Chapter 3

Energy Trade Practices in India: Review of Tariff and Non-Tariff Barriers in Relation to ASEAN

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CHAPTER 3

Energy Trade Practices in India: Review of Tariff and Non-Tariff Barriers in Relation to ASEAN

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The EAS region has several factors---e.g., geographical proximity, gaps in energy supply versus demand, and different socio-economic conditions---that are conducive to energy cooperation between India and its neighbours. Thus, this study focuses on India's energy trade with other countries in the East Asia Summit (EAS) region, especially the Association of South East Asian Nations (ASEAN), its barriers and limitations. It suggests that India has the capacity to boost its energy trade in both domestic and international markets. An eventual integration with the ASEAN and EAS region holds great promise for India's own economic development. At present, however, India has a weak energy trade network, which should be strengthened so as to optimally utilise energy resources. Existing barriers, both tariff and non-tariff, are hindering this process. India needs to reform the bilateral relations with every member-nation of the ASEAN in terms of the requirements of that particular country and that of India. This study further looks at the various obstacles in the energy sector that hinder trade between India and ASEAN countries and suggests possible steps for removing these.

JEL Classification: F13, Q4, Q40, Q41, Q42, Q48, Q49

Introduction

India's economic policies after 1947, the so-called post-independence years, were socialist in nature. Attempts to liberalise the economy in 1966 and in 1985 failed, and the actual economic liberalisation began only in 1991, after the economic crisis in India. The downfall of the economy was attributed to a high fiscal deficit of 12.7 percent in 1990-1991 and to political instability. The situation was further aggravated by the crisis in the Gulf (Middle East) countries, wherein a steep rise in prices of oil and consequently, of petroleum imports into India, became very expensive. Foreign remittances from migrant Indian workers in these countries also declined, and several creditors and investors pulled out their resources from India (Cerra and Saxena, 2000). The Soviet Union, India's largest export market, weakened due to the crises in the Gulf; thus, exports too declined. All these factors resulted in the devaluation of the Indian currency.

The government of India was compelled to restructure its economic policy not only to revive its economic growth, but also to tackle widespread poverty in the country. The economic liberalisation initiated in 1991 brought about a total shift to a more open economy with greater reliance upon market forces; a dynamic private sector, including foreign investment; a restructuring of the government's role; a phase out of import licensing; and reduction of import duties (Ahluwalia, 2002). In India, the Foreign Trade (Development and Regulation) Act of 1992 provides for the expansion and regulation of foreign trade and implementation of the export-import policy. Accordingly, the Ministry of Commerce and Industry promotes and regulates foreign trade and also releases notifications on trade policies on a regular basis.

Gradually, India has shifted from conservative trade approaches to more progressive policies that encourage export-led growth, thus improving efficiency and competitiveness of industries. Globalisation of the Indian economy became the guiding force behind the formulation of trade policies. Reform measures introduced in the subsequent policies focused on liberalisation, openness, and transparency. They promoted a trade-friendly environment by simplifying the procedures for doing business.

In the first quarter of 2012, the Indian economy grew by 5.3 percent, the lowest in almost a decade. With surging trade and budget deficits, and a depreciating currency, there is widespread concern over whether India would see the return of a "1991-like crisis" (Financial Times [FT], 2012). To revive its economy and thus create an efficient and financially stable energy sector, India must maintain further economic growth and reduce any negative impact on its public finance. This needs an accelerated transition of the energy sector based on a market economy.

India's social and economic development has slowed down due to severe energy shortage in the fuel sector, including coal, gas, oil and uranium. Its declining domestic production further requires more energy to be imported. India imports crude oil, coal, and gas but because of the disparity between domestic and international prices for these fuels, the volume of actual fuels imported may be less than the volume required to meet the shortage. Moreover, an increasing fuel import has negative financial implications on the economy. Thus, India has to have a well-functioning energy market---i.e., a system where the national energy demand can be met by timely and sustainable investments and where business entities operating in the energy market are commercially viable. Energy policies in India have been designed to address the country's growing energy deficit and to focus on developing alternative sources of energy, particularly nuclear, solar, and wind energy.

Energy cooperation between India and countries of the Association of South East Asian Nations (ASEAN) needs to be accelerated. After all, several factors across these countries---e.g., geographical proximity; imbalances in distribution between energy resources and demand; and differences in economic, social and energy development stages---justify why forging energy trade relations makes sense. Each country in the region has some comparative advantage that can be harnessed and mutually benefit its energy trade partners. Currently, India's weak energy trade network needs to be strengthened if it were to optimally utilise and take full advantage of its energy resources.

This paper reviews the energy sector in India, focusing on the energy trade and its barriers and limitations and on the promotion of energy trade between

India and other countries, particularly the ASEAN members. It suggests that India has the capacity to boost its energy trade in both domestic and international markets.

Energy Sector in India: An Overview

India's total primary energy consumption from crude oil (29.45%), natural gas (7.7%), coal (54.5%), nuclear energy (1.26%), hydro electricity (5.0%), wind power, biomass electricity, and solar power was 595 million tonnes of oil equivalent (Mtoe) in the year 2013. The net imports included about 144.3 Mtoe of crude oil; 16 Mtoe of liquefied natural gas (LNG); and, 95 Mtoe of coal---a total of 255.3 Mtoe of primary energy equivalent to 42.9 percent of the total primary energy consumption (BP, 2014).

About 70 percent of India's electricity generation capacity is from fossil fuels, of which coal accounts for 40 percent. This is followed by crude oil and natural gas at 24 percent and 6 percent, respectively. India is largely dependent on fossil fuel imports for its energy demands. By 2030, India's dependence on energy imports is expected to exceed 53 percent of the country's total energy consumption.

The growth of electricity generation in India has been hindered by domestic coal shortages and, as a consequence, India's coal imports for electricity generation have risen (IEA, 2012). Given such ever-increasing energy demand coupled by restricted domestic fuel reserves, India set up extensive plans to develop the renewable and nuclear power industries. There are four main types of energy in India: *thermal* (coal, gas, oil), *hydro (major)*, *renewable* (small hydro, wind, and solar), and *nuclear energy*. Table 3.1 provides details of the installed capacity of energy utilities in India as of December 2013.

Table 3.1: Installed Capacity (MW) of Energy Utilities in India

Type	Source	Total Capacity	Percentage
Thermal	**Total**	**159,793.99**	**68.19**
	Coal	138,213.39	58.75
	Gas	20,380.85	8.92
	Oil	1,199.75	0.52
Hydro (Conventional)	Hydroelectricity	**39,893.40**	**17.39**
Renewable Energy Sources (RES)	SHP, BG, BP, U&I*; Wind & Solar Energy	**29,462.55**	**12.33**
Nuclear	Nuclear	**4780.00**	**2.09**
Total		**2,33929.94**	**100.00**

Note: *SHP= Small Hydro Project; BG= Biomass Gasifier; BP= Biomass Power; U & I=Urban and Industrial Waste Power.
Source: Central Electricity Authority, 2014.

The power sector in India is under the Ministry of Power (MoP) and has three major segments: generation, transmission, and distribution. Power Generation consists of three sectors: state, central, and private. State-level corporations consist of State Electricity Boards (SEBs), which are formed in all the states and at present constitute about 38.83 percent of overall power generation with an installed capacity of 90,836.70 MW. The central sector, also known as Public Sector Undertakings (PSUs), accounts for 32.53 percent of the installed capacity (76,095.30 MW). Such major PSUs include the National Hydroelectric Power Corporation Limited *(*NHPC Ltd), National Thermal Power Corporation Limited (NTPC Ltd), and Nuclear Power Corporation of India (NPCIL*).* The private-sector enterprises comprise 28.64 percent (66,997.94 MW) of the total installed capacity. Table 3.2 shows the sector-wise distribution of energy in India (as of December 2013).

