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ASEAN-India Energy Cooperation: Current Status and Future Scope of Cooperation

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Abstract

ASEAN and India are the fastest growing economies in the world and have been looking for more energy to drive the growth. Both ASEAN and India are also committed to Sustainable Development Goals (SDG) to ensure access to affordable, reliable, sustainable and modern energy for all by 2030 and moving towards low-carbon growth path through promoting different means of renewable energy source. ASEAN and India have high potentials and complementarities in terms of access to the conventional and renewable energy resources. Given above, this article attempts to examine current status of energy cooperation between ASEAN and India and discusses the future scope in energy cooperation between them. It also presents a set of policy recommendations in order to achieve energy security between ASEAN and India.

Keywords: Energy, Renewable Energy, SDG, Regional Cooperation, ASEAN, India

JEL Code: O13, Q28, F15

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Table of Contents

Figures

Tables

Boxes

ASEAN-India Energy Cooperation: Current Status and Future Scope of Cooperation

Prabir De and Durairaj Kumarasamy

1. Introduction

In January 2018, the leaders of ASEAN countries and India issued the *Delhi Declaration* to mark the 25th Anniversary of ASEAN-India Partnership. They recommended: "Continue to enhance cooperation for ensuring long term food and energy security in our region through strengthening cooperation in agriculture and energy sectors; work together to promote the development of renewable energy technology through international platforms including the International Solar Alliance (ISA) where applicable."[1]

The renewable energy has become the key focus of ASEAN-India energy cooperation.[2] Since renewal energy sources produce very negligible or zero global warming emissions, deeper cooperation in renewal energy may help countries moving towards low-carbon growth path. ASEAN aims to secure 23 percent of its primary energy from renewable sources by 2025, whereas India aims to achieve 40 percent of power capacity to be based on non-fossil fuels and reduction in emission intensity by 33–35 percent by 2030.[3] The leaders of ASEAN and India have, therefore, called for stronger collaboration to achieve energy security and to meet the Sustainable Development Goals (SDG).

The energy cooperation between ASEAN and India appears to be more promising if we consider the countries commitments under the Sustainable Development Goals (SDG). ASEAN countries and India are committed to achieve the SDG 7, which aims to ensure access to affordable, reliable, sustainable and modern energy for all by 2030 (Box 1). Therefore, to expand energy access, it is crucial to enhance energy efficiency and to invest in renewable energy.[4] These targets may seem ambitious, but with better cooperation between ASEAN and India, it can become a reality. Strengthening the renewable energy cooperation, therefore, will help meet the twin targets - SDG as well as climate change.

India shares both land and maritime borders with ASEAN. Both have wide access to ocean, wind, solar and other forms of renewable energy sources. While India's power grid is connected with Myanmar in a small scale, several ASEAN countries are now members of India's International Solar Alliance (ISA). When the countries in ASEAN and India face common SDG targets and challenges in renewable energy, regional cooperation makes sense

[1] Refer, for example, Delhi Declaration 2018, Ministry of External Affairs (MEA), New Delhi
[2] ASEAN-India Plan of Action (POA) 2016-2020 outlines the energy cooperation between ASEAN and India. Please refer, https://asean.org/wp-content/uploads/images/2015/August/POA_India/ASEAN-India%20POA%20-%20FINAL.pdf
[3] Refer, for example, IRENA (2016)
[4] Refer, https://sustainabledevelopment.un.org. Also refer, Gielen et al (2019)

to generate wider benefits, particularly through exchange of know-how, conduct of training and capacity building while dealing the common challenges together.

Box 1: Targets for SDG 7

- By 2030, ensure universal access to affordable, reliable and modern energy services.
- By 2030, increase substantially the share of renewable energy in the global energy mix.
- By 2030, double the global rate of improvement in energy efficiency.
- By 2030, enhance international co-operation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology.
- By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular, least developed countries, small island developing states and land-locked developing countries, in accordance with their respective programmes of support.

Source: UN SDG

The rest of the paper is arranged as follows. Section 2 discusses India's energy trade with neighbouring countries including ASEAN countries. Section 3 presents status in meeting the renewable energy targets, whereas the Section 4 highlights the scope and opportunities in energy cooperation between ASEAN and India. Finally, conclusions are drawn in Section 5.

