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ASEAN-India Gas Cooperation: Redefining India's "Look East" Policy with Myanmar

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Abstract: *As economic power shifts towards Asia---particularly China, India and the Association of Southeast Asian Nations (ASEAN) ---a robust energy cooperation within this region will help sustain the region's development. Cooperation master plans already in place include interconnecting power grids and gas pipelines, engaging in cross-border power projects and promoting freer trade of energy commodities among the countries. The East Asia Summit region (EAS) pioneers such cooperation not only within the ASEAN region and the Greater Mekong Subregion (GMS) but with nations such as India, Russia, the United States, and Australia as well. This study, though, focuses more on India and how its Look East Policy helps forged trade and other bilateral cooperation with the ASEAN nations, and how Myanmar plays a strategic role in India's energy security. This study also concentrates on a particular energy resource---natural gas---and develops a quantitative assessment model to evaluate India and its neighbouring countries' long-term natural gas demand, corresponding infrastructure requirements, and investment demand. Specifically, it looks at how India's Look East Policy can help secure the required amount of natural gas from the ASEAN and East Asia region and at what cost.*

There is nothing new with including Myanmar in a discussion on regional energy cooperation. After all, this is a country with abundant untapped natural resources, including hydro and natural gas. However, very few studies have so far focused on Myanmar's strategic location and geography and how it can provide the non-energy resources---such as land, water, human resources, and maritime channels for seaborne trade---needed to develop a robust integrated energy market. All these are essential factor inputs for large-scale energy infrastructure projects. This study thus explores Myanmar's role in helping India with the latter's own energy security.

Through a three-stage analysis of the regional energy problem, the study demonstrates that India is eventually going to depend more on gas (after coal) for its energy supply. As India's home-grown gas supply is not sufficient to meet its domestic gas demand, it currently imports more than 75 percent of its requirement from Qatar. Given the growth in future demand, growing supply volatility of Middle East gas, and increasing gas prices (including Asian premium), any dependence on the Middle East's supply makes gas more expensive and vulnerable for India. Also, since more than 27 percent of the landed price of gas and LNG in the country consists of transport cost, it is important to reduce the distance of transport.

Keywords: Energy Market Integration, Natural Gas, India, Myanmar Energy
JEL Classification: Q43

1. Introduction

Since 2010, India has been redefining its position (along with China) as a regional economic and political powerhouse, as well as emphasising its relationship with the ASEAN and other East Asian countries[1]. By joining the East Asian Summit group and promoting closer trade relationships with ASEAN countries as well as with Japan and South Korea, India has been demonstrating a steady policy focus on the East.

India's "Look East" policy is not new but in fact has been inactive due to lack of concrete actions since the 1990s. Nonetheless, India's geographical proximity to and long relationship with the ASEAN should be enough reasons for it to revive its cooperation with the ASEAN and Far East countries. Moreover, the recent changes in India's leadership may further enhance the collaboration between India and the ASEAN (including South Asian Association for Regional Cooperation [SAARC] countries) in all possible economic activities, as per their promise in their election manifesto published in early 2014.

Given India's immediate need to improve its economy (e.g., to reverse its falling GDP growth rate, which is now below 5%), its government has to fast-track its programs for basic infrastructure development and the manufacturing sector. Energy, therefore, has a part in the whole process of development. Compared to the 2013 level of energy consumption, India's primary energy supply is around 4 percent to 5 percent per annum, which needs to be driven up to the 8-percent to 9-percent range by 2020.

Today, India is the fifth largest energy consumer in the world. Of the 12,000 million tonnes of oil equivalent (mtoe) of energy resources that the world consumes, India comprises 4.4 percent (524.2 mtoe). Global consumption of primary commercial energy (coal, oil, and natural gas; nuclear and major hydropower) has grown at a rate of 2.6 percent over the last decade. In India, demand grows at around 6.8 percent, while the supply is expected to increase at a compounded annual growth rate (CAGR) of 1 percent only. Of the total primary energy consumption basket, oil

[1] Protocol to amend the framework agreement on comprehensive economic cooperation between the Republic of India and the Association of Southeast Asian Nations.

and gas comprise 45 percent. Even if one exploits hydropower's potential to the fullest, or if there is a 40-fold increase in the contribution of renewable resources and a 20-fold spike in the contribution of nuclear power capacity by the year 2031-2032, fossil fuels will continue to take a 74-percent to 85-percent share of the energy mix.

2. Growing Importance of Natural Gas in India

Although India's energy supply portfolio is envisaged to skew towards coal in the near future, natural gas will continue to increase its contribution to the supply portfolio. Factors such as (in)availability of good and affordable quality coal, lack of investment in coal mining, allocation of coal beds for mining, coal prices, and increasing concern over environmental pollution explain why the competitive advantage remains with natural gas. Natural gas comprised 4 percent of the country's total primary energy in 1999, and further rose to 10 percent by 2010. By 2025, natural gas is expected to comprise almost one-fifth (20%) of India's primary energy supply. India's gas demand will be 132 Bcm by 2030 with an average per-year growth rate of 5.4 percent, one of the highest in the world.

India has a total proven gas reserve of 38 trillion cubic feet (Tcf). Its demand for gas is around 189 MMSCMD, while the total supply is around 168 MMSCMD. Out of the total supply, only 122 MMSCMD is domestically produced; the rest is imported as liquefied natural gas (LNG). Given India's gas reserve situation, LNG importation is inevitable. Therefore, India's natural gas supply can be secured by improving the regional gas supply, particularly by including Myanmar in the picture. Energy market integration is thus a potential solution to India's widening energy supply-and-demand gap.

This study explores options on how to augment India's natural gas supply, mainly by considering external sources (gas importation) that are cost competitive. Since natural gas is envisioned to remain part of India's future energy demand, the study further investigates the role of ASEAN countries, particularly Myanmar, and how to improve mutually agreeable trade and investment in the natural gas sector.

The next section lists the objectives of this study. Thereafter, Section 4 of this paper deals with the current state of India's energy security, with focus on natural gas

vis-à-vis the country's targets. Section 5 discusses the ASEAN energy situation, particularly its energy supply and demand condition, and its potential as a reliable supplier of energy to India. Section 6 further analyses the importance of natural gas in several Asian nations' energy security. Sub-section 6.1 looks at a list of potential cross-border natural gas and LNG projects between ASEAN and India and the benefits of collaboration.

Section 7 compares the investment demand in the South Asian region, mainly dominated by India, under an enhanced regional trade collaboration in the natural gas sector. The next section (Section 8) focuses on costs related to pipeline and LNG-based gas trade between the ASEAN and India. In particular, the section talks about how India's bid to build a low-cost gas supply chain in the mid to long term will benefit the ASEAN and Myanmar. Sections 9 and 10 further explain why Myanmar is strategically important to India and why bilateral cooperation can enhance and secure the latter's long-term, low-cost gas supply. Finally, the study provides recommendations on how both regions can improve and benefit from their gas trade cooperation.

3. Objective of This Study

While India will be increasingly dependent on gas for its energy supply, its current home-grown gas supply is not sufficient. It currently imports more than 75 percent of its requirement from Qatar. Given India's future demand growth, along with supply volatility in the Middle East's gas and rising prices (including Asian premium), any dependence on the Middle East's supply will be expensive for India as well as expose the latter to vulnerabilities. Also, since more than 27 percent of landed price of gas and LNG in the country consists of transport costs, it is therefore important to reduce the distance of transport. Meanwhile, India’s Look East policy, especially in terms of exploring energy sector cooperation with the ASEAN and East Asia, has failed to produce any good result so far.

Meanwhile, Myanmar's rise in the region's geopolitical map, its untapped natural resources, and location in the border of India all explain why this nation is a strategic factor in India's efforts to meet its near- to mid-term demand for gas at a more economical price. India can procure gas from Myanmar either by direct resource extraction or by using Myanmar as transit country to bring gas from the ASEAN countries.

The primary objective of this study, therefore, is to demonstrate that regional energy market integration---particularly between Myanmar and part of the ASEAN, and India---can provide more strategic and sustainable energy supply to India. In this context, the study evaluates how India's existing Look East policy can be strengthened and, in the process, help diversify its energy supply portfolio (mainly natural gas) and improve its energy security.

This study also intends to explain Myanmar's strategic position in India's sustainable energy supply chain by identifying potential hard and soft linkages between the countries in the development of natural gas. Finally, it will also estimate the gas sector's investment demand and range of economic benefits to beneficiary countries.

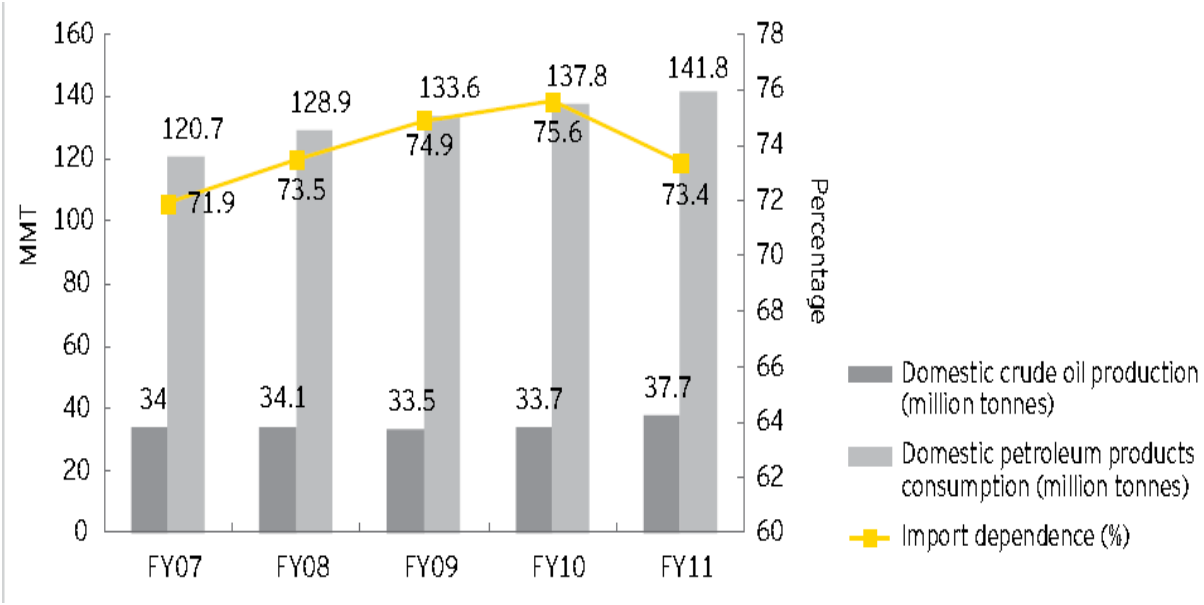
4. India's Energy Security

India is one of the world's fastest-growing economies, averaging an annual real economic growth of 8 percent in the past decade. Meanwhile, its energy sector sees an average 6.5-percent growth in demand yearly. Thus, along with the projected economic growth, energy demand is expected to rise. This rising energy demand, in turn, makes energy security increasingly important. India, however, has to grapple with the fact that its supply of natural gas from domestic fields continues to be below projection levels.