Table 3.2: Sector-Wise Distribution of Energy Utilities in India

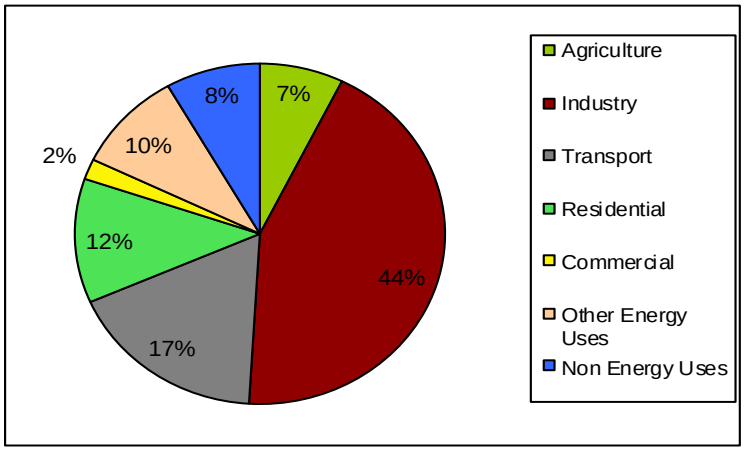
Sector	Total Capacity (MW)	Percentage
State Sector	90,836.70	38.83
Central Sector	76,095.30	32.53
Private Sector	66,997.94	28.64
Total	**2,33929.94**	**100.00**

Source: Central Electricity Authority, 2014.

Figure 3.1 shows the India's sector-wise energy consumption in 2012-2013. Industry garnered the main share (44%), followed by the Transport sector (17%); Residential sector (12%); Other Energy Uses (10%); Non-Energy Uses (8%); and Agriculture sector (7%). The Commercial sector has the least share at 2 percent. On the other hand, Figure 3.2 illustrates the energy consumption of India in 2012-2013. The highest share in India is that of coal (53%), followed by oil (30.45%). On the other hand, the world energy consumption shows a reversed trend as its major share is that of oil (33.11%), followed by coal at 30 percent (BP, 2013).

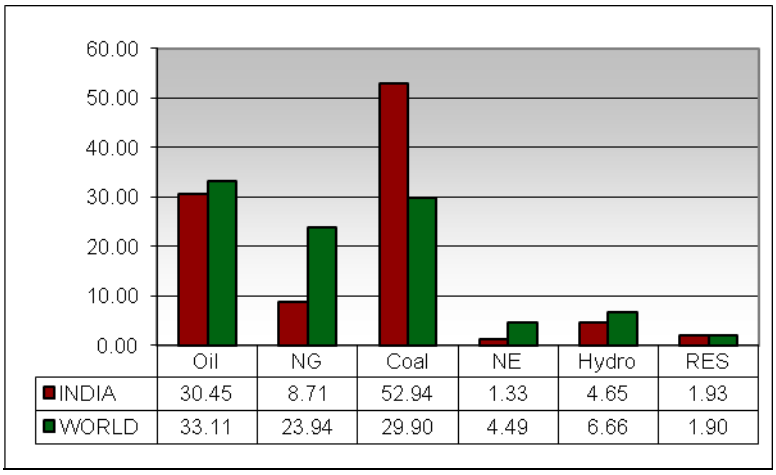
In terms of total energy consumption in the world, India is the third largest consumer at 774 Mtoe, after China at 2,713 Mtoe, and the United States at 2,152 Mtoe (Enerdata, 2013).

Figure 3.1: Sector-Wise Energy Consumption in India (%)



Source: TERI, 2013.

Figure 3.2: Energy Consumption: India v/s World (%)



	Oil	NG	Coal	NE	Hydro	RES
INDIA	30.45	8.71	52.94	1.33	4.65	1.93
WORLD	33.11	23.94	29.90	4.49	6.66	1.90

Source: BP, 2013.

Energy Sources

India's largest energy source is coal, followed by petroleum and traditional biomass such as burning firewood and waste. Its energy policy aims to ensure that the energy sources are adequate to meet the demands of its fast growing economy. However, factors such as subsidies, rising dependency on imports, and poor reforms in this sector impede India's efforts to meet the energy demand (Energy Information Administration [EIA], 2013).

Coal

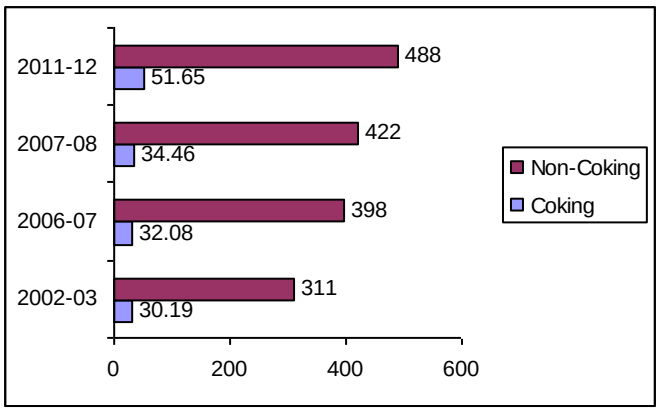
India is the fourth largest coal producer in the world after China, the United States, and Australia. Due to continued increase in investments, its production has grown from about 70 million tonnes (MT) in the early 1970s to 557 MT in 2012-2013 (BP, 2012). More than 991 of India’s coal deposits are found in the eastern and south central parts of the country---in particular, in the states of Jharkhand, Odisha, Chhattisgarh, West Bengal, Andhra Pradesh, Maharashtra, and Madhya Pradesh. The estimated reserves of coal were around 293.5 billion tonnes in 2012. Most of the coal production in India comes from open cast mines (88%) while underground mining accounts for the rest (12%) of the national output (Ministry of Coal, 2013).

Generally, coal is classified in terms of certain chemical (ash, moisture, and volatile matters) and physical (caking index, coke type, and swelling index) parameters. In India, coal is broadly classified into two types: coking and

non-coking. India has the fifth largest coal reserves in the world. About 88 percent of these are non-coking coal reserves and 12 percent coking. Indian coal is characterised by its high ash (45%) and low sulphur content. The power sector is the largest consumer of coal, followed by the iron and steel, and cement sectors.

Lignite is commonly known as brown coal and is classified as grades A to C on the basis of gross calorific value as per the requirement of the industries. It is considered as an appropriate fuel for power generation especially due to its low ash content (Geological Survey of India [GSI], 2014). Figure 3.3 presents the coal production trend in India from 2002-2012, wherein it can be seen that non-coking coal garners the major share and its production is increasing rapidly to meet the high demand from the power sector.

Figure 3.3: Coal Production Trend in India (MT)

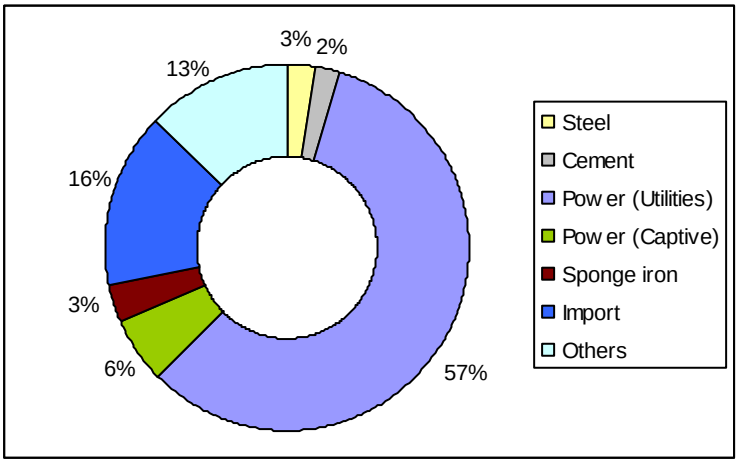


Source: GSI, 2014.