2. India's Energy Trade with South and Southeast Asian Countries

South Asian countries are endowed with vast energy resources. However, the resources are unevenly distributed among the South Asian countries. For instance, India, Pakistan, and Bangladesh have vast reserves of gas and coal, whereas Nepal and Bhutan have high reserves of hydro-electric power. India's energy trade with South Asian countries is below the optimal capacity. Energy trade may help South Asian countries to minimise the gap between supply and demand in energy resources.

Table 1 (a): Energy Resource Potential in South Asia

	Coal (Million Tonnes)	**Oil** (Million Barrels)	**Natural Gas** (Trillion Cubic Feet)	**Biomass** (Million Tonnes)	**Hydropower** (Gigawatts)
Afghanistan	440	-	15	18-27	25
Bangladesh	884	12	8	0.08	0.33
Bhutan	2	-	-	26.60	30
India	90085	5700	39	139	150
Nepal	-	-	-	27.04	83
Pakistan	17550	324	33	-	59
Sri Lanka	-	150	-	12	2
Regional Total	108961	5906	95	223	349.33

Source: Asian Development Bank (2012)

Among South Asian countries, India is holding more than 95 per cent of coal resources, oil and natural resources.[5] India is also having major share in biomass and hydro resources, followed by Nepal and Bhutan. In case of renewable energy like solar energy, South Asian countries are having almost same production capacity. India shows high potential and capacity in wind energy, compared to other South Asian countries (Table 1(a) and Table 1(b)).

Table 1(b): Renewable Energy Potential in South Asia

	Bangladesh	**India**	**Nepal**	**Bhutan**	**Pakistan**	**Sri Lanka**
Solar Power (Kmh/sq.m. per day)	3.8-6.5	4-7	3.6-6.2	2.5-5	5.3	NA
Wind (MW)	Limited Potential	151918	3000	4825	24000	25000

Source: Asian Development Bank (2012)

India's power trade with its neighbours is largely one-sided. India annually imports around 1,200 MW power from Bhutan, and exports 1,200 MW to Bangladesh, 450 MW to Nepal and 3 MW to Myanmar.[6] In case of high-speed diesel (HSD), India's exports to South Asian countries are mostly directed to Bangladesh, Bhutan, Nepal and Sri Lanka (Table 2), whereas India's export of HSD to Bangladesh, in particular, has witnessed a sharp rise of 177 percent in the last two years. India has started exporting HSD to Myanmar via land border since 2017-18. The cross-border electricity trade in the South Asian region will grow with the likely strengthening of regional power cooperation among countries including India, Bhutan, Bangladesh, Nepal, Pakistan, Sri Lanka and Myanmar[7]. Currently, about 3,000 MW of electricity is being traded in the region among the seven countries, which is likely to be doubled by 2020[8].

Table 2: India's Export of HSD to South Asian countries

(US$ Million)

	2016-2017	**2017-2018**	**Growth (%)**
Bangladesh	91.94	254.86	177.22
Bhutan	65.43	70.06	7.08
Nepal	513.59	722.05	40.59
Sri Lanka	314.49	524.61	66.81
Myanmar	0.00	0.018	
Total	**985.45**	**1571.58**	

Source: Calculated based on EXIM Databank, Ministry of Commerce and Industry, India

[5] Refer, Asian Development Bank's Energy Database
[6] Ibid
[7] Refer, for example, Kumar (2018)
[8] Refer, for example, IRADe (2014)

Bhutan has an installed generation capacity of 1,606 MW and exports around 70 per cent of its annual electricity production to India[9]. For Nepal, its overall electricity supply is inadequate to meet rising power demand, and, therefore, the country relies on imported diesel and electricity from India. The current installed power generation capacity of Nepal is around 792 MW, out of which 734 MW (93 per cent) is generated from hydro resources and 53 MW (7 per cent) is generated from thermal resources[10]. Nepal imports about 450 MW power from India through 11 cross-border interconnected lines. Apart from the high potential of hydro and coal reserves, South Asia is also rich in natural gas. For example, natural gas contributes about 78 per cent of Bangladesh's total power generation[11].