This combination of stagnant domestic production and mounting demand explains India's rising dependence on imported oil in the past few years (Figure 1). Thus, any threats to the supply of crude oil have always been a cause for concern. For example, the recent political turbulence in the Middle East, especially in Libya

and Egypt, triggered a sudden decrease in crude oil production in the region, causing crude oil prices to spike and, in turn, drive up inflation in India. Also, the recent depreciation of the rupee, which raised the cost of crude oil imports for India, had an inflationary effect on the economy.

Figure 1: India's Past Trend of Energy Security

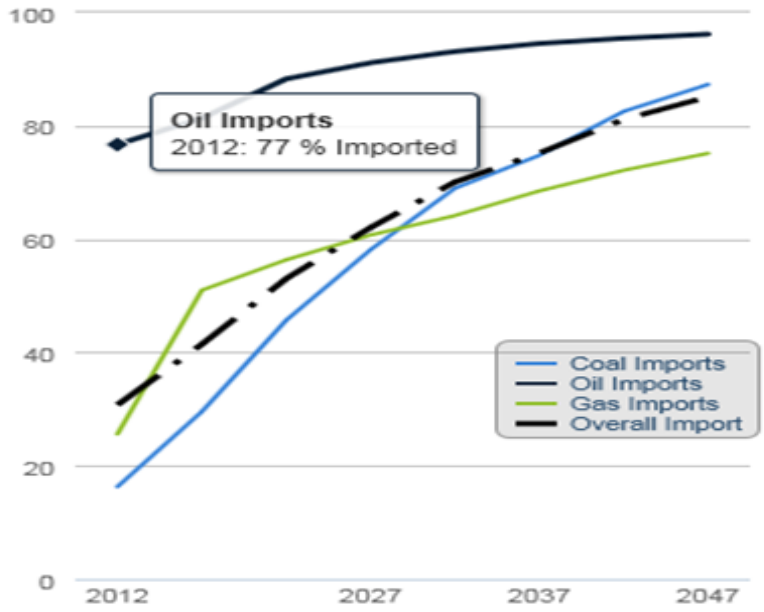


Source: FICCI, EY (2011).

However, assuming India's future growth prospect continues to be bullish at least until the 2030s, its energy security status might worsen if it allows itself to be over-dependent on imported coal, oil, and natural gas.

Figure 2 below shows the future trend of energy security (% of fuel import) in India. It shows that India's dependence on imports can even go up to 80 percent of the total energy supply by 2050. Energy security here is defined as the percentage of imported fuel compared to total energy supply in the country.

Figure 2: Future Trend of Energy Import Status in India



Source: India Energy Security Scenario 2047

To improve the country's energy security, India not only needs to reduce its fuel import but must also secure more reliable and affordable supply of energy across the borders. Given India's humongous energy demand, it is unrealistic to believe that domestic supply can fully and efficiently meet the national energy demand. The more reasonable assumption is that India will continue to import a certain level of energy until such time when all domestic resources are exploited, and coal has become its major source of energy (India Energy Security Scenario 2047, 2014). However, in terms of energy-related emissions, coal-ran energy systems produce the highest amount of greenhouse gas emissions, which can damage the environment, ecology, and human health. India, therefore, has to strike a balance between energy security, economic development, and environmental quality. This is why a natural gas-based economy is one of the solutions for India. Natural gas is less polluting, highly efficient and easily movable from one place to another. As far as India's energy supply is concerned, natural gas is expected to play an important role in the coming years.

5. Importance of Natural Gas in the Region

Natural gas is an alternative to the world's rapidly depleting supply of oil. Like oil, natural gas can be easily transported from wellheads to destination points either by pipelines or by tankers. Liquefied natural gas has been at the heart of this evolution. In fact, LNG's global trade is set to increase by over 2 percent per year for the next 20 years. It is expected to reach 427 Bcm by 2017, with over 300 Bcm going to Asian markets, according to the International Energy Agency's (IEA) forecasts. In the past three years, Qatar has emerged as the leading LNG exporter, as it accounts for 30 percent of LNG trade in 2011. Interestingly, Australia is set to overtake Qatar as the leading LNG exporter by the end of the decade. More importantly, the global LNG balance has shifted to Asia---not only to mature markets such as Japan and South Korea, but also to China, Thailand, and India. The good news for Asian customers is that most of it will come from the Pacific basin, particularly Australia, Papua New Guinea, and Indonesia. Much of this will be within the borders of countries. However, an increasing amount will cross international borders.

The world’s LNG trade in 2011 grew by 8 percent (or 17.7 MT), to reach a new high of 241.5 MT, primarily due to the sharp increase in demand from Japan (by 8.2 MT) right after a major earthquake and tsunami hit the country in March 2011 and damaged its Fukushima nuclear power plant. Increased demand from the United Kingdom (by 4.4 MT), India (by 3.4 MT), and China (by 3.3 MT) more than offset the 3.4 MT decline from Spain and the 2.6 MT drop for the United States, which continues to increase consumption of domestic unconventional gas.

The LNG trade grew stronger than anticipated in 2011, not just in volume but in geographic reach as well. Since 2006, five new countries started exporting LNG while 10 new markets began importing the product. The LNG exporting nations consist of Algeria, Australia, Brunei, Egypt, Indonesia, Libya, Malaysia, Nigeria, Oman, Qatar, Trinidad and Tobago, the United Arab Emirates, and the United States. At the same time, the price differential between oil-linked spot and Henry Hub prices for LNG has created new opportunities as well as challenges for the industry.

Table 1 demonstrates that the entire South and Southeast Asian regions have comparatively less natural gas reserves and reserve-to-production (R/P) ratio compared to the rest of the world. On average, the region has only 31 years of reserves compared to the Middle East region's (mainly Qatar's) more-than-100 years of reserves. Moreover, within the Asia Pacific region, Southeast Asia has far better reserves than South Asia. India and Bangladesh have a combined 40 years of reserve only, compared to the Southeast Asian countries' over-200 years of reserves. Table 2 shows that apart from Indonesia, Malaysia, and Myanmar, the rest of the regions' countries are net gas importers.

Table 1: Comparison of Gas Reserve and Reserve-To-Production Ratios

Source: Compiled from BP Statistics of Word Energy 2013

Region	Total Reserve (TCM)	Share Of Total Gas Reserve (%)	R/P Ratio
Brunei	*0.3*	*0.2*	*23*
China	*3.1*	*1.7*	*29*
India	*1.3*	*0.7*	*33*
Indonesia	*2.9*	*1.6*	*41*
Malaysia	*1.3*	*0.7*	*23*
Myanmar	*0.2*	*0.1*	*17*
PNG	*0.4*	*0.2*	*>100*
Thailand	*0.6*	*0.2*	*7*
Viet Nam	*0.3*	*0.3*	*65*

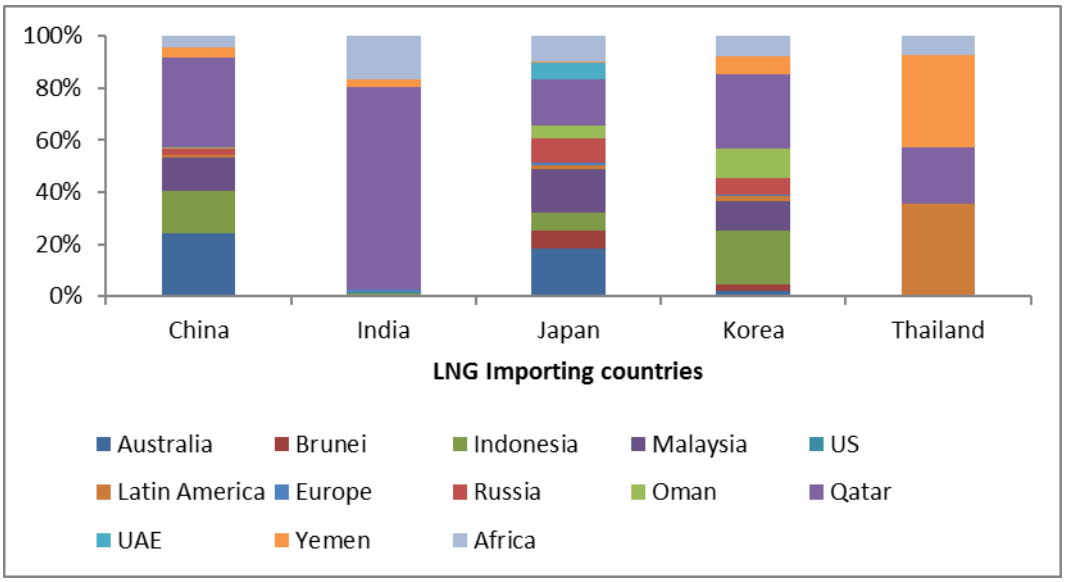
Table 2: Export and Import Status of Natural Gas of India and ASEAN (In Bcm)

Countries	2005	2006	2007	2008	2009	2010	2011	2012
India	6.04	7.99	9.98	10.79	11.76	11.04	14.99	14.35
Indonesia	-37.9	-37.1	-36.3	-36.4	-34.6	-41.7	-38.6	-35.3
Malaysia	-29.7	-29.6	-31.2	-30.9	-30.4	-30.7	-33.3	-31.9
Myanmar	-12.2	-12.6	-13.5	-12.4	-11.6	-12.4	-12.8	-12.7
Philippines	3.28	2.74	3.29	3.44	3.48	3.26	3.56	3.41
Singapore	6.84	7.05	8.62	8.24	8.06	8.40	8.77	8.31
Thailand	8.86	8.98	9.36	8.58	8.31	8.82	9.59	9.85
Viet Nam	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
China	-2.6	-2.4	1.3	1.0	4.3	12.1	27.8	36.6
Japan	78.6	83.7	90.2	93.7	87.4	94.5	105.5	116.7
Korea	30.4	32.0	34.7	35.7	33.9	43.0	46.3	50.0

Note: negative values are export figures.
Source: Complied from BP 2013 energy statistics.