More than half (58.75%) of the total installed electricity generation capacity in India's energy basket is coal based. The demand for coal is projected to reach 980 MT during the 12th Five-Year Plan of the Government of India (2012–2017). Domestic production is expected to rise to 795 MT in the terminal year (2016-2017). Although the demand gap will be met through imports, domestic coal production is slated to grow at an average rate of 8 percent compared to about 4.6 percent during the 11th Five-Year Plan (2007-2012). As the major source of energy consumption in the country, coal contributes about 30 percent of the total domestic consumption. Figure 3.4 shows the sector-wise distribution of coal consumption in India. About 63

percent of the coal in the country is consumed in the power sector, followed by the import sector (16%).

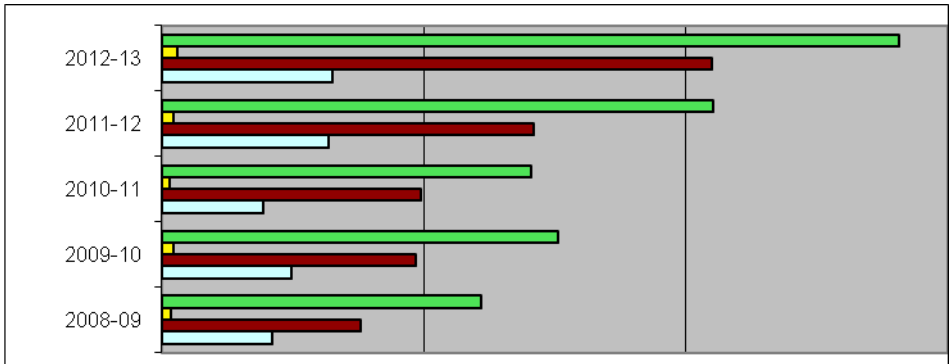
Figure 3.4: Sector-Wise Distribution of Coal Consumption in India (%)



Note: *Others: Includes, jute, bricks, coal for soft coke, colliery, fertilisers and other industries consumption.
Source: Ministry of Coal, 2013.

Although India has the fifth largest coal reserves in the world, its coal sector is one of the most centralised and inefficient. Two state-owned companies; namely, the Coal India Limited (CIL) set up in 1975 and the Singareni Collieries Company (SCCL), have a near-monopoly on production and distribution. There is an increasing gap between demand and supply. On the supply side, India's coal imports have grown by more than 13 percent per year since 2001 (EIA, 2013). Figure 3.5 shows the coal import trend in India by type over the last five years.

Figure 3.5: Coal Imports to India by Type (MT)



	2008-09	2009-10	2010-11	2011-12	2012-13
Total Imports	60.88	75.6	70.4	105.21	140.63
Coke	1.88	2.35	1.49	2.36	3.07
Non-Coking	37.92	48.56	49.43	71.05	105.00
Coking	21.08	24.69	19.48	31.8	32.56

Source: MoC, 2013.

Based on the existing Indian Import policy, consumers themselves can freely import coal under an open general license. Steel Authority of India Limited (SAIL) and other steel-manufacturing units import coking coal, while coal-based power plants import non-coking coal. Main importers of coke include pig-iron manufacturers, iron-and-steel sector consumers using mini-blast furnace, cement plants, captive power plants, sponge iron plants, industrial consumers, and coal traders. India imports majority of its coal from Indonesia and South Africa (thermal coal), and Australia (coking coal). However, new regulatory mechanisms in these countries are driving coal prices up, leading India to now look at importing coal from other countries such as Mozambique.

The overall coal import for the year 2012-2013 was estimated to be 140.63 MT. Despite this increase in production, the existing demand still exceeds the supply. There is a perennial shortage of coal. India exports an insignificant quantity of coal to its neighbouring countries, viz., Bangladesh, Bhutan, and Nepal. Domestically, the development of core infrastructure sectors such as power, steel, and cement are dependent on coal (Ministry of Coal, 2012). Unfortunately, there is no provision for private and foreign investment in coal production. Thus, despite having large coal reserves and a healthy growth in

natural gas production over the past two decades, India remains very dependent on imported crude oil (EIA, 2013).

Oil and Natural Gas

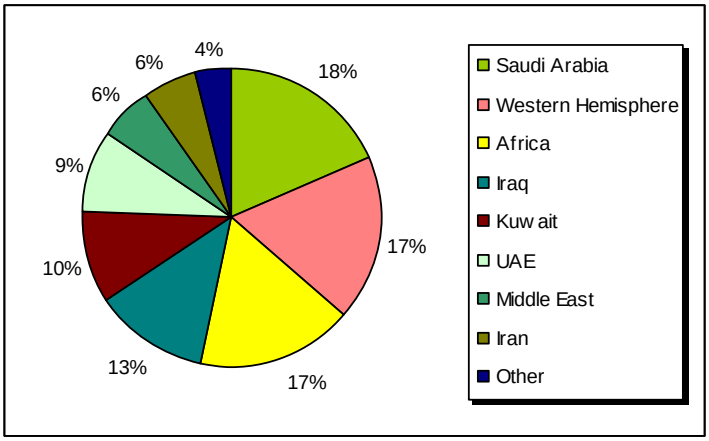
In 2011-2012, India was the fourth largest consumer of crude oil and natural gas in the world after the United States, China, and Russia. The share of crude oil in production and consumption is expected to be 6.7 percent and 23 percent, respectively, by 2021-2022. Petroleum demand in the transport sector is expected to grow rapidly in the coming years as vehicle ownership expands. While India's domestic energy resource base is substantial, the country relies on imports for a considerable amount of its energy use, particularly for crude petroleum.

Combustible renewables and waste constitute about one-fourth of the Indian energy use. This share includes traditional biomass sources such as firewood and dung, which are used by more than 800 million Indian households for cooking. The estimated reserves of crude oil in India stood at 759.59 MT while that of its natural gas was at 1,330.26 billion cubic metres (Bcm) in 2011-2012. The geographical distribution of crude oil indicates that the maximum reserves are in the Western offshore (44.46%), followed by Assam (22.71%). Meanwhile, the maximum reserves of natural gas come from the Eastern offshore (34.73%), followed by Western offshore (31.62%).

India's growing dependence on oil imports can be gleaned from the increasing volume of net crude oil imports as well as in the rising share of net crude oil imports in the refinery crude throughput. Imports accounted for 44 percent of crude oil processed (in terms of refinery crude throughput) in 1990, 83 percent in 2010-2011, and 84 percent in 2011-2012.

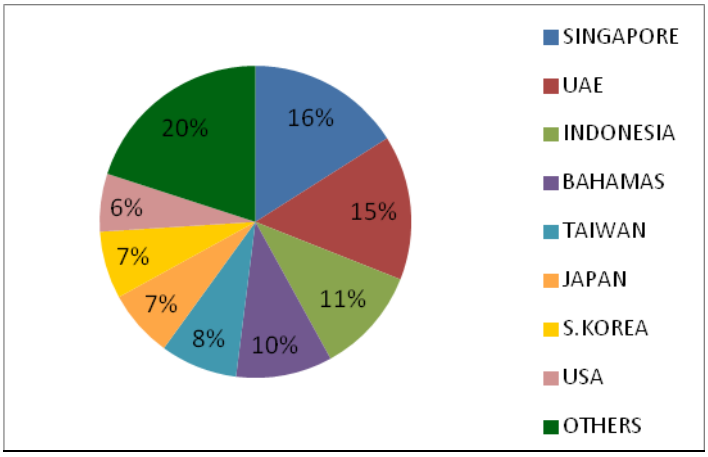
Figure 3.6 shows India's crude oil imports in 2012. Saudi Arabia (18%) is the largest source of India's crude oil imports. The second largest suppliers are Africa---mainly, Nigeria--- (17%), and the Western Hemisphere (17%). While being a net importer of crude oil, India has also become a net exporter of petroleum products (Figure 3.7) such as naphtha, motor gasoline, and distillate fuel oil to the international market, particularly Singapore, the United Arab Emirates, and Indonesia (EIA, 2013).