The Motihari-Amlekhgunj petroleum product pipeline between India and Nepal was inaugurated in September 2019. The 69 km-long pipelines from Motihari in Bihar to Amlekhgunj in Nepal is the first-ever cross-border petroleum product pipeline in the South Asia region. Built by Indian Oil Corporation (IOC) and Nepal Oil Corporation (NOC), the pipeline has the capacity to carry two million metric tonne of clean petroleum products to Nepal. This oil pipeline has several advantages for Nepal such as reduces retail pump price in Nepal, prevents pilferage and adulteration and assures uninterrupted supply during blockades or stir.[12]

Indian Oil Corporation (IOC) is also planning to set up a LPG storage and liquefied petroleum gas (LPG) import terminal in Myanmar. Besides, similar projects are also being planned by India in Bangladesh and Sri Lanka as part of larger plan of energy connectivity in the South Asian neighbourhood. Numaligarh Refinery Ltd (NRL) in Assam has started supplying diesel to Myanmar and is looking at options to build fuel storage and retail distribution in Myanmar. India is planning to set-up a LNG terminal (by Petronet) in Myanmar and also setting up LPG storage facilities (by IOC)[13]. According to the Indian Minister for Petroleum & Natural Gas, "The Hydrocarbon Vision 2030 for North East India envisages a natural gas pipeline from Numaligarh towards Sittwe (in Myanmar) in different phases."[14] These projects will then generate possibilities of gas exchange and grid connectivity between India and Myanmar.

NRL exports diesel through rail rake from Siliguri in West Bengal to Parbatipur in Bangladesh. Construction of a 136-km long product pipeline (6 km in Indi and 130 km in Bangladesh) is under construction. In Sri Lanka, India is jointly developing Trincomalee oil storage tank farm and is also setting up an LNG terminal and a 500 MW LNG-fired power plant near Colombo. India is working with Sri Lanka to set up a solar power plant Sri Lanka, which can generate 50 MW to start with.

[9] Refer, for example, Ankush Kumar (2018)
[10] Ibid
[11] Ibid
[12] Refer, for example, Times of India (2018)
[13] Refer, for example, https://www.hydrocarbons-technology.com/news/india-plans-establish-lng-import-terminal-myanmar/
[14] Delivered at the seminar on 'Assessing India's Connectivity with Its Neighbourhood', organised by VIF on 3 August 2018 in New Delhi

In 2013, India and Bangladesh initiated two collaborative power projects. The first project involves a grid interconnection through 125-km transmission line to supply 500 MW of power from West Bengal to Bangladesh. The system was started with 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.[15] The second project includes a 1,320 MW thermal power projct in Bangladesh named "Maitri". This project is being developed by the Bangladesh-India Friendship Power Company, which is a joint venture between the National Thermal Power Corporation (NTPC) of India and the Bangladesh Power Development Board.[16]

Demand for electricity trade in South Asia and particularly between Bangladesh, Bhutan, India and Nepal has been growing rapidly, which can be addressed through regional cooperation on energy trade.[17] For example, India is assisting Bhutan to build a 10,000 MW hydropower project with concessional finance, with a total investment of about US$ 10 billion. Hydro electricity from the river power plant built on the Mangdechhu River in Bhutan will be taken towards the Eastern and Northeastern region of India. PTC India Ltd. (PTC) signed Power Purchase Agreement (PPA) with Druk Green Power Corporation Ltd. (DGPC) to purchase surplus power from 720 MW Mangdechhu Hydro Electric Project in Bhutan for 35 years. Besides, India has an extensive engagement in Bhutan's hydro power sector. Since 1961, India has helped Bhutan to develop several hydro power plants such as Tala, Chuka, Jaldhaka, among others.

Table 3: India's Export of High-Speed Diesel, Top 10 Destinations (US$ Million)

Country	2005-2006	Country	2010-2011	Country	2015-2016	Country	2017-2018
Netherland	574.74	Netherland	1,989.22	Singapore	921.36	Slovenia	4,054.27
Singapore	542.54	Brazil	1,821.21	Turkey	828.91	Italy	1,044.23
Brazil	462.91	Singapore	1,443.66	Israel	801.56	Saudi Arab	1,021.90
South Africa	399.56	France	1,212.30	Kenya	724.43	Turkey	912.72
Sri Lanka	390.81	Israel	1,163.46	Mozambique	713.89	Malta	901.53
U S A	250.57	UAE	691.11	Gibraltar	651.4	Niger	886.38
UAE	164.64	Tanzania	598.23	Netherland	632.42	Austria	795.09
France	163.92	Belgium	558.82	Australia	629.45	Netherland	722.05
Kenya	158.01	Kenya	506.23	Tanzania	582.23	Sri Lanka	629.75
Greece	136.09	South Africa	465.55	Brazil	551.79	Thailand	597.82
Total Export of Top Countries	3243.79		10449.79		7037.44		11565.74
Total Exports of HSD	4,409.51	Total Exports HSD	14,858.22	Total Exports HSD	10,725.13	Total Exports HSD	15,263.55