Figure 3 shows the current LNG imports of major countries in the region. Supply portfolio diversity is important in a nation's energy security because the higher the diversity ratio, the better the risk-hedging capacity of the country against supply disruption, price escalation, etc. It is observed that India's sources for LNG supply are less diverse compared to Japan's, which boasts the highest diversity ratio of LNG supply. India is mainly dependent on Qatar gas. In contrast, Thailand, for example, imports from Yemen as well as Latin America. China is gradually diversifying its sources by shifting more towards ASEAN regional suppliers.

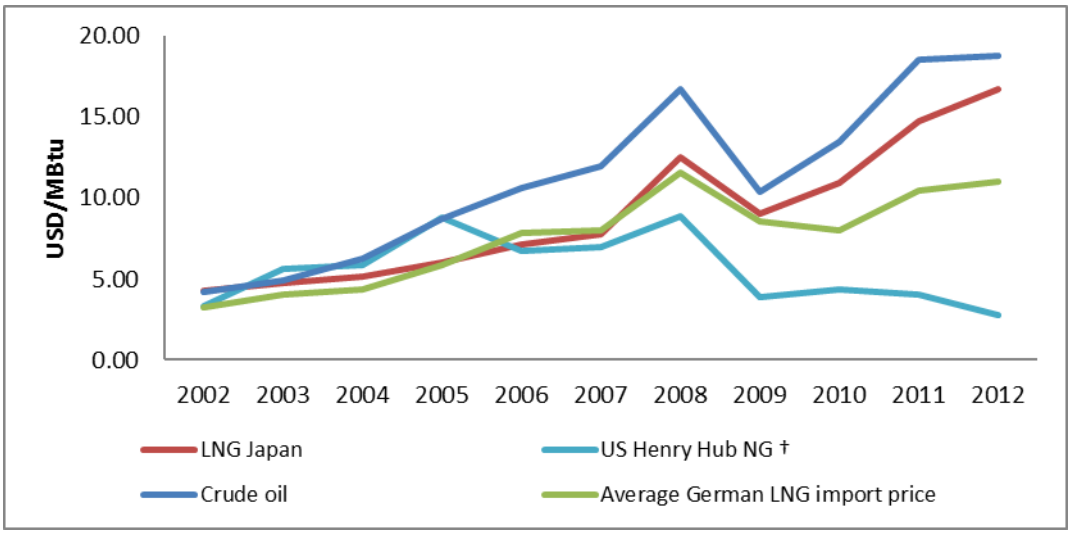
Figure 3: LNG Import Portfolio of Major Countries (as on 2012)



Source: Compiled from BP 2013 Energy Statistics.

As a matter of fact, Asian customers of LNG are paying premiums on each unit of LNG purchased outside of the region. It has been clearly shown in the Figure 4 where Japan's LNG import price is way above the average German price for long term contract. Since 2013, things are started changing. Japan, India and Korea are now joining hands to combat this increasing price of LNG import. Japan already stared diversifying its supply from Russia and United States, where India is also trying to find an alternative supplier .

Figure 4: Natural Gas Prices in the International Markets



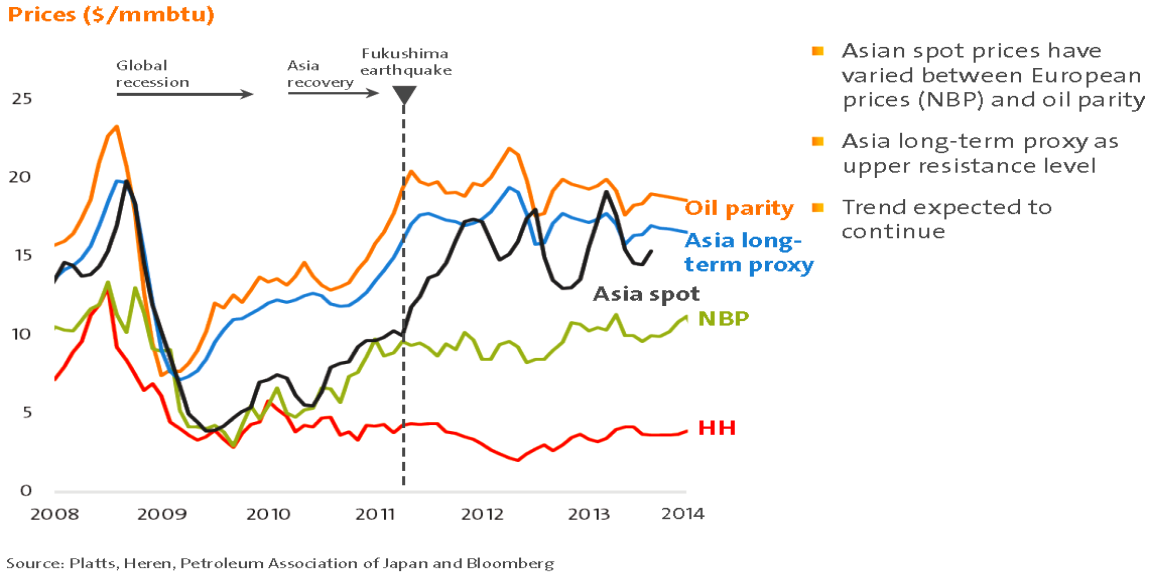
Source: Compiled from BP 2013 Energy Statistics.

6. The Asian LNG Importers' Group and Enhancing Bargaining Capacity

The earlier section has noted that the LNG prices in Asia are substantially higher than those in other major regions such as Europe and North America. Even as the view on natural gas as an alternative fuel for oil is waning and the rationale for such pricing is less clear today compared to the past, majority of LNG contracts in the Asia Pacific have a pricing formula that is linked to the oil price. Asian LNG importers such as Japan and China paid as much as US$15.75 per million British thermal unit (MMBtu) in middle of year 2013 compared to $2.97 per MMBtu paid by LNG buyers in the US Gulf Coast and $9.79 per MMBtu by British consumers, according to the US Federal Energy Regulatory Commission. Similarly, India's LNG imports are expected to rise to 19 percent by 2014, according to industry estimates. Japan as well as India are struggling with higher fuel imports, especially due to their weakening currencies. China, South Korea, Taiwan, and Singapore are also major LNG consumers and expected to lead the demand for LNG. In fact, Asia-Pacific countries will account for 64 percent of LNG demand by 2020. Meanwhile, Japan and India are also seeking cooperation opportunities with other LNG importers to improve their bargaining positions with energy exporters. Figure 5 below shows how

the Asian LNG price is way above European prices and below oil parity price, which justifies the need for a regional importers' group.

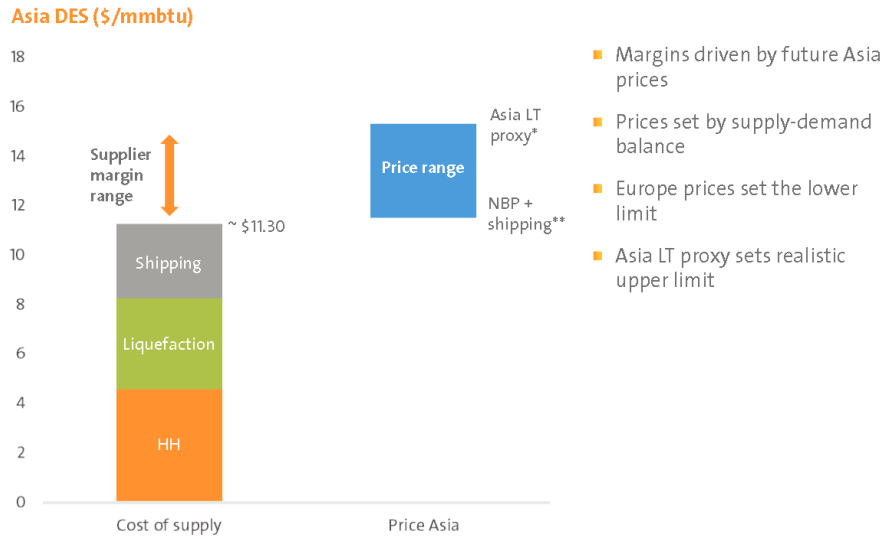
Figure 5: Asian LNG Price Comparison with Others



Source: Platts, Heren, Petroleum Association of Japan and Bloomberg

If the Asian LNG price was to be decomposed further (Figure 6), one can find that around 20 percent of the cost of supply is due to shipping and around 20 percent to 30 percent is the suppliers' margin. More than 50 percent of what Asia is paying for is therefore the flexible component of the total price---a price that can still be adjusted by increasing the region's bargaining power and reducing the shipping distance.

Figure 6: Decomposition of Asian LNG Supply Cost



Note: Figure assumes JCC= $100/bbl , NBP= $10.03 and
* Asian Long Term (LT) proxy = 0.1485XJCC+0.50 and
**Additional shipping from UK to Asia
Source: BG LNG Market Outlook 2013

Figure 5 further corroborates the need for a regional LNG supplier in Asia. However, since LNG is highly price sensitive, lowering its price can demotivate investors from setting up new LNG plants in the region. It has been envisaged that a reduction in Asian LNG premier price can even reduce the export of gas from North America and Russia. On one hand, to keep the investors' interest up, the LNG price needs to be above a critical level; on the other hand, LNG price should be lower than a forbidden limit that will keep the buyers in the market. As a matter of fact, Singapore becoming Asian LNG hub with India joining Japan and China to form a regional importers' group can further strike a balance indeed.