Figure 3.6: Crude Oil Imports by India in 2012 (%)



Source: EIA, 2013.

Figure 3.7: Export of Oil Products* by India 2012 (%)

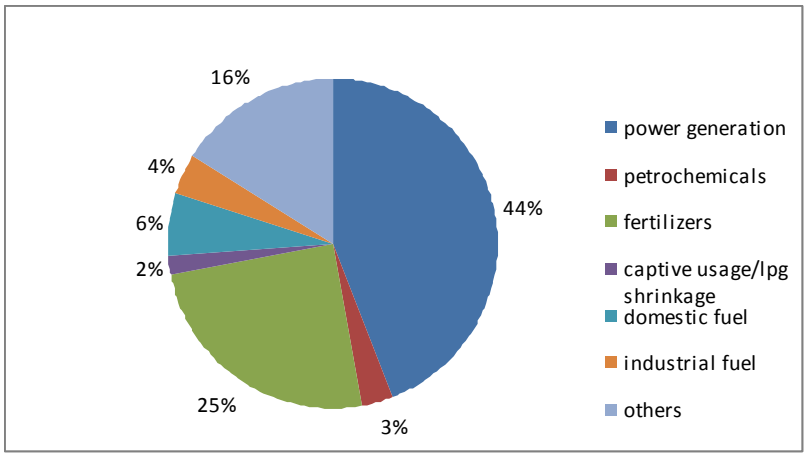


Note:*Oil products -motor fuel, kerosene jet fuel, naphtha
Source: EIA, 2013.

India ranks 11th among the world's natural gas consumers. Ten percent of India's primary energy consumption consists of natural gas (BP, 2012). Note that in 2011-2012, 46.3 Bcm of natural gas was consumed in India, showing a recline of 10 percent over the previous period.

The demand for natural gas has grown at about 6.5 percent during the last decade (Petroleum Planning and Analysis Cell [PPAC], 2012). Several industries such as power generation, fertiliser, and petrochemicals are now opting for natural gas. Although India supplies natural gas for the domestic market, the demand has exceeded the supply. Figure 3.8 shows the sector-wise consumption of natural gas in 2012.

Figure 3.8: Sector-Wise Consumption of Natural Gas in 2012 (In %)



Source: MOSPI, 2014.

In 2011-2012, India imported 13.2 MT of LNG from several countries such as Abu Dhabi, Algeria, Australia, Egypt, Equatorial Guinea, Malaysia, Nigeria, Norway, Oman, Qatar, Trinidad and Tobago, the United States, and Yemen. There are three LNG terminals in the country (Dahej, Hazira and Dabhol). As India imports nearly 80 percent of its crude demand, rising international prices can result in more under-recovered overheads to oil marketing companies.

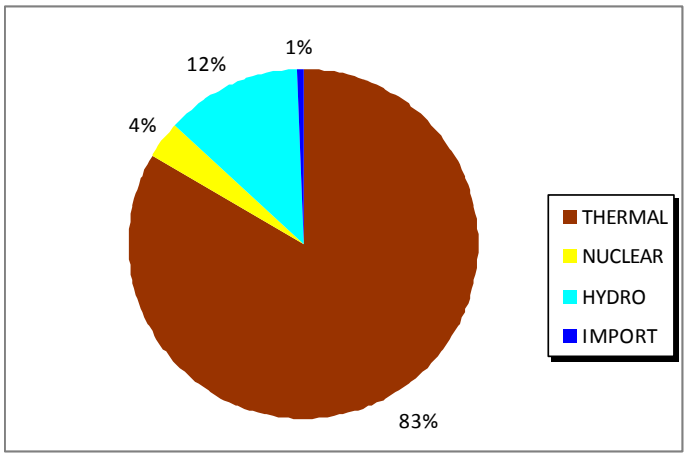
Power

More than 50 percent of the Indian population has little or no access to commercial energy for their living needs and livelihood. Even those who have access have to endure an erratic electricity supply as well as power cuts. The total installed generating capacity of power utilities climbed from 199 GW as on 31 March 2012, to 233 GW by December 2013---representing an increase of 17 percent. The installed capacity consists of 58.75 percent coal, 8.92 percent gas, 0.52 percent oil, 17.39 percent hydropower (> 25MW), 12.33 percent renewable energy sources (RES), and 2.09 percent nuclear energy. Out of this total installed capacity, the highest share is contributed by the state sector (38.83%), followed by the central sector (32.53%), and the private sector (28.64%), as shown in Tables 3.1 and 3.2.

In spite of the high demand for power utilities, the capacity addition has been lower than the planned targets. For example, this target was 78,700 MW for the 11th Five-year Plan (2007-2012) but the actual capacity addition was only 53,922 MW. This indicates an under-achievement of approximately 25,000 MW (Central Electricity Authority [CEA], 2011).

In terms of generation, India recorded a total of 912,056.70 million units (MU) of power (2012-2013). Figure 3.9 shows the source-wise distribution of power-generation in India for 2012-2013. Thermal sources generated about 760,675.80 MU (83%); hydroelectricity, about 113,720.29 MU (12%); nuclear sources, 32,866.11 MU (4%); and imports, 4,794.5 MU (1%) of the total generation in the country (CEA, 2013).

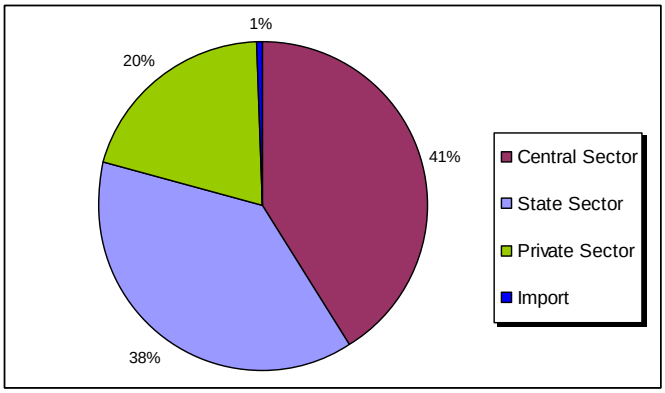
Figure 3.9: Source-Wise Generation of Power (MU), 2012-2013



Source: CEA, 2014.

On the other hand, Figure 3.10 shows the sector-wise distribution of power generated in India for 2012-2013. The central sector generated about 375,970.33 MU (41%); state sector, about 347,153.72 MU (38%); private sector's Independent Power Producers (IPPs) and utilities, 157,197.45 MU (17%) and 26940.7 MU (3%), respectively; and imports, 4,794.5 MU (1%) of the total generation in the country (CEA, 2013).