Source: Calculated based on EXIM Databank, Ministry of Commerce and Industry, India

[15] Refer, for example, Ministry of Power (2016)
[16] Refer, for example, The Tribute Online
[17] Refer, for example, Livemint (2018)

For a long time, ASEAN countries such as Malaysia, Indonesia, Thailand and Brunei are important sources of India's crude oil. However, in recent years, India's trade in energy products has undergone some major changes. While India has become a major importer of coal, India has also become a major exporter of refined petroleum products. As of now, petroleum products constitute the largest export item of India. India's petroleum products like HSD are exported to Southeast Asian countries such as Singapore, Thailand, and Myanmar. India's exports of petroleum products are also directed to some other regions/countries such as EU, UAE, South Africa and ASEAN countries like Singapore and Thailand (Table 3).

Myanmar has an estimated hydropower potential of 39,720 MW, of which only about 2 percent has been utilised. India and Myanmar have agreements for the development of the Sedawyagi and Yeywa hydropower projects. India had also shown interests in the Tamanti multipurpose project, which had a hydropower component of 1,200 MW in the first stage.[18]

India has been investing in the ASEAN region for development of energy infrastructure, but limited to CLMV countries. Most of the projects have been mobilised through development cooperation and construction of facilities such as power transmission. The major investments made by Indian firms in Myanmar are in oil and gas sector (98 per cent of India's total investment in Myanmar), of which, almost 90 per cent of India's investment in Myanmar has been made by ONGC Videsh Ltd. (Table 4). The company has invested via JV and WOS with various firms in Myanmar. ONGC Videsh Ltd. (OVL) has also invested in oil and gas sector in Vietnam. The other major Indian firms in oil and gas sector are Gas Authority of India Ltd. (GAIL), Jubilant Oil and Gas Private Ltd., Oil India Ltd., Petro Engineering and Construction Pvt. Ltd., etc.[19]

OVL aims to support India's oil and gas security through overseas participation in oil and gas exploration and production activities. OVL has also invested in oil and gas sector Vietnam. OVL has won two on-land oil blocks in Myanmar in 2013. For example, OVL has stakes in the A-1 and A-3 gas discovery blocks and three other offshore acreages in Myanmar. The Ministry of Energy, Myanmar has awarded 13 blocks onshore blocks, out of which OVL received Blocks B-2 (Zebyutaung-Nandaw) and EP-3 (Thegon-Shwegu) for exploration.

To conclude, India depends on crude oil imports to meet its energy demand. India imports almost most of its domestic crude oil requirements. India also sources a substantial part of domestic coal requirements from Indonesia, Australia, and South Africa. The increase in refining capacity has helped India to become a major exporter of petroleum products. While the energy trade has been happening in a limited scale in South Asia, the same is even yet to happen between India and ASEAN.

[18] The project was later permanently shelved.
[19] Refer, AIC (2016)

Table 4: Indian Firms Investment in Energy Sector in Myanmar (2008-2016)

(US$ million)