The next section of this study first describes the current state of the natural gas demand and use in India and other ASEAN countries, which are both potential buyers as well as sellers of gas. Next, the paper highlights the potential benefits from cross-border gas infrastructure projects.

India

Because of rapid industrialisation, India's natural gas consumption is projected to grow from 6.6 Bcf/day in 2010 to 14 Bcf/day by 2035 (EIA, 2011). Its domestic production of natural gas, which has been its major source of gas, failed to grow fast enough to meet rising demand. Thus, India relies on imported LNG. Liquefied natural gas terminals have, in fact, been constructed in the country in recent years. Petronet LNG Limited of India set up the country's first LNG receiving and regasification terminal at Dahej, Gujarat, and is in the process of building another terminal at Kochi, Kerala. In 2011, the state of Gujarat, where two of India's four LNG import facilities are located, proposed to increase its annual LNG import capacity to 1.2 Tcf (3.3 Bcf/day) from 0.5 Tcf (1.4 Bcf/day) (Shah, 2011, May 24).

Indonesia

While oil production in Indonesia has been declining since the mid-1990s, its gas production has been rising in recent years, reaching 81 Bcm in 2011. Infrastructure is the most significant challenge to gas production in Indonesia as the bulk of the country's gas resources is located on the outer islands, far from demand centres in the island of Java.

Indonesia's government has prioritised the production of gas for domestic use, which could reduce the future availability of gas for export. Its proven gas reserves are just over 300 Bcm, with the largest production areas found in Sumatra and East Kalimantan. Meanwhile, the biggest undeveloped prospect is located offshore, in the East Natuna Block, which holds about 130 Bcm of gas reserves. Other promising areas that have yielded notable discoveries in recent years include West Papua and Sulawesi.

Indonesia has historically been a significant exporter of gas---mainly LNG---to Japan, Korea, and China. In fact, in 2012, Indonesia was the world's fifth-largest LNG exporter. Its three operating LNG liquefaction plants (Bontang, Arun, and Tangguh) have a combined capacity of 45 Bcm per year. However, exports have begun to decline because of falling production at the Arun liquefaction plant in northern Sumatra, which is being wound down in preparation for its conversion into a regasification terminal in 2014.

Two new liquefaction plants, Sengkang and Donggi-Senoro, are being built on the island of Sulawesi. Furthermore, there are plans to expand the Tangguh plant and Abadi Floating Liquefied Natural Gas (FLNG) project in the remote Arafura Sea. Indonesia's first regasification terminal, a floating storage and regasification unit (FSRU) in West Java, started receiving deliveries in 2012. Two others were under construction as of mid-2013, with more expected to be built so as to meet the domestic market's gas demand.

Malaysia

Malaysia's gas production in 2011 was at 56 Bcm, the second largest in the South and Southeast Asia. Production from offshore Peninsular Malaysia, including the Thailand-Malaysia Joint Development Area, caters specifically to domestic users, while production from offshore Sarawak feeds the 33-Bcm MLNG (Bintulu) liquefaction terminal. The nation's gas production is projected to rise in the medium term, reaching about 70 Bcm in 2020 before declining slightly to 65 Bcm in 2035.

Proven gas reserve is currently at 240 Bcm. A ninth liquefaction train expected in 2015---soon to be the world's first operating FLNG facility---will expand capacity by 15 percent. Construction has begun on the Kanowit FLNG terminal, which will be used to develop fields offshore Sarawak.

Malaysia is the world's second-largest LNG exporter, with Japan, Korea and China as main customers. However, Peninsular Malaysia is expected to consume more gas, given its population and economic activity, which may reduce their net gas export over time. Specifically, its net gas export is expected to increase to about 30 Bcm by 2020 but because of the rising domestic gas demand, will fall to 17 Bcm by 2035.

In 2013, Malaysia became both an exporter and importer of LNG, when it commissioned the 5.2 Bcm Lekas regasification terminal in Malacca. The facility is under long-term supply contracts with Qatar Gas and Gladstone LNG (Australia), while at least two other small regasification terminals (Pengerang and Lahad Datu) are in the offing.

Brunei

Brunei Darussalam has sustained its gas output at around 12-13 Bcm per year despite declining oil production. Southwest Ampa, its largest producing gas field, hold the majority of its production although in the future, prospects are hinged on explorations in the deep waters of the Baram Delta. Most of Brunei Darussalam's gas production feeds the 9.8-Bcm Brunei LNG liquefaction plant, which exports to Japan and Korea under long-term contracts. Production is projected to increase to a modest 14 Bcm by 2030.

Viet Nam

Gas production in Viet Nam has grown steadily in the past decade, reaching 9 Bcm in 2011. The Lan Tay field in the Nam Con Son basin, located offshore southern Viet Nam, supplies gas to the onshore Phu My power plant and provides almost two-thirds of the country's total output. As domestic gas demand growth is expected to outpace production, the Thi Vai LNG regasification terminal will be built and completed by 2016. A second regasification terminal is also planned. Viet Nam's gas production is projected to remain relatively steady throughout the projection period.

Thailand

Thailand's gas-producing fields, including the PTT EP-operated Bongkot field---the country's largest---lie offshore of the Gulf of Thailand. After the Joint Development Area shared with Malaysia came online in 2011, Thailand's gas production became 28 Bcm per year. Net imports of gas were 11 Bcm in 2011, majority of which were from the pipeline from Myanmar. With domestic demand outpacing production, the country began taking LNG shipments in 2011 following the opening of the Map Ta Phut regasification terminal. The Overlapping Claims Area with Cambodia is promising in the long term, although its development hinges on the two countries' resolution of their long-standing territorial dispute.

Efforts to maintain gas output will hardly be enough to stave off the expected 75-percent fall in Thailand's gas production by 2030-2035. For this reason, coupled with

rising domestic gas demand, net gas imports will rise to almost 60 Bcm by 2035, most likely via the Myanmar pipeline.

Myanmar

Myanmar has a notable potential to increase its gas production. The bulk of its output currently comes from the offshore Yadana and Yetagun fields, which mainly supply Thailand. Meanwhile, production at the offshore Shwe field---the primary source of gas to feed the newly commissioned Myanmar-China gas pipeline (July 2013) ---is ramping up. With a transmission capacity of 12 Bcm per year, the pipeline will support rising exports to China's Yunnan province based on a 30-year agreement. The government has sought to increase foreign investment in the energy sector following the lifting of economic sanctions, and has attracted strong interests in several acreage offerings since 2011. However, it will take time to develop additional prospects, and it is unclear whether future gas supplies will be for domestic use or for export. The government issued a tender in July 2013 to import higher volumes of LNG.

The availability of infrastructure will be an important determinant of future exploration activities and production. Many of Southeast Asia's gas production areas are located far from demand centres and will require either an expansion of transmission infrastructure or LNG liquefaction facilities to ship the gas to regasification terminals domestically or abroad. The Trans-ASEAN Gas Pipeline project aims to establish broader gas interconnections throughout the region, but progress has been slowed down by a shortage of gas sources and huge investment requirements. Meanwhile, several countries are either building or considering to build floating liquefied natural gas facilities so as to develop remote resources as well as regasification terminals for receiving imported gas.

Table 3: Gas Production by Country in the Southeast Asia Regions (Bcm)

	1990	2011	2020	2025	2030	2035	2011-2035*
Brunei Darussalam	9	13	16	15	15	14	0.5%
Indonesia	48	81	108	118	129	139	2.3%
Malaysia	17	56	71	68	67	65	0.6%
Philippines	0	4	5	5	4	4	0.2%
Thailand	6	28	19	15	11	7	-5.5%
Viet Nam	0	9	13	12	12	12	1.3%
Share of world	4.0%	6.0%	6.3%	5.8%	5.6%	5.3%	n.a.

Source: Compiled from reports published by International Gas Union in 2011 and 2013, Wijayatunga and Fernando (2013), ADB (2012) and Gippner (2010), World Bank (2013), The New Age (2013), CIA (2013), Hameed (2011), ADB/ADBI (2009), Rahman, *et al*. (2013), Thant, *et al*. (2013).

6.1. Scope of ASEAN: India Gas Cooperation and Energy Market Integration

The previous section of this study has just established how natural gas will be part of the regional energy supply mix. The sector's growth and development in the region nevertheless, depends on various issues:

- ***How quickly the planned addition of liquefaction capacity is implemented, or at least how easy the Final Investment Decision (FID) is sought.*** An additional 180 MTPA liquefaction capacity is expected to come online by 2016, of which 80 percent is in Australia, Indonesia, and Malaysia.

- ***How other players in the global LNG market respond to the rapidly changing situation***. Qatar is the single largest competitor in this sector. However, recent increases in Qatar LNG price in the Asia market puts them in competition with the US and East African suppliers. As increasing price of LNG in the market can be seen in two ways: It can be an opportunity for investors to put their money further in the energy sector's growth or it could be a cause for alarm to LNG investors considering that the sector is highly price elastic to alternative options such as piped natural gas[2].

- ***How the region's regasification capacity project is going to be built*** Of the 94 MTPA of the world's regasification capacity expected to be online by 2016, around 60 MTPA will be in the Asia Pacific region itself. Nonetheless, the regasification capacity is still lower than the requirement. Investors are still very skeptical about the growth prospect of the LNG market in the region given the rising price (i.e., rising beyond $17 to $18/MMBtu) of LNG compared to other fuels.

- ***How shale gas is going to shape the gas market in the near future.*** From 2015 onwards, the United States will be exporting shale gas to the global market, making it a net LNG exporter. In fact, the United States has started exporting gas to Asia, especially to Japan and China.

