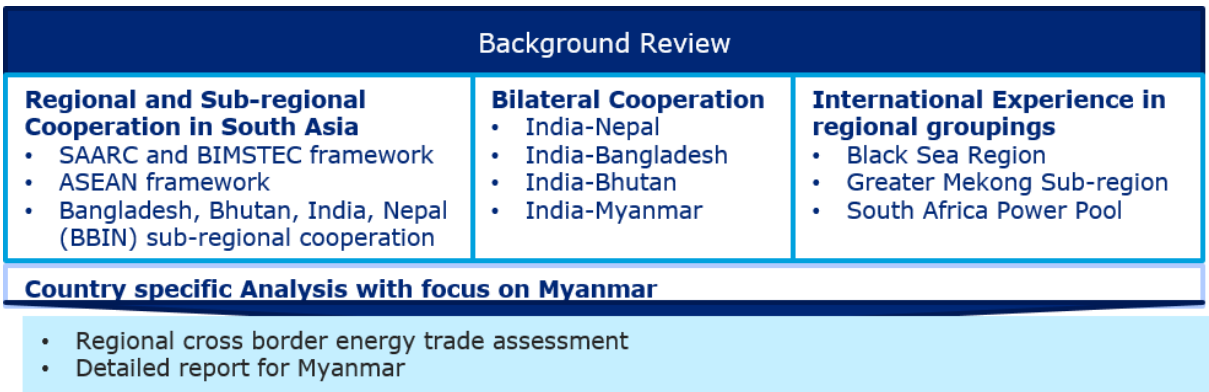
Figure 54: Overall Approach



3.1 Task 1: Background review

The regional, sub-regional, and international energy cooperation mechanisms were reviewed through secondary research. For this purpose, available publications and reports by multi-lateral agencies such as USAID (SARI/IE), ADB, World Bank, UK's Department for International Development (DFID), were reviewed. In addition, the country specific information was compiled from the available information for the power utilities, regulatory commission, government ministries, and global. etc. We also leveraged Deloitte's proprietary database, extensive network in the region, and on-ground project implementation experience to provide keen insights into the critical aspects of the work. The following *Figure 55* shows the approach followed for the Task 1.

Figure 55: Task 1 – Background review

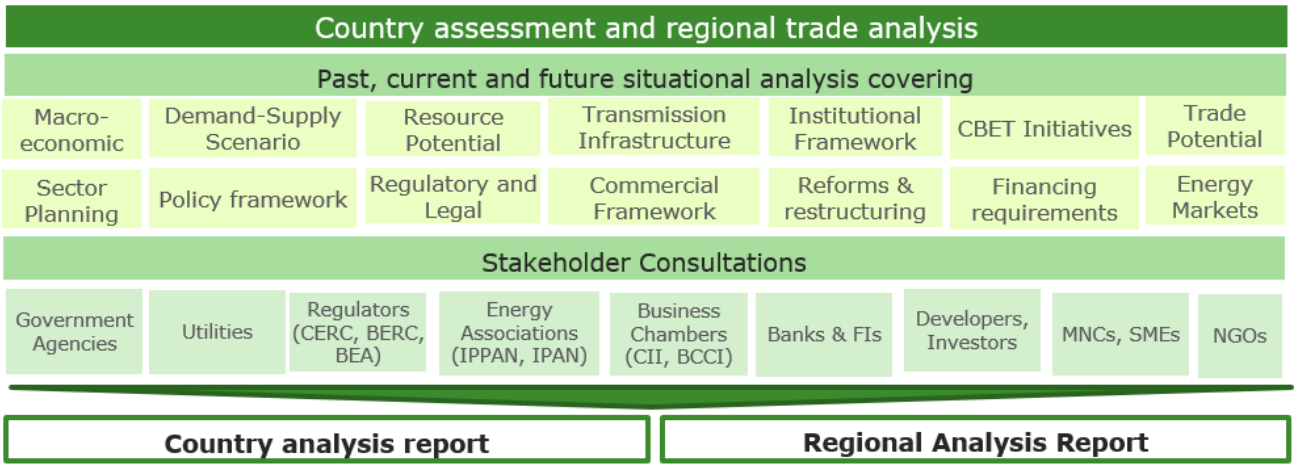


3.2 Task 2: Political Economy Analysis

A political economy analysis of South Asia and Southeast Asian countries for cross-border electricity trade provided country specific assessment and regional energy trade analysis along with the

recommendations about policy reforms to be achieved for facilitation of cross-border electricity trade. The situational analysis covers the following key parameters shown in *Figure 56* below.