Indian Firm	Foreign Firm	JV/ WOS	Major Activity	Value	Share in India's Total FDI Stock in Myanmar (%)
ONGC Videsh Ltd.	Daewoo International Corporation	JV	Manufacturing	29.95	21.1
ONGC Videsh Ltd.	Daewoo International Corporation	WOS	Manufacturing	18.33	12.9
ONGC Videsh Ltd.	ONGC Caspian E & P Bv	WOS	Agriculture and Mining	16.56	11.7
ONGC Videsh Ltd.	Myanmar Ad-2 Project	WOS	Manufacturing	15.60	11.0
Gas Authority of India Ltd.	Daewoo International Corporation	JV	Manufacturing	12.12	8.6
ONGC Videsh Ltd.	Block Ad-7 In Myanmar	WOS	Agriculture and Mining	10.26	7.2
ONGC Videsh Ltd.	Myanmar Ad 3 Project	WOS	Manufacturing	8.87	6.3
ONGC Videsh Ltd.	SHWE Offshore Pipeline	JV	Agriculture and Mining	8.45	6.0
Gail (India) Ltd.	SHWE Offshore Pipeline	JV	Agriculture and Mining	3.96	2.8
ONGC Videsh Ltd.	Ad-9 Project Myanmar	WOS	Manufacturing	3.68	2.6
Essar Oil Ltd	Daewoo International Corporation	JV	Manufacturing	1.61	1.1
Jubilant Oil And Gas Private Limited	Jubilant Oil & Gas Private Limited	JV	Agriculture and Mining	1.29	0.9
ONGC Videsh Ltd.	Block Ad-3 Myanmar	WOS	Manufacturing	0.43	0.3
Petro Engineering And Construction Pvt Ltd	Alpha Ecc (Myanmar) Private Limited	JV	Agriculture and Mining	0.29	0.2

Source: Authors' calculation based on RBI data.

3. ASEAN Approach to Energy Cooperation[20]

Region wide energy cooperation in ASEAN started in 1976 when the ASEAN Council for Petroleum (ASCOPE) was established. In the initial phase, the focus was on oil and power grid cooperation. The objective of ASCOPE was to promote active collaboration and mutual assistance in the development of petroleum resources. The ASEAN level cooperation started in this regard in 1981 as it established a task force involving the Heads of ASEAN Public

[20] This section draws upon inputs received from the ASEAN Centre for Energy (ACE).

Utilities Authorities (HAPUA) with the objective of promoting cooperation on power grid connections. The main focus was on establishing mechanisms to avoid supply disruptions.

In another important development, the ASEAN Energy Cooperation Agreement (AECA) was signed in 1986 through which the member countries agreed to cooperate on a wide range of issues to foster efficient development and use of all forms of energy. Cooperation activities included planning, development of resources, conservation, security of supply, capacity building and exchange of information. In addition, an important milestone was achieved in the form of ASEAN Petroleum Security Agreement (APSA) in 1986, which was a binding agreement that put obligations on member countries. It established ASEAN Emergency Petroleum Sharing Scheme (AEPSS) to ensure mutual supply of oil by six countries in sudden shortfalls in supplies.

3.1 ASEAN Plan of Action of Energy Cooperation (APAEC) (2016-2025)

In terms of energy consumption, the ASEAN region is projected to double its energy usage between 2010 and 2035. Fossil fuels will remain the dominant source of energy, with oil consumption projected to double; while the use of natural gas expected to triple[21]. Coal consumption is also projected to rise to over 80 percent during the same period. Studies indicate that continued reliance on fossil fuels to meet energy demands will have serious environmental consequences, affecting air and water quality, water availability, land use, and even the global climate. Hence, there is a crucial need to ensure that energy sources will not only be affordable but also environmentally sustainable in the long run. Recognizing the urgency of the ASEAN region's energy predicament, the ASEAN Plan of Action for Energy Cooperation 2010-2015 (APAEC) was prepared to serve as a blueprint on ASEAN cooperation on energy. APAEC is a series of policy documents to support the implementation of multilateral energy cooperation to advance regional integration and connectivity goals in ASEAN[22]. ASEAN recognises the critical role of an efficient, reliable and sustainable energy in stimulating regional economic growth and development.

The fourth APAEC (2016-2025)[23] was launched at the 32nd ASEAN Ministers on Energy Meeting (AMEM), held in September 2014 in Vientiane, Lao PDR endorsed the theme as "Enhancing Energy Connectivity and Market Integration in ASEAN to Achieve Energy Security, Accessibility, Affordability and Sustainability for All". The APAEC 2016-2025 is being implemented in two phases. Phase I covers the period 2016-2020 for the implementation of short to medium term measures to enhance energy security cooperation and to take further steps towards connectivity and integration.