- ***How transportation cost is a crucial factor in LNG's long-term business viability.*** The pricing of LNG in South and Southeast Asia is mainly driven by both the Japan Crude Cocktail (JCC) price and the "slope" used to link the LNG price to the oil market price. It is understood that the higher the crude oil price in the international market, the more attractive the LNG price will be as long as the product

[2] To attract investors to an LNG project, the price of a unit volume of natural gas delivered into a bulk distribution pipeline must at least equal the combined costs of producing, liquefying, transporting, storing, and regasifying, plus the costs of the capital needed to build the necessary infrastructure—and a reasonable return to investors. A major portion of the total cost of the LNG value chain is usually in the liquefaction plant (nearly 40%), while the production, shipping, and regasification components account for nearly equal portions of the remaining costs. It has been noticed that the costs of all components of the LNG value chain have declined during the last 20 years because of modification in technology.

is transported within a critical distance of around 2,000 km. Given this typical pricing characteristics, intra-regional LNG trade is the most likely option.

Gas production in Southeast Asia has more than doubled over the last two decades. Indonesia and Myanmar and, to a lesser extent, Malaysia, will further increase Southeast Asia's gas production until 2035. Total gas production in the region will grow by 30 percent (from 203 Bcm in 2011 to about 260 Bcm in 2035). About three-quarters of the incremental growth is expected to come on stream by 2020.

The ASEAN region is a key exporter of LNG to global markets as well as an increasingly LNG importer. In the case of Indonesia and Malaysia, a mismatch between the geographic locations of their gas resources vis-a-vis rising local demand has created a situation where they are both importers and exporters of LNG. Unnecessary spending, thus, could be avoided by interconnecting the energy markets and improving intra-regional trade. In fact, the rising local demand and limited interconnections among countries in the region have prompted the installation of several LNG regasification terminals in recent years.

Studies indicate that because India is strategically located between the Middle East and the ASEAN and Far East (Japan and Korea) areas, this nation can contribute to developing and nurturing the natural gas market in the region. India’s aggressive offshore gas field acquisition and joint venture plans can increase access to the gas supply and allow long-term, low-cost gas contracts. It can also opt to enter into joint ventures with or acquire liquefaction projects in Indonesia, Malaysia, and Australia. In fact, in early 2014, the Adani Enterprises Ltd. of India bought the world’s largest coal port in Queensland, thus potentially increasing the flow of coal for power generation in India.

Moreover, because of India’s own burgeoning domestic demand for gas, the nation needs gas-importing facilities such as import terminals and regasification plants. Since India only has a couple of projects related to the regasification plants along with ports, it should still consider joint ventures, equity financing, or other suitable

financing mechanisms for developing LNG import facilities in nearby locations. Myanmar, Bangladesh or Thailand, for example, can be linked to India even by surface transport. Asian Highway 2[3] can even be utilised to transport LNG in tankers by land. Because 20 percent of the total supply cost of gas in Asia is currently coming in as shipments, reducing the distance of imported gas can control LNG's landed price.

Thus, India's Look East policy should emphasise:

- How to increase its stake in ASEAN and South Asian regional natural gas exploration licenses;
- How to improve its access to LNG value chain infrastructure development to reduce the operational and shipment cost of LNG; and
- How to increase the supply of alternative sources of gas such as low-cost shale domestically as well as from other locations such as the United States and Canada.

Table 4 below lists the planned projects in the LNG value chain in the ASEAN and South Asian regions wherein India may consider taking part in various capacities, be that as technical partner, financial collaborator or even direct acquirer. The list excludes construction projects where an addition of a new partner is not an option.

[3] Asian Highway 2 is the road in the Asian Highway Network running 13,177 km from Batam, Indonesia to Khosravi, Iran and Tanjungpinang, Indonesia to Khosravi, Iran.

Table 4: Planned LNG Projects in the Region

Country of Project	Project Name	Capacity (MMTPA)	Year Started	Project Status
Liquefaction				
Indonesia	Abadi FLNG (on Arafura sea)	2.5	n/a	Planned
Malaysia	Rotan FLNG in Sabah	1.5	2016	Planned
Regasification				
Indonesia	Banten FSRU	3.0	-	Planned
	Central Java FSRU	3.0	2016	Planned
Malaysia	Lahad Datu in Sabah	0.8	2016	Planned
	Pengerang in Johor	3.8	2017	Planned
Philippines	Quezon LNG	1.0	-	Planned
	Batangas FSRU	3.8	2017	Planned
Thailand	Ma Ta Phut LNG Expansion	5.0	2014	Planned
Viet Nam	Thi Vai LNG	1.0	2016	Planned
	Binthuan LNG	3.0	2018	Planned

Gas Pipeline				
Myanmar-India-Bangladesh	Gas Pipeline	900 Km total gas trade of 5 Bcm.		Pipeline from the Shwe field off the Bay of Bengal through the Rakhine State in Southern Myanmar, from where it would turn east to enter the Indian state of Tripura. The pipeline would then enter Bangladesh at Brahmanbaria and traverse the country until it exits at Jessore and terminates at the Indian state of West Bengal.

Source: Compiled from reports published by International Gas Union in 2011 and 2013, Wijayatunga and Fernando (2013), ADB (2012) and Gippner (2010), World Bank (2013), The New Age (2013), CIA (2013), Hameed (2011), ADB/ADBI (2009), Rahman, *et al*. (2013), Thant, *et al*. (2013).

7. Assessing Natural Gas Sector's Investment Demand in ASEAN and South Asia

The earlier section discussed the importance of natural gas in the energy supply of the South and Southeast Asian region, including India. The natural gas market in this region is yet to mature and thus needs huge infrastructural development across the gas value chain covering exploration, extraction, shipment, and distribution.

Two major gas products---piped natural gas (PNG) and liquefied natural gas (LNG) ---have different infrastructure requirements although they are characteristically the same product at the end-user level. Liquefied natural gas is easier to transport across long distances compared to PNG, which needs physical connectivity between producer and consumer. The LNG can be shipped to any parts of the world by tankers. This is the main reason LNG business is growing fast.

However, the LNG business is highly price sensitive in both supply as well as demand side. Once LNG prices increase, consumers immediately react by shifting their fuel use to PNG. At the supply side, on the other hand, if the LNG price falls, investors shy away from investing in new projects due to concerns of increased risk in capital recovery. Therefore, a fine balance is needed to satisfy both consumers as well as investors.

Asia's gas market currently experiences high volatility because efforts in improving its regional gas supply has not caught up with the speed with which demand is increasing. Up until 2013, more than 70 percent of the region's LNG is imported from other parts of the world. At present, China, India, and Japan together consumes more than 45 percent of the world's LNG, but this is expected to increase to up to 70 percent by 2030.

7.1. Model Description and Major Assumptions

What then is the future investment demand in the energy sector of the region (including the ASEAN), and of India? Following the principles of market integration, it is assumed that more energy sector cooperation between the sub-regions of South and Southeast Asia (mainly India) will enhance the level of energy trade. It is further

assumed that market integration could increase the trade in both PNG and LNG by around 10 percent.

This section aims to estimate a least-cost optimal energy supply system for the region under an improved inter-regional trade, especially on natural gas and utilisable energy (electricity). A bottom-up energy system model (i.e., MESSAGE) is used here to calculate the demand. The Model for Energy Supply Strategy Alternatives and their General Environmental Impact (MESSAGE) is a multi-region energy system model capable of estimating the least-cost supply option of energy in a long-term manner under different constraints such as climate, resource, and costs.

The model pathways assume a common median demographic projection wherein the global population increases from almost 7 billion today to about 9 billion by the 2050s (UN DESA, 2009). The pathway also assumes a median economic development path, expressed in terms of world GDP, which allows significant development in the 50 or so poorest countries in the world. At the same time, it reflects higher resource productivity as well as demand growth in the richest countries but is dampened by changing consumption patterns and lifestyles. This GDP development path is built on the updated IPCC B2 scenario.

The socioeconomic development pathway chosen in this model is consistent with global aspirations towards a sustainable future that is highly attainable. Global real per-capita income in the study pathway grows at an annual average rate of 2 percent over the next 50 years, but with significant differences in the pace of development across regions.

Final energy use in 2005 was presumed to be 7 GJ to 46 GJ per capita in developing countries and 73 GJ to 219 GJ per capita in developed countries. Meanwhile, GDP per capita is US$671 to US$4,905 for developing countries and US$3,487 to US$40,050 for developed countries. It is further assumed that by 2050, the developing countries' per-capita energy consumption would be around 28 GJ to 50 GJ while that of developed nations would be around 62 GJ to 98 GJ.

The GDP per capita by 2050 is anticipated to be in the range of US$6,000 to US$20,000 for developing countries and between US$24,500 to US$52,000 for developed countries. In terms of final energy consumption intensity (MJ/dollar of GDP), the model assumes that the regions had an intensity of from 3.0 MJ/dollar to

9.8 MJ/dollar of GDP in 2005, which will then drop to 0.9 MJ/dollar to 2.5 MJ/dollar of GDP by 2050.

7.2. Model Scenarios

This study has two set of scenarios:

Business as Usual (BAU) scenario: This scenario considers implementation of all existing mid- to long-term plans along with no strict environmental and greenhouse gas (GHG) emissions reduction targets. In terms of macroeconomic drivers, regional GDP growth rates are considered moderate at 5 percent to 6 percent per annum until 2050, and population growth rate is estimated to be around 1 percent per annum. Primary energy consumption in the South and Southeast Asia regions under this scenario is presumed to be 30 GJ to 40 GJ per capita by 2050.

Enhanced Energy Trade (EET) scenario: An increase in energy trade in natural gas, including both PNG and LNG, is assumed. The region is expected to come up with more than 10 to 15 new LNG terminals and liquefaction plants by 2050 to strengthen its LNG exporting capacity. By 2030, the total LNG export capacity will be growing by 10 percent to 15 percent.

In fact, a potential increase in the import and export capacity of coal, oil, and natural gas by 10 percent every 10 years until 2050 and by 1.5 percent of LNG export capacity every year from 2010 to 2050 is assumed. However, since the actual capacity utilisation will start from 2015, the enhanced LNG export for the Southeast Asia region is expected to begin in 2020.

7.3. Simulation Results and Findings

Under the EET scenario, the gas sector is assumed to be the second largest area for future investment in the ASEAN region. Majority of the investment goes into new port capacity addition and construction of liquefaction units. The region is also investing heavily in regasification plants to meet the increasing energy demand that accompany economic growth. In terms of LNG value chain costs, liquefaction is one of the most costly activities, followed by exploration, shipping, and regasification.