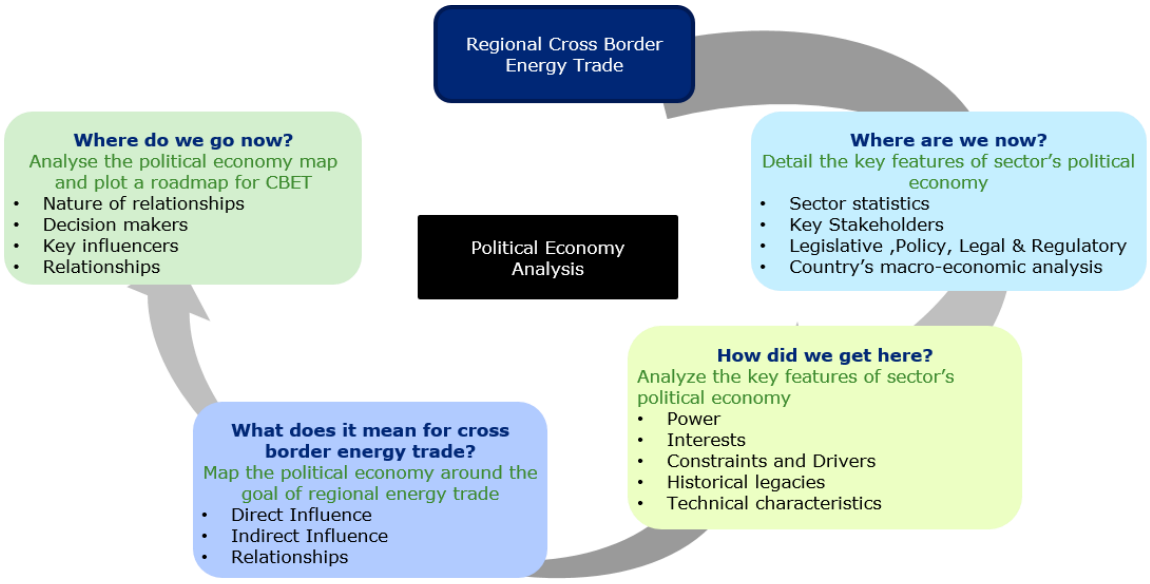
Figure 56: Key parameters for situational analysis



The stakeholder consultations were organized through face-to-face discussions in India, Burma and Bangladesh while telephonic interviews were conducted for Nepal and Bhutan.

A summary of stakeholder discussions on cross-border electricity trade on the priorities, barriers, key drivers and solutions to identify key reform issues were compiled and country reports prepared as shown in *Figure 57* below.

Figure 57: Overview of political economy analysis



The regional analysis report addresses the regional political economy analysis, underscores the priority of policy reforms needed, highlights the risk and identifies the activities that SARI/EI could work on for facilitation of cross-border electricity trade. The report also includes short-term activities and a long-term roadmap, timeline and potential partners for SARI/EI (including government and civil society). We leveraged the established political economy analysis (PEA) frameworks from WB, USAID and customized them for the political economy analysis.

3.3 Task 3: Sub-regional energy trade environment analysis

This task will cover the various drivers required for enabling cross-border electricity trade among South Asia and Burma in short- to medium-term and the rest of the Southeast Asia region in the long-term.

This includes political, social and market dynamics, harmonization of energy policies and legal, regulatory and institutional framework for the member countries and highlights implementing and supporting institutions. We developed an evaluation framework to quantify the impact of key drivers and prioritized them for the sub-regional energy trade environment analysis. The final report on political economy analysis provides the recommendations, method, findings and analysis for linking South Asia with Burma & Southeast Asia.

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