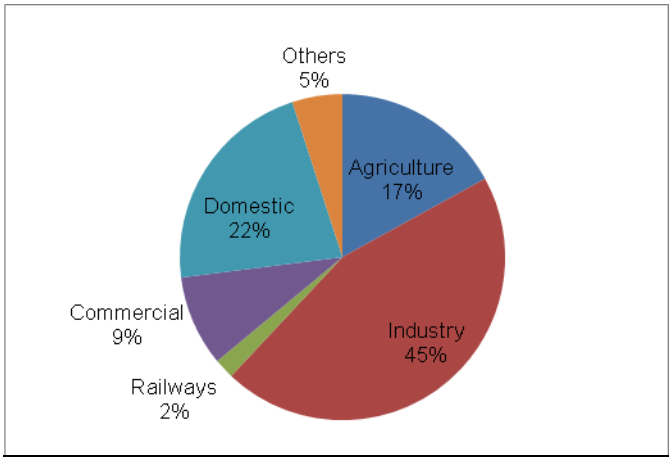
Figure 3.10: Sector-Wise Generation of Power (MU), 2012-2013



Source: CEA, 2014.

Finally, Figure 3.11 shows the sector-wise consumption of electricity in India in 2012.

Figure 3.11: Sector-Wise Consumption of Power in India, 2012 (%)



Source: MOSPI, 2014.

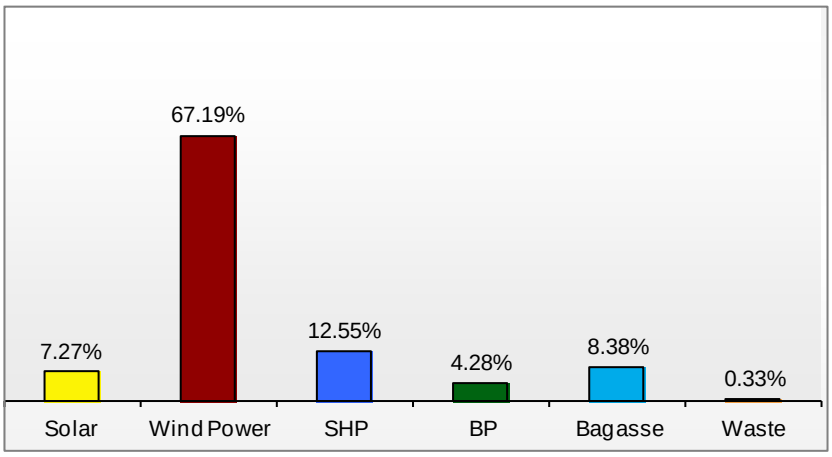
Renewable Energy Sources

India sees a potential for generating renewable energy from various sources: wind, solar, biomass, small hydro, and cogeneration bagasse. The country has the world's fifth largest wind power market and plans to add about 20 GW of solar power capacity by 2022. Renewable energy sources (RES) took about 12.33 percent share of India's total energy-producing capacity in 2013 (Table 1). In 2011-2012, the total potential for renewable power generation in the country is estimated at 89,774 MW. This includes wind power potential of 49,130 MW (54.73%), small-hydro power (SHP) potential of 15,399 MW (17.15%), biomass power potential of 17,538 MW (19.54%), and potential from bagasse-based cogeneration in sugar mills of 5,000 MW (5.57%).

The geographic distribution of the estimated potential (among the Indian States) reveals that Gujarat has the highest share at about 13.91 percent (12,489 MW), followed by Karnataka with 12.3 percent share (11,071 MW) and Maharashtra with 10.69 percent share (9,596 MW), mainly on account of wind power potential. Figure 3.12 gives the source-wise capacity of RES in India in 2012. Renewable energy sources are a feasible alternative as they bring environmental and socio-economic benefits along with potential energy

security to India. About 32% of the total primary energy use in the country is still derived from biomass and more than 70% of the country's population depends upon it for its energy needs. At present, availability of biomass in India is estimated to be about 500 million metric tonnes per year. In addition, surplus biomass availability of about 120 – 150 million metric tons per annum is estimated, which includes agricultural and forestry residues, corresponding to a potential of about 18,000 MW. Further, the 5000 MW surplus power could be generated through bagasse-based cogeneration in the 550 sugar mills in India, provided that these mills adopt technically and economically optimal levels of cogeneration for extracting power from the bagasse produced by them (Ministry of New and Renewable Energy (Ministry of New and Renewable Energy MNRE, 2014).

Figure 3.12: Source-Wise Capacity of RES in 2012 (%)



Source: MNRE, 2014.

India's research and development on clean energy technology are funded by the National Clean Energy Fund (NCEF). To mitigate the alarming pollution levels in the country and to encourage development of RES, the Indian government, during the 2014 Union Budget, has proposed to increase the clean energy cess on imported coal from INR 50 per tonne to INR100 per tonne, and to raise the basic customs duty on bituminous coal to 2.5 percent from the earlier 2 percent. The amount of the cess collected will be invested in the NCEF (Press Information Bureau [PIB], 2014).

Nuclear Energy

Consumption from nuclear energy has increased from 5.2 Mtoe in 2010 to 7.3 Mtoe in 2011, comprising 1.2 percent of the total global consumption (BP, 2012). The gross generation from nuclear power in 2011-2012 was 32,455 million kWh with an availability factor of 91 percent. This represents an increase of 22.6 percent over the 2010-2011 period. India has nuclear reactors at six locations with a total installed capacity of 4,780 MW as well as 10 new nuclear power projects in the pipeline under the 12th Five-year Plan (2012–17). It owns five nuclear reactors under construction and plans to construct 18 additional nuclear reactors by 2025. As a result of the 2011 Fukushima nuclear disaster in Japan, India's atomic energy regulator will renew the operational license of all the 20 atomic power plants in the country only on a short-term basis---i.e., until the installation of additional safety measures as suggested by the Nuclear Power Corporation of India Ltd is in place.

Energy Trade

In its pursuit of energy trade, India needs to address existing issues such as poverty and ever increasing population, as well as find ways to ensure energy access and energy security. *Energy security* is defined as the continuous availability of energy in varied forms, in sufficient quantities, at reasonable prices, to fuel economic growth (IEP, 2014). While energy access refers to access to all modern forms of energy, the government schemes so far have focused essentially on electricity. Thus, India should focus on reducing its dependence on energy imports and diversifying its energy basket.

In India, about 75 million households still have no access to electricity. More than 80 percent of the households still use traditional fuels (fuel wood, agricultural waste, and biomass cakes) for cooking and general heating needs, while 43 percent rely on kerosene as their primary fuel for lighting. Under the Rajiv Gandhi Grameen Vidyutikaran Yojana (RGGVY), a national electrification program of India's Ministry of Power, about 107,083 (out of 110,886 un-electrified villages) have been electrified. However, in many of these electrified villages, electricity still remains unavailable. Furthermore, where available, power supply is erratic and for couple of hours only. During outages, the rural population is forced to use kerosene and other traditional

fuels for meeting their lighting and other energy needs (Census, 2011). The Ministry of Power, which is responsible for rural electrification, focuses mainly on grid extension.

The coal distribution system in India is governed by the New Coal Distribution Policy (NCDP), under which all major Independent Power Producers (IPPs), Captive Power Producers (CPPs), cement and sponge iron units seek coal allotments from the Ministry of Coal (MoC) through their nodal ministry. A standing linkage committee reviews and recommends the applicants to the coal companies for issue of Letters of Assurance (LOA). With this LOA in tow, unit holders then approach the coal companies for their coal supplies.

Trade within the Five Regional Indian Grids

India's state grids are inter-connected, consisting of five major transmission regions: the northern, north eastern, eastern, southern, and western areas. It started in 1991, when the north eastern region (NER) and eastern region (ER) grids were linked. After more than a decade, in 2003, the western and ER-NER grids were interconnected. Subsequently, in 2006, the northern and eastern grids followed suit. Thus, four regional grids: the northern, eastern, western and north eastern grids were synchronously connected to form a central grid operating at one frequency. Finally, in 2013, the southern region grid was also connected to the central grid in synchronous mode, thereby achieving the government's target of "One Nation-One Grid-One Frequency." This will, in turn, help in optimal utilisation of scarce natural resources by transferring power from resource-centric regions to load-centric regions. It will not only promote a vibrant electricity market but will also facilitate trading of power across various regions within the country (Power Grid Corporation of India Limited, 2014).