Thus, majority of the sectoral investments amounting to US$10 billion to US$12 billion per annum by 2040 would go into developing the liquefaction capacity and LNG shipping infrastructure. Figures 7(a) and 7(b) illustrate the expected investment scale in the region by 2040.

Figure 7(a): Investment Demand in Energy Sector in ASEAN Region (in US$@ 2005)

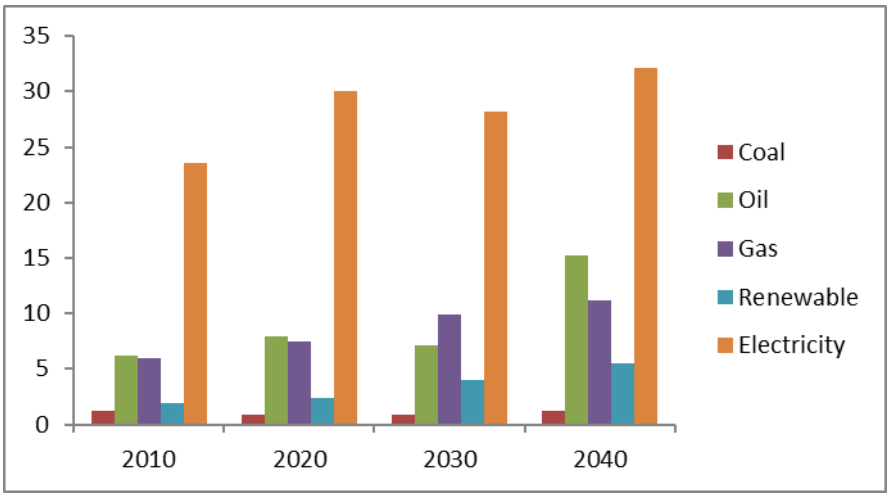
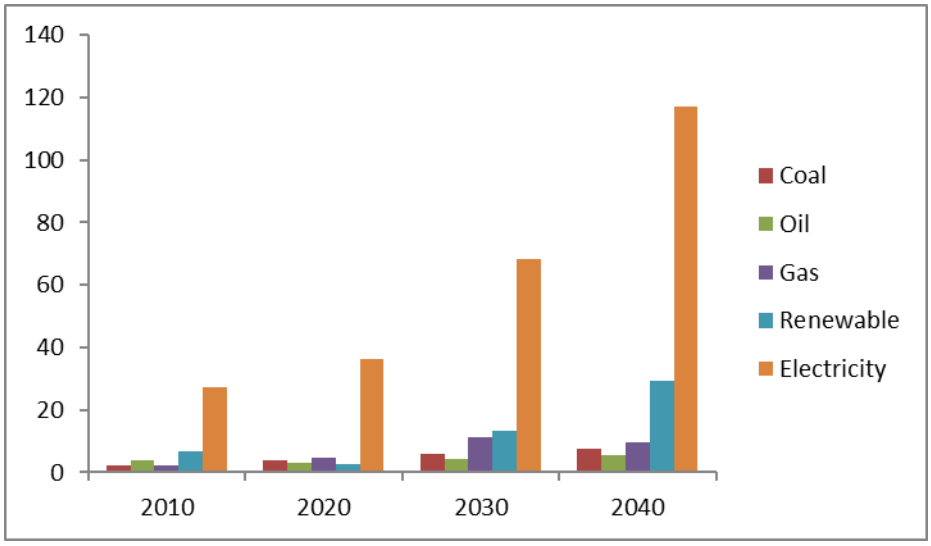


Figure 7(b): Investment Demand in Energy Sector in India and South Asia Region (in US$@ 2005)



Source: Model generated, authors' estimated.

India and other South Asian countries are expected to invest more in the electricity sector than in other energy sectors such as natural gas, coal, and oil. India will add 150,000 MW of thermal generation by 2017, of which more than 30 percent of the capacity added is on gas-based generation. However, investments will also focus on constructing LNG terminal facilities, regasification plants, and pipelines that will transfer gas to destination points. Given the pattern of future investments, India is anticipated to continue importing fuel so that its domestic power sector supply can support the bigger capacities of its thermal power stations. The country has already been increasing its coal and LNG imports year-on-year to meet the demand of the high efficiency power plants.

In the ASEAN region, majority of the investment is expected to be in the electricity sector, followed by the gas sector. However, the region's total investment in the gas sector is higher than that of India and other South Asian countries mainly because of the former's heavy investments in new gas field exploration and gasification plants.

8. Cost Comparison between Pipeline and LNG

Since 2010, the LNG capital cost has been rising rapidly across the value chain and across geographical locations. The highest cost escalation has been observed in the Asian region partly due to foreign exchange rate variations. Asia's capital expenditures (CAPEX) for LNG liquefaction has gone up to US$900/ton in 2013 compared to US$400/ton in 2010. This is further projected to go as high as US$1,400/ton by 2020. Almost all liquefaction projects under construction in this region are facing very high cost overruns. Thus, investors worry about this market's future growth in spite of the continuous demand for LNG for the next two decades.

In terms of regasification projects, capital cost is likewise rapidly increasing in Asia more than in the rest of the world. Onshore regasification projects (including storage, regasification, piping) cost around US$187/ton in 2013 compared to US$145/ton in 2011. By 2020, such project cost could escalate up to US$220/ton.

This is a huge jump if one where to compare with the 2004 on-shore regasification CAPEX of below US$100/ton. On the other hand, as an LNG importer, a nation has a number of technological options with varied cost structures to choose from. For example, floating LNG terminals are relatively less expensive that on-shore units (US$135 /ton).

9. Strategic Importance of Myanmar

Myanmar is strategic in India's bid to secure its energy supply. Given the country's existing and potential gas availability in the mid- to long-term, Myanmar can supply to India provided the latter develops the required infrastructure and makes the needed resources available.

9.1. Role of Myanmar in Regional Energy Trade

Located between two economic giants China and India, which together is home to 2.5 billion people, Myanmar bridges South and East Asia. Myanmar produces 2 MTOE per annum of surplus that can be exported. Its total energy export amounted to 8.6 MTOE in 2011, which was roughly more than half of its total primary energy supply. That same year, it exported to Thailand 36 Bcm of pipeline natural gas out of its 700 Bcm of total gas reserve.

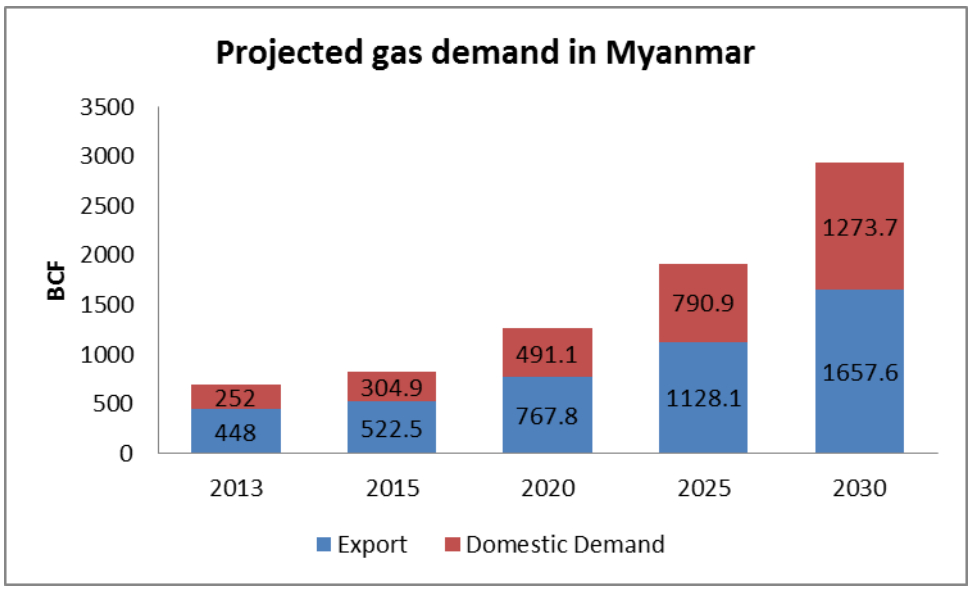
China, too, is arranging a major deal with Myanmar by investing US$4.8 billion into the Shwe Gas project. This will be the single largest gas field in Southeast Asia with a total capacity of 150 Bcm. An 850-km pipeline is under construction to get this gas into Yunnan province. Myanmar's Ministry of Energy has further opened 11 shallow and 19 deep water blocks through competitive bidding.

9.2. Reserves and Availability of Myanmar Gas

Until recently, Myanmar's proven gas reserve is around 12 Tcf (or 12,000 Bcf), mostly coming from two blocks in the Shwe gas fields. It currently produces around 1.2 Bcf of gas per day. Domestic demand for gas is still lower than that of its exports due to the low energy demand from its domestic industries and households.

As of 2013, Myanmar's domestic gas demand is around 0.7 Bcf per day (or 252 Bcf per year) compared to 448 Bcf of annual exports. Its gas surplus may continue for another couple of decades even with a steady growth in domestic demand, provided the gas production remains stable. Annual domestic demand will grow at 10 percent per annum while export demand will rise at 8 percent until 2030. At these growth rates, Myanmar's total consumption will be around 2,800 Bcf by 2030. Figure 8 shows Myanmar's projections on domestic and export gas demand until 2030. This statistics further confirms that Myanmar will continue to be an energy exporter in the South Asian region.

Figure 8: Projected Domestic and Export Gas Demand of Myanmar



Source: Authors' estimates using data from ADB report on Country Partnership Strategy 2012-14, BP Energy Statistics 2013.