Due to diversities in different regions' industrial and household needs, there is some difference in their supply and demand for power and consequently, in the frequencies. Also, regions differ in the peak requirement hours within a day. That is, one regional grid reaches its day’s peak power demand while another regional grid is still below its peak requirement. Because of the large gap between demand and supply, these energy-surplus as well as energy-

deficit regions sharing one central grid need to enter into energy (power) trade. Table 3.3 shows a cross-sectional representation of the imports and exports of electricity (2012-2013) among the five Indian regions sharing one central grid.

Table 3.3: Import and Export of Electricity within India (in million kWh) for 2013

	North	West	South	East	North East	**Total Export**
North	-	3,034.9	267.5	2,122.8	216.8	**5,642**
West	6,060	-	2,258.2	2,063	68.4	**10,449.6**
South	51.2	8.8	-	-	0.2	**60.2**
East	15,886.4	6,499.7	3612.7	-	1,977.2	**27,976**
North east	2.9	-	-	8.9	-	**11.8**
Total Import	**22,000.5**	**9,543.3**	**6,138.4**	**4,194.7**	**2,262.6**	**44,139.6**

Source: CEA, 2014.

India's eastern region is the largest exporter and northern region is the largest importer of power. The eastern region exports the highest units of 15,886.4 million kWh to the northern region, in particular. The northern region experiences severe power shortages throughout the year almost every year; hence, it imports the most units (22,000 million kWh), with a major share coming from India's eastern region.

Trade with South Asian Nations

India highly depends on fossil fuel imports for its energy demand mainly due to the scarcity of domestic reserves. The country imports nearly 80 percent of its domestic crude oil requirements mainly from West Asia. It also gets more than 10 percent of their domestic coal requirements mainly from Indonesia, Australia, and South Africa. Cross-border linkages include import of power from Bhutan and export of power to Nepal. While India is a net importer of energy, the increase in refining capacity has helped turn India into a net exporter of refined petroleum products, particularly middle distillates (PPAC, 2012).

In 2012-2013, India exported 63.408 MMT of petroleum products worth INR 3, 20,090 crore (US$58,848 million), an increase of 4.23 percent in quantity.

In terms of value, this is a rise by 12.45 percent (in INR) and 0.79 percent (in US$). On the other hand, India's import of petroleum products for the same period was 15.774 MMT valued at INR 68,363 crore (US$12,506 million), which marks a decrease of 0.47 percent in quantity. This also represents a 0.40 percent rise in Indian Rupees terms and a decline by 11.86 percent in dollar terms. India's import of petroleum products is restricted to balancing domestic refinery production (MoPNG, 2013).

Low electrification rate in India is an obstacle to achieving energy security, energy access and opportunities for market integration with other South Asian countries. India's poor energy trade network with the South Asian nations constrains the optimal utilisation and relative advantage of energy resources. It has no cross-border pipeline or trade in natural gas, while cross-border electricity interconnections and trade are insignificant.

Most of the South Asian nations have the potential to resolve the imbalance in supply and demand in the energy sector. The region is well endowed with energy resources, but these are unevenly distributed or unexploited. India, Pakistan, and Bangladesh have large reserves of gas and coal, while Nepal, and Bhutan have a tremendous potential of hydro-electric power. Meanwhile, Nepal, Bhutan, Pakistan, Myanmar, and Sri Lanka face acute power shortages. To mitigate such power shortage, the SAARC Energy Centre was set up in Islamabad in 2006. Its objective was to facilitate trade among India, Pakistan, Bangladesh, Sri Lanka, Nepal, Maldives, and Bhutan (Mahmud, 2012).

Promotion of cross-border electricity exchange and trade among the South Asian nations will ensure that there is optimal usage of the regional resources for electricity generation. For example, the hydro-electricity potential of Nepal and Bhutan could be exported to other South Asian Association for Regional Cooperation (SAARC) countries through common grid stations. India already has grid interconnections with Nepal and Bhutan, but more energy market integration would take place if other South Asian nations would connect to the said grid.

Some instances of bilateral trade between India and its trade partners are briefly discussed below.

India and Bhutan

India and Bhutan share the largest regional bilateral agreement (in terms of volume) for electricity trade for the past few decades. Bhutan exports of more than 75 percent of its generated electricity to India comprising 25 percent of the former's GDP (Energy Sector Management Assistance Program [ESMAP], 2008). India provides technical and financial support for the hydropower projects in Bhutan, and in return, it is entitled to import all the surplus power, after Bhutan's energy needs are met. Their bilateral cooperation aims to install hydro-power plants with a total capacity of 10,000 MW by 2020. Existing hydropower projects in Bhutan financed by India include Chhukha, Tala, and Kurichhu, which have installed capacity of 336 MW, 1,020 MW and 60 MW, respectively. Three more hydro-power projects---Punatsangchu I (1,200 MW), Punatsangchu II (1,020 MW), and Mangdechu (720 MW) are under construction and due to be commissioned by 2018 (MEA, 2014).

In April 2014, India and Bhutan signed an inter-governmental agreement on the Development of Joint Venture Hydropower Projects on four hydro-power facilities with a total capacity of 2,120 MW via public sector undertakings. These four hydro-power projects are the 600 MW Kholongchu, 180 MW Bunakha (which has 230 MW downstream benefits from Tala, Chukha, and Wangchu), 570 MW Wangchu, and 770 MW Chamkarchu. India's hydro-power cooperation with Bhutan is mutually beneficial since Bhutan earns revenues by exporting its clean and low-cost electricity to India, which also strengthens their economic and political relationships (Mahmud, 2012).

India and Nepal

Nepal's techno-economically feasible hydroelectric potential is estimated at 43,000 MW, of which only 627 MW have been developed. India has been assisting Nepal in the development of its hydro power potential through four projects viz., Pokhra (1MW), Trisuli (21MW), Western Gandak (15MW) and Devighat (14.1MW). In addition, four major water resources projects in Nepal viz., Pancheshwar (5600MW), SaptaKoshi (3300MW), Naumure (225MW) and Karnali (10800MW) are under discussion with their Indian counterparts at various levels, as mutual interest projects. Further, two

projects viz., Upper Karnali HEP (300MW) and Arun III HEP (900MW) are being developed by Indian CPSUs/IPPs (Ministry of Power [MoP], 2013)
The transmission capacity of the existing 132 kV and 33 kV lines between the two countries limits the exchanges to about a third of the agreed level of 150 MW. The power exchange agreement between India and Nepal has three major components; namely, the Dhalkebar-Muzaffarpur, Duhabi-Purnia and Butwal-Gorakhpur transmission lines, each with a capacity of 400 kV. Of these, the first phase construction of the Dhalkebar- Mujaffarpur's 400 kV transmission interconnection is under way. The transmission line from Dhalkebar to Muhaffarpur spans 140 km, but only 45 km of this transmission line lies within the Nepalese territory. Meanwhile, the Duhabi-Purniya line measures 112 km long, of which 22 km lies within the Nepalese territory. Similarly, 25 km of the 125 km Butwal-Gorakhpur transmission line lies within Nepal (ESMAP, 2008).

India and Bangladesh

The energy cooperation between India and Bangladesh was formalised in October 2013, with the inauguration of two collaborative power projects. The first project involves a transmission line to supply 500 MW of power from West Bengal to Bangladesh. This 125-km grid will establish a 400 kV double-circuit, cross-border link between the Bheramara of the western electrical grid of Bangladesh and the Baharampur of the eastern electrical grid of India. The system will facilitate an initial power flow of 500 MW into Bangladesh from the Indian grid, with a provision to boost the power flow to 1,000 MW (Mahmud, 2012). The second project includes a 1,320 MW thermal power undertaking in Bangladesh named "Maitri" (which means friendship). The Bangladesh-India Friendship Power Company is a joint venture between the National Thermal Power Corporation (NTPC) of India and the Bangladesh Power Development Board (Economic Times, 2013).

India and Myanmar

Myanmar has an estimated hydropower potential of 39,720 MW, of which only about 2 percent has been developed. India and Myanmar have collaborative agreements for the development of the Sedawyagi and Yeywa hydropower projects. India is also participating in the Tamanti multipurpose project with a hydropower component of 1,200 MW in the first stage. Inadequate investments in transmission and distribution grids meant to export power from Nepal to the northeast region of India (although already synchronised with the eastern and northern regions) hampers the power trade between these two countries (IPP Association of India, 2011).

India and Pakistan

In response to a draft Memorandum of Understanding presented by Pakistan to the Indian government, a feasibility study---together with the installation of transmission line to import 1,200 MW power from India---is likely to be carried out by the World Bank. The two nations have further coordinated technical working groups to review the initial implementation phase of the deal. In the project's initial phase, Pakistan is expected to import 500 MW from India, which would subsequently increase to 1,200 MW (Economic Times, 2014).

India-ASEAN Trade Relations

Since the early 1990s, the economic relationship between India and the ASEAN countries has improved significantly. India’s liberalisation program and economic reforms under the "Look East Policy" (1991) were initially aimed at developing an economic and strategic relationship with the ASEAN countries. Such trade of goods and services between India and other ASEAN economies is all the more significant in today's times.

The India-ASEAN economic relationship began in 1992. In 1995, India was accorded the full ASEAN Dialogue Partner status. It became a member of the ASEAN Regional Forum (ARF) in 1996, and of the East Asia Summit in 2005. It signed the Treaty of Amity of Cooperation in 2003 and has several

bilateral free trade agreements with Singapore and Thailand, and on sub-regional initiatives such as the Mekong Ganga Cooperation Initiative and the Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) (Parameswaran, 2010).

Through regional trading arrangements (e.g., free trade agreements [FTAs]), preferential trade agreements (PTAs), and comprehensive economic cooperation agreements), India has shown its willingness to open its markets and liberalise trade. Agreements to promote and enhance mutual trade and economic cooperation among contracting states are either bilateral or multilateral in nature (e.g., the Asia-Pacific Trade Agreement; the BIMSTEC in 1997; the South Asian Free Trade Area [SAFTA] in 2006).

The signing of the ASEAN-India Free Trade Agreement (AIFTA) in 2010 further improved the potential for greater bilateral trade. According to AIFTA, India will slash import tariffs on 80 percent of the commodities it trades with the ASEAN, with the goal of reversing India's growing marginalisation in this region. The FTA is expected to increase bilateral trade to US$200 billion by 2022 and lead to talks on the Regional Comprehensive Economic Partnership (RCEP), which would also include Australia, China, Japan, South Korea, and New Zealand.

As far as energy trade with the ASEAN nations is concerned, Indonesia, Malaysia, and Brunei Darussalam provide prospects for mutually beneficial cooperation. Indonesia is important for energy trade relations with India as it is an important source of coal for India. Bilateral trade between India and Indonesia has been revised from US$25 billion to US$45 billion by 2015. In fact, beyond the regional FTA, India and Indonesia have started negotiations on a comprehensive economic cooperation agreement that would further liberalise trade (Times of India, 2012).

There are several areas for possible energy trade cooperation: oil and gas exploration, down-stream processing activities, etc. Various projects under way provide India the chance to support ASEAN nations, such as the Trans-ASEAN Gas Pipeline (TAGP) networks or the ASEAN Highway (AH) Network. Also, the Asia-Pacific Energy Cooperation (APEC) is a long-term project where India can play an important role (Nambiar, 2011).

The trade between India and the Mekong region is estimated to have increased from US$2 billion to US$17.4 billion over the past decade, thereby recording a compound annual growth rate (CAGR) of nearly 25 percent. Thus, the Mekong-India Economic Corridor (MIEC), a major India-ASEAN connectivity initiative, is a win-win proposition. Integrating the four Greater Mekong countries: Myanmar, Thailand, Cambodia, and Viet Nam with India through its east coast and northeast region, MIEC links these nations through a network of land and sea infrastructure. In terms of the land route, the MIEC proposes to connect Ho Chi Minh City (Viet Nam) with Dawei (Myanmar) via Bangkok (Thailand) and Phnom Penh (Cambodia) with India's northeast region. In terms of the sea route, Chennai on the eastern coast of India would connect to Bangkok, and the hinterlands to Viet Nam and Cambodia in the eastern direction and Myanmar to the west. The MIEC is foreseen as a dynamic industrial region wherein the economies will further integrate and collectively emerge as a globally competitive economic bloc (CII, 2014).

Energy Trade Barriers

Trade barriers are essentially government-placed restrictions on trade between nations. There are mainly two types of barriers: tariff barriers and non-tariff barriers. The tariff barriers refer to monetary restrictions such as taxes and levies imposed on trade to protect the domestic industry. Non-tariff barriers, on the other hand, refer to non-monetary restrictions that include documentation and packaging requirements; and, technical or safety standards. On the export side, they consist of barriers such as export subsidies, prohibitions, and quotas. On the import side, they include import licensing, bans, and custom procedures. India and its trading partners need to do away with the burdensome non-tariff barriers that impede free flow of trade. The following issues should be dealt with using a "fast-track approach" so as to mutually benefit partners.

- *Tariff Barriers*: The tariff barriers in India, like in other countries, have negative impacts such as inflationary pressures, government control and political considerations in economic matters, imbalance in demand-supply chain, strains on international trade relations. In India, subsidies on fuel (cooking gas and diesel), and on power and food supplied through the

public distribution system have put tremendous pressure on the public finances. Fiscal deficit has grown after 2009, and market borrowings have risen from INR 2,470 billion in 2008-2009 to INR 5,075 billion in 2012-2013. The average annual growth of fiscal deficit in the last 10 years has been 13 percent (Narayan, 2014).

- Energy trade involves large amounts of expensive mechanisms, infrastructure and connectivity, and tariffs are very important for the potential investors. High tariffs create obstacles in the regional market integration as they protect domestic industry. Presently, the Indian economy is characterised by low growth, high inflation, high current account deficit and fiscal stress---factors that discourage foreign investment in trade and other sectors. Efficient fiscal planning and reduction/removal on energy subsidies can address these barriers.

- *Energy Pricing and Subsidies:* Distorted energy pricing and subsidy regimes in India and in the ASEAN region deter the commercial viability of trading in energy, as the entities that are selling energy at subsidised rates will have to pay for the energy at cost, with negative financial consequences. For example, India has a law that states that solar modules must be produced within the country before they can benefit from state subsidies.

- *Geopolitical Barriers*: Regional disagreements and conflicts between trading nations (India, Pakistan, Bangladesh, and Sri Lanka, for example) supersede attempts to augment energy trade. In spite of all the bilateral and multilateral agreements, India's energy trade with its neighbours is very limited. In fact, the full potential is yet untapped. At present, cross-border energy trade is limited among Bhutan, India, and Nepal.

- *Inadequate Infrastructure and Connectivity Issue:* The lack of an integrated gas and electricity infrastructure due to political and security reasons also hampers regional energy trade. To enhance the India-ASEAN trade relations and connectivity, the relations among Northeast India, Bangladesh, and Myanmar should be strengthened. India will benefit largely by improving trade relations with Bangladesh, which not only shares the longest international border with India (3,500 km) but is also strategically

located along India's connectivity to Southeast Asia and China. Such forged relations will also reinforce the energy cooperation in the ongoing hydroelectric projects in the state of Sikkim (Upper Teesta) in India, Bhutan, and Nepal and help revive the Myanmar-Bangladesh-India gas pipeline project.