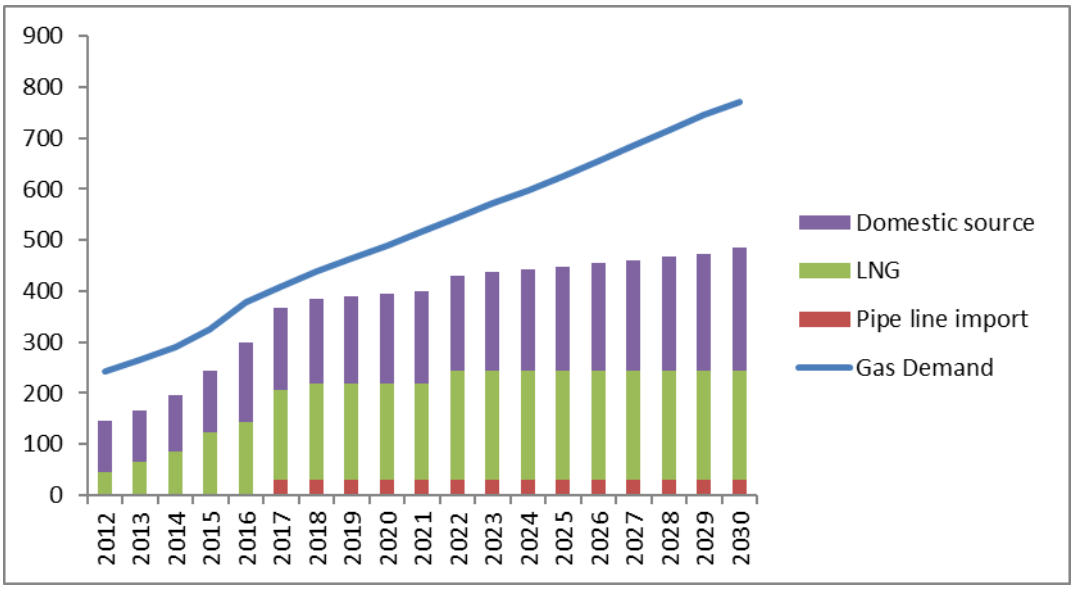
Out of 12 Tcf of reserves, Myanmar has already committed majority of its share to China and Thailand under several long-term contracts. There is a very limited resource available for other countries such as India. Nevertheless, Myanmar has 80 Tcf of potential reserves that are yet to be contracted. The Myanmar government, with its current level of technical and financial capacity, is not yet in a position to

convert these potential reserves into proven reserves. India, thus, could opt to be a potential technical and financial partner of Myanmar on this regard.

9.3. Scope of India-Myanmar Gas Trade

India's long-term natural gas demand has been increasing rapidly compared to its domestic gas supply. Such demand-and-supply gap has widened exponentially over time. By 2030, India's gas supply and demand gap will reach up to 280 MMSCMD, or around 35 percent of the country's total gas demand. Figure 9 shows the supply and demand for India's domestic and imported gas.

Figure 9: Indian Gas Supply and Demand Condition by 2030 (in MMSCMD)

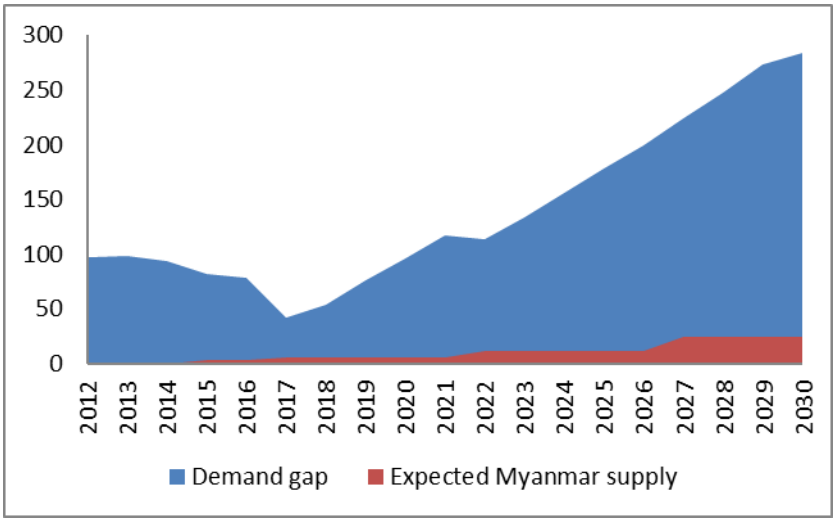


Source: Authors estimated using data from published documents of Ministry of Oil and Natural Gas, Govt. of India

To supplement its domestic gas exploration, India also sources its gas from overseas. Currently, India imports around 16 Bcm gas from Qatar, which is around 78 percent of its total import. Up until 2012, Myanmar was not being considered as a source of gas for India. However, Myanmar's potential as a supplier of relatively low-cost gas is now acknowledged.

Although proposed for quite while now, the Myanmar-Bangladesh-India gas pipeline has not materialised due to various political issues among countries. If this plan eventually pushes through, Myanmar can supply 24 MMSCMD by 2040. While the amount mentioned is not significant enough to cover India's requirement, it is just the same a secured supply for India provided proper infrastructure is in place. Figure 10 shows the possible contribution of Myanmar gas from the A-1 gas field of the Shwe Project.

Figure 10: Expected Myanmar Gas Supply to India (in MMSCMD)

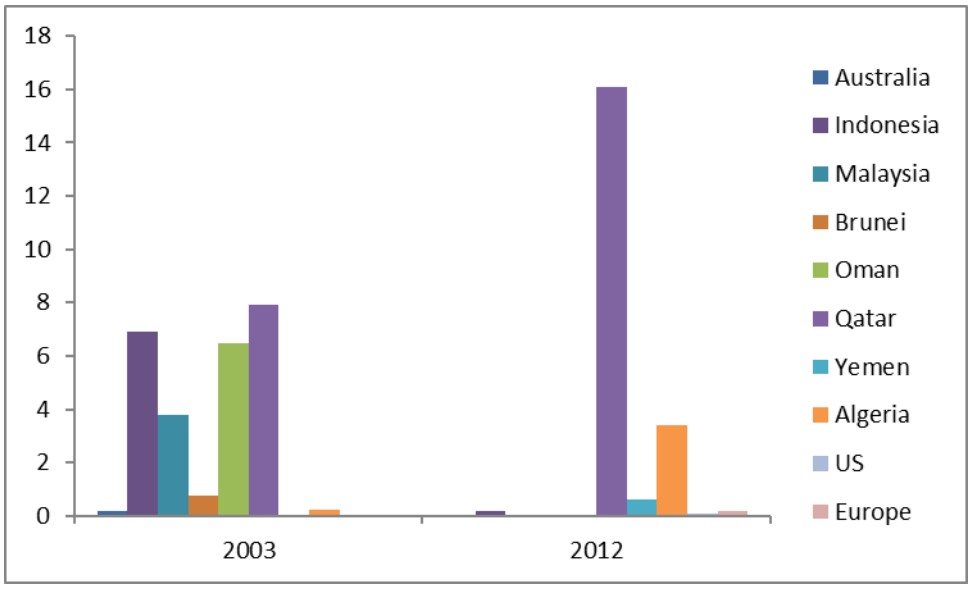


Source: Author estimated using data from Ministry of Oil & NG, Government of India; Ministry of Energy, Government of Myanmar 2013.

From 2003 to 2013, India changed its list of gas sourcing countries mostly from the ASEAN region to the Middle East. It now imports gas from the Middle East (Qatar, Yemen) in bulk and pays almost US$16 to US$17 per MMBtu. This price is primarily linked to the international crude oil price and Japan crude cocktail.

Figure 11 below shows how India shifted its supply base from Eastern counties to the Middle East in a rapid manner.

Figure 11: India's Historical Gas Supply Condition



Source: Authors estimated using data from BP Energy Statistics, 2013.

This figure further demonstrates India's gradual move towards riskier supply chains by abandoning its ASEAN sources. To achieve more energy security, India needs to revive its tie-up with countries such as Bangladesh, Myanmar, and Thailand. Although China is much ahead of India in terms of establishing a relationship with Myanmar, India could still get into the picture given that Myanmar still has 80 Tcf future gas potential for reserve.

10. Myanmar's Position as Natural Gas Exporter to India

Based on the available natural gas so far contracted to Indian companies (mainly in A-1 block), Myanmar can provide around 6-8 MMSCMD. This amount is very small compared to India's total demand. India must therefore explore other indirect options to enhance its stake in Myanmar's gas in both mid- to long-term periods.

This study used a multi-criteria analysis on Myanmar's energy sector to understand the pros and cons of its long-term gas development project with India. The analysis is based on the following criteria: (1) Technical limitation of Myanmar's

gas supply; (2) Long-term availability of excess energy; (3) Myanmar's geopolitical situation; (4) Myanmar's socio-economic situation due to energy cooperation; and (5) Myanmar's investment environment and energy pricing. Each indicator has been evaluated against the primary objective of creating an environment that will enable India to source natural gas from Myanmar. This exercise mainly aims to identify the factors that can hinder lndia's bid to increase its long-term gas supply contract with Myanmar.

Issue 1: Technical limitation of gas supply

One limitation of access to Myanmar's gas supply is linked to its poor technical capacity to convert resources into reserves. The country has an estimated reserve of 12 Tcf compared to production of only 1.2 Bcf/day only. Its poor infrastructure to carry gas from remote gas fields to the demand centres is another factor to hurdle if it were to increase its gas production. For example, the Yadana gas pipeline is supposed to provide 200 Mft^3/day to Yangon but, in practice, is supplying only 30 Mft3/day due to its obsolete and poorly maintained pipeline infrastructure. Also, Myanmar already has several long-term export contracts; meaning, only a very limited amount of gas is left for new contracts. During 2010-2011, out of 10,000 KTOE of natural gas production, Myanmar exported around 8,900 KTOE.

These existing conditions in Myanmar can be considered as opportunities for India to provide technical assistance, on a success fee basis (i.e., percentage of saved or recovered gas), in the areas of performance improvement, loss reduction and recovery, and gas transportation, as well as in building new infrastructure for the gas industry.

Issue 2: Long-term availability of excess energy

Increasing Myanmar's electrification ratio from the current 26 percent to at least 80 percent by 2030 could significantly reduce its capacity to export energy. The existing per-capita electricity consumption is around 100 Kwh/annum---far below the world average of 600 Kwh/annum. However, because the country would have around 70 million people by 2030, it will by then need to be supplied around 42,000 Gwh of

electricity. Aside from the higher population, the rising energy demand from its industrial sector would also reduce the potential to export energy. By 2015, Myanmar's industrial contribution to GDP will jump to 32 percent as compared to 26 percent in 2010.