- *Lack of Trust and Unfavourable Political Climate:* Developing power trade networks with Nepal and Bhutan will benefit India as its peak demand is synchronised to the seasonal hydro power potential and production peak of these two nations. However, all three nations continue to suffer from power deficits due to lack of trust, unfavourable political climate, and issues over river water sharing (viz.,Kosi, Gandak, and Mahakali treaties). At present, the aim to have power trade agreements with Nepal and Bhutan is difficult to accomplish.

- Weak *Regulatory Policy:* Disagreements on energy pricing are other non-tariff barriers affecting power trading. For example, the power trade between India and Nepal poses a challenge as energy prices are not fixed commercially and there are inadequate grid interconnections and transmission lines available. Also, Nepal's lack of an integrated hydropower sector policy is another major issue hounding their collaboration.

- *Renewable Energy:* India has mandated a 5-percent ethanol blending in petrol and 5-percent biodiesel blending in diesel as well as set future blending targets of 20 percent. However, the lack of sufficient production and funds, high costs, competitive markets, inadequate infrastructure, lack of access to technology, and competing usage of land for producing food crops are the major impediments that need to be addressed.

- *Information Barrier and Lack of Transparency:* Lack of transparency and ineffective dissemination of trade-related information are also non-tariff barriers. Such lack of information and transparency on the country-specific trade procedures, norms, and regulations is not conducive to energy trade in the region. The introduction and implementation of new trade regulations must be intimated in advance to trade partners.

- *Trade Specifications Not In a Universal Language:* Many countries publish the trading norms and other related specifications in their national

language. This non-tariff barrier makes it difficult for trading partners if no translated versions are made available.

Conclusions and Policy Implications

While there is a huge potential for regional cooperation, existing barriers---both tariff and non-tariff---are hindering this process. India needs to reform the bilateral relations with every member-nation of ASEAN in terms of the requirements of each member-country and that of its own. After all, the ASEAN and East Asia Summit (EAS) hold great promise for India's own economic development once its trade integration with the region is improved. This study recognises the obstacles to energy trade between India and countries in the ASEAN and suggests possible steps for removing these.

- Energy trade between India and the ASEAN countries may have significant economy-wide repercussions, including the energy-growth-development linkage. Thus, such impacts have to be taken into consideration during India's policy- and decision-making processes.
- Political agreements on energy trade can work in the nascent stages of trade, but unless they quickly evolve into sustainable commercial arrangements, they are not conducive to growth in energy trade.
- India could be a major regional player in the renewable energy sector as it has (1) longer solar insolation periods for solar energy; and (2) a large potential for various renewable energy forms. Its vast area of wastelands could be utilised for growing non-edible oil crops for liquid fuels and wood for thermal power, for instance.
- Private sector investments should aim to overcome regional energy security challenges in a mutually beneficial manner. India needs to negotiate joint venture projects that satisfy the commercial as well as capacity building requirements of its trading partners, too.

The study recommends the following measures to improve the energy trade in the region:

- *Smoothing Out Relations:* Political tensions can be addressed through continuous and serious dialogues, which can happen only through a promise of integration. India needs to earnestly resolve issues with its

neighbours Sri Lanka, Pakistan, Nepal, and Bangladesh through a concerted effort and genuine cross-border diplomacy. Trade relations between India and Nepal need to be strengthened through sincere efforts from both sides. After all, Nepal has great hydropower potential, and because of North India's proximity to the major power grids in Nepal, India can serve as a potential importer of this energy.

- *Building Relations Based on Trust*: India and its neighbours have to work at improving trade relations in the power sector by focusing on the "human dimension" of building trust on each other. In the initial stage, projects may be funded by the respective governments, while other private funding agencies can provide additional support through concessional loans and grants.
- *Trade-friendly Agreements:* India and its trading partners in bilateral/multilateral/regional agreements must work towards improving the dispute settlement mechanism and simplifying the customs procedures so as to make the energy trade less restrictive. Existing agreements must have a built-in mechanism to review any shortcomings and make changes. Bilateral power trading arrangements such as those between India and Bhutan need to be encouraged as they not only promote bilateral power integration but could also be expanded into a multilateral, regional power integration network.
- *Increasing Renewable Energy's Share:* The share of renewable energy in India's installed capacity mix could be made bigger. The country currently lacks an integrated/national-wide economic perspective toward renewable energy, along with a comprehensive, research-backed policy on increasing the adoption of liquid biofuels. That is, although national energy policies already exist, the actual development of renewable energy is still largely dictated by individual states' own regulations and policies.
- *Infrastructure Development:* The South Asian economies are increasingly burdened by energy deficits, and setting up a regional power grid could help alleviate these deficits. Nepal and Bhutan have hydropower resources that India needs so as to meet its ever-increasing energy demands. The coal and natural gas resources of Bangladesh, India, and Pakistan can complement their neighbours' hydropower potential, thus optimising both the region's energy security and resource use. Myanmar, which is fortunate to have reserves for hydroelectric

power capacity and natural gas as well as a strategic location, has the potential to tap such opportunities. Developing physical and institutional infrastructure will facilitate regional energy trade as well as bring positive economic, social and environmental impacts such as accessibility to steady supply of power, job opportunities, and reduced emissions.

- *Addressing the Energy Security:* Reforms are needed so as to revive the energy security in India and sustain its unprecedented economic growth. India is largely dependent on coal to fuel its power sector, but the scarcity of coal is a major issue. There are several options to improve this situation. Encouraging private sector participation in the coal sector is one. In India, coal mining is restricted to the public sector, with the Coal India Limited and Singareni Collieries accounting for 82 percent of the annual domestic production. Private companies are only allowed to mine coal for their small captive use.

Giving the newly created coal regulatory body some statutory powers is another solution. This regulator was created in 2014 in light of the various issues plaguing the coal sector: decrease in coal production, issues with coal pricing, allotment of mines, etc. However, the regulator only has administrative (advisory) powers and lacks a statutory status. Thus, it has no authority to specify the price of coal.

Lastly, over 80 percent of India's mines are the open-cast type--- unlike China, which has mainly underground minds. To augment coal production, India also needs to consider underground mining, which is environmentally benign.

- *Less Rigid Trading System:* Pricing mechanisms must be flexible enough to increase the amount of fuel imports. Currently, the current pricing methods are inflexible and negatively affect consumer's fuel choices. In India, the subsidised prices of fuels such as kerosene and diesel resulted in artificially high consumption rates on one hand; and discouraged investments in clean energy, as it is perceived to be more expensive, on the other hand.
- *Other Measures:* A regional energy information database should be created, and transparency should be promoted in international trade. Also, a universal language should be used for all communications and

documents relating to trade. To relieve the pressure on the coal sector and lessen the dependence on imported oil and gas, renewable energy sources need to be harnessed.

India should also recognise that to promote regional energy trade, adjacent nations ought to be allowed to utilise and optimise the energy resources available within the region. Sharing of energy resources will help in meeting the energy demand as well as also act as catalyst to the region's economic or financial growth.

With the new leadership in India's government, positive changes are expected in various development sectors, including the energy sector. Recently, to enhance interaction among important ministries related to the energy sector, government departments such as the Ministries of Power, Coal, and New and Renewable Energy, were brought under one umbrella and assigned to one minister only. After all, to have a more meaningful relationship with the ASEAN, India needs to recover the momentum of its economy growth and, if it were to further such growth, it must bring about new reforms.

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