Thus, Myanmar's increasing domestic demand for natural gas may significantly hamper India's aspiration to enter into big-volume contracts in the future assuming no new resources are discovered in the interim.

Issue 3: Myanmar's geopolitical situation

Although India's Look East Policy was in place for a couple of decades, the India-ASEAN linkage via Myanmar did not prosper. Neither did the Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) work as per expectations. Meanwhile, China (via its Go West Policy) created long-term agreements with Myanmar to develop their gas fields and import gas via pipelines. The Myanmar-China gas pipeline connecting Shwe gas field in Myanmar can export 1.2 Bcf gas per day to China, which is more than 100 percent of its current capacity of 500 Mcf/day.

Also, almost all future large-scale hydro power projects in Myanmar are funded and supported by China.

Thus, by 2020, more than 75 percent of Myanmar's gas is expected to be exported to China. This skewed relationship favouring China in terms of developing, managing and maintaining Myanmar's burgeoning energy sector is one of the biggest hurdle to India's bid to establish its own energy trade relationship.

Issue 4: Myanmar's socio-economic situation

Large-scale, international energy infrastructure projects may not necessarily benefit the Myanmar's local people. Kyaukphyu, which is at the southern end of the Myanmar-China gas pipeline of the Shwe project, has not received the required benefits and development promised by project developers, including the local government. While the Chinese authority has provided compensation to the local

government, this was not distributed effectively among the beneficiaries, leaving the locals unhappy.

Also, Myanmar has no standard environmental regulation to mitigate any ecological and environmental damage brought by infrastructure development. Neither is there a rehabilitation policy for displaced locals. Myanmar also lacks a skilled technical workforce among its locals, who can deal with the complex technology involved in gas extraction, transportation and use.

Such socio-economic situation is an area of opportunity for India to establish soft linkages with the Myanmar government and, in the long run, to gain access to new gas fields that are now at resource stage. India can opt to provide technical assistance in sustainable gas exploration, establish technical training institutes, or build capacity to conduct environmental impact assessments as well as conduct impact assessment of new projects. These efforts may not only help Myanmar improve the projects' operational efficiency but also give the country the ability to discern which new projects may have an adverse environmental and ecological impact. Such assistance can improve their bilateral relations and India's access to new projects in the future.

Issue 5: Myanmar's investment environment

Myanmar still has a lot of room to strengthen its foreign direct investments (FDI) policies on energy cooperation. Most of its FDIs in the energy sector are joint ventures on onshore and offshore blocks, but these have not generated enough value add to the domestic market in terms of knowledge and technology development. International companies are more inclined towards individual benefits rather than following a comprehensive development plan designed to equally benefit local partners.

Myanmar's financial regulatory system, including the insurance and legal system (i.e., dispute settlement), are also not sophisticated enough to handle massive foreign investments in the domestic market. In fact, its financial market is still at a nascent stage of development and demands huge amount of improvements in all spheres.

Although Chinese investment in Myanmar's energy sector already reached around US$12 billion by 2013 (IHLO, 2013)---which comprises 40 percent of Myanmar's total FDI---the economy-wide impact of such investments are not apparent yet due to several reasons. One important explanation could be the divergence between the FDI proposal and Myanmar's domestic requirement and social structure. For instance, several instances of civil unrests were reported in and around various energy projects funded by international institutions. India can consider this as an opportunity for it to take part in reforming Myanmar's financial sector, especially in making its regulatory and legal systems robust and, through Myanmar, establishing deeper connection with the ASEAN nations down the line.

Issue 6: Myanmar's energy pricing

Myanmar's energy price is one of the lowest in Asia. In 2011, official electricity charges in Yangon were 12 cents per kWh for foreigners and 75 kyat (9 cents) for offices; however, the average price actually paid by the end of the year was only 5 cents/kWh, or 35 kyat. These prices fall far below the cost of producing electricity.

If Myanmar could supply additional gas in the regional market, this would be procured by countries in both South Asia and Southeast Asia. Furthermore, assuming trade in natural gas and LNG does increase, the region is expected to come up with 11 to 15 new LNG terminals and liquefaction plants by 2050. By 2030, total LNG export capacity in the region is expected to grow by 10 percent to 15 percent.

Energy price affects the operational efficiency and long-term sustainability of the energy supply. Subsidised energy, meanwhile, not only encourages wastage of energy but decreases resources' rent costs, too, which then ultimately exhausts the resource at a faster rate. India could consider this as an opportunity to help build Myanmar's capacity to reform the pricing system for energy resources (including natural gas) so as to extend the long-run availability of gas. Such cooperation in price reforms can likewise help India make the most out of the ASEAN-India energy market integration via Myanmar.

In all these, one can therefore conclude that while the volume of Myanmar's gas supply to India may be insignificant in the short run, it is to India's advantage to set up strong linkages with this neighbouring country. Myanmar, after all, could be India's gateway to the ASEAN and Far East trade (including of energy commodities) in the near future. It can indirectly give India a foothold into the region's supply of LNG. India should proactively take advantage of its geographical proximity to the largest offshore gas field (Shwe Project) on the Bay of Bengal, Myanmar and jointly explore the project's future blocks.

11. Redefining India’s Look East Policy in the Context of the Energy Market Integration

India initiated the Look East Policy in the 1990s to strengthen its relationship with ASEAN countries. In 1997, a sub-regional economic grouping called BIST-EC consisting of Bangladesh, India, Sri Lanka, and Thailand was established to strengthen the Look East Policy. Later, the group was renamed BIMSTEC with the addition of Myanmar, Bhutan, and Nepal. This group aims to create an enabling environment for rapid economic development through cooperation projects in trade, investment and industry, technology, human resource development, tourism, agriculture, energy, infrastructure, and transportation.

The Look East Policy eventually gave India the opportunity to re-engage with its eastern neighbours and to gradually emerge as a significant player in the strategic dynamics within the region, which is centred on a rising China. Economically, India’s trade with the ASEAN grew immensely: From US$2.3 billion in 1991-1992 to US$45.34 billion in 2008-2009. Singapore stood out as India’s largest trading partner in the ASEAN, followed by Malaysia and Indonesia.

The pace of economic reforms in India also saw ties being further forged with East Asian neighbours. In the second phase of the Look East Policy, a Free Trade Agreement (FTA) was signed. Considered the highlight of the policy is the signing of the India-ASEAN Free Trade Agreement on 13th August 2009 in Bangkok. The agreement focused on trade-in-goods and did not include software and information

technology. Two-way trades between India and the ASEAN reached US$47 billion in 2008, as compared to the earlier estimate of US$10 billion.

Some initiatives under the Look East Policy strengthened India's infrastructure for oil and natural gas imports from neighbouring countries. One project was the construction of the 165-km Indo-Myanmar Friendship road connecting Tamu and Kalaymiyo-Kalewa in February 2001. Other important projects are the Myanmar–India-Bangladesh gas and/or oil pipeline, and Tamanthi Hydroelectricity project. Two agreements related to oil and natural gas infrastructure development in the second phase of the program are the India-Myanmar Bilateral ties (2011) and the India–Viet Nam pacts (2011).

India-Myanmar Bilateral Ties in 2011: On 14th October 2011, India's prime minister, Dr. Manmohan Singh and visiting president of Myanmar, Mr. U. Thein Sein, held talks in New Delhi, where India sought to booster its ties with Myanmar by pledging an additional US$500 million as loans. The state heads agreed to examine the feasibility of establishing railway links and to speed up work on two hydroelectric power projects in Myanmar. They also arranged to tighten their cooperation in the oil and natural gas sectors.

India–Viet Nam Pacts in 2011: On 12th October 2011, India and Viet Nam signed six agreements that included a pact to promote oil exploration in the South China Sea. However, China objected to India exploring oil in the South China Sea, claiming that it was a part of China. India and Viet Nam rejected China's claim, pointing out that as per the United Nations, the blocks belong to Viet Nam.

In the field of security cooperation, the two nations instituted mechanisms for biennial dialogues on security issues. They also decided to increase the trade target to US$7 billion by 2015 from the present level of US$2.7 billion.

Based on the above multi-criteria assessment of Myanmar's role in India's bid to further energy sector cooperation with the ASEAN and other South Asian countries, the Look East Policy should focus on two aspects:

- **Soft linkages between countries**: India has immense capacity and resources to assist, guide, develop and reform neighbouring countries in such fields as technical capacity, banking and finance, and institutional capacity in the energy sector. The Look East Policy should therefore emphasise the need for clear and quantifiable objectives on soft linkages that are related to regional energy cooperation and integrated market development.
- **Hard linkages between countries**: Now that India is in the process of strengthening its market linkages with the ASEAN and other South Asian countries, especially after its new government took over in May 2014, its Look East program should now redefine policies in the energy sector in a *quantifiable manner*. Such policies should emphasise the issues surrounding targeted acquisition of international gas exploration licences, increasing joint ventures in gas exploration, cross-border energy infrastructure development targets, etc.

12. Conclusions

Beyond partly providing a solution to India's gas demand in the short-run, Myanmar is key in linking India with the ASEAN energy market. India, therefore, needs to utilise its existing Look East Policy to enhance the scope of further cooperation with the ASEAN countries, including Myanmar.

Myanmar, on the other hand, can help promote South and Southeast Asian energy cooperation by improving the following areas:

- Myanmar should consider providing the needed gas supply to close the gap with the regional market's demand. This supply could be in the tune of 3 Tcf to 4 Tcf by 2030 after meeting all domestic and existing long-term export contracts.
- Myanmar needs to invest in enhancing its resource recovery capacity in the gas sector and to improve the efficiency of existing gas infrastructure such as the pipeline flow density.

- There is a need to upgrade Myanmar's gas-based power plants that are still using single open-cycle systems and consuming more than 300 percent extra gas to produce the same amount of electricity by closed-cycle system. This will help save a substantial amount of gas for either its domestic use or for export.

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