ASEAN welcomes collaborative partnerships with development partners and international organisations to achieve the aspirations of the ASEAN Community Vision 2025. Engagement

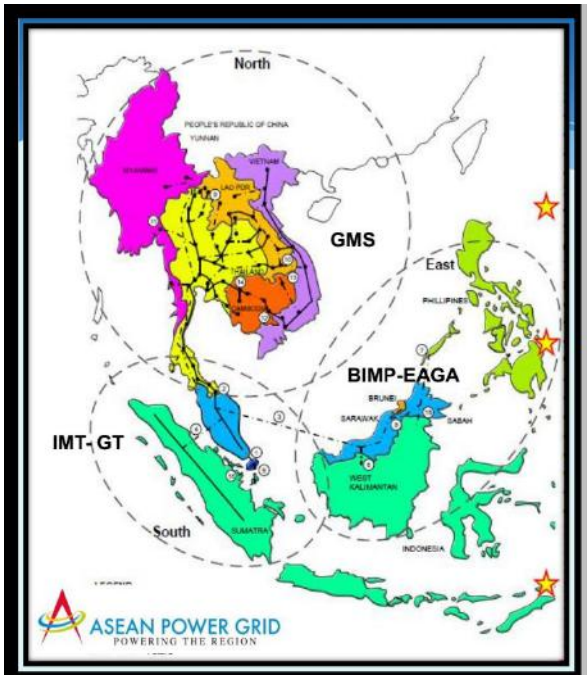
[21] Refer, for example, EXIM Bank (2018)
[22] Refer, ACE (2015)
[23] The first APAEC (1999-2004), the second APAEC (2004-2009) and the third APAEC (2010-2015) has been phased to support the energy cooperation agenda under the ASEAN Vision 2020.

with development partners and international organisations will play a key role in meeting ASEAN's energy objectives and targets under the APAEC 2016-2025. The APAEC strategies are broad and flexible enough to meet the ever-changing global and regional energy environments and to support the goals of the ASEAN Economic Community Blueprint 2025. ASEAN has had strong support from development partners (Australia, China, EU, India, Korea, Japan, US, Russia) and international organisations (International Energy Agency (IEA), IRENA and International Atomic Energy Agency/IAEA), over a broad range of activities like joint research studies, capacity building workshops, and publications.

The key strategies of the seven programme areas of the APEC 2016-2025 phase I are summarised as follows:

(i) ASEAN Power Grid is a major initiative of multilateral electricity trade in at least one sub-region in ASEAN. To meet the electricity demand in ASEAN, ASEAN aims to connect cross-border power grid system at sub-regional level and finally the entire region. Through the interconnection project (Figure 1), the power exchange and purchase would almost triple from 3,489 MW in 2014 to 10,800 MW in 2020 and further increase to 16,000 MW post-2020.[24]

Figure 1: Interconnection Projects of ASEAN Power Grid



		Earliest COD
1)	P.Malaysia – Singapore ***(Plentong – Woodlands)***	**Existing**
	P.Malaysia - Singapore (New)	Post 2020
2)	Thailand - P.Malaysia	
•	Sadao - Bukit Keteri	**Existing**
•	Khlong Ngae - Gurun	**Existing**
•	Su Ngai Kolok - Rantau Panjang	2016
•	Khlong Ngae – Gurun (2nd Phase, 300MW)	2016
3)	Sarawak - P. Malaysia	2025
4)	P.Malaysia - Sumatra	post 2020
5)	Batam - Singapore	post 2020
6)	Sarawak - West Kalimantan	**Existing**
7)	Philippines - Sabah	post 2020
8)	Sarawak - Sabah – Brunei	
•	Sarawak –Sabah	2020
•	Sabah – Brunei	**Not Selected**
•	**Sarawak – Brunei**	2016
9)	Thailand - Lao PDR	
•	Roi Et 2 - Nam Theun 2	**Existing**
•	Sakon Nakhon 2 – Thakhek – Then Hinboun (Exp.)	**Existing**
•	Mae Moh 3 - Nan - Hong Sa	**Existing**
•	Udon Thani 3- Nabong (converted to 500KV)	2019
•	Ubon Ratchathani 3 – Pakse – Xe Pian Xe Namnoy	2018
•	Khon Kaen 4 – Loei 2 – Xayaburi	2019
•	Thailand – Lao PDR (New)	2015-2023
10)	Lao PDR - Vietnam	2016-2020
11)	Thailand - Myanmar	2018-2026
12)	Vietnam - Cambodia (New)	2020
13)	Lao PDR - Cambodia	2016
14)	Thailand - Cambodia (New)	Post 2020
15)	East Sabah - East Kalimantan	Post 2020
16)	Singapore – Sumatra	Post 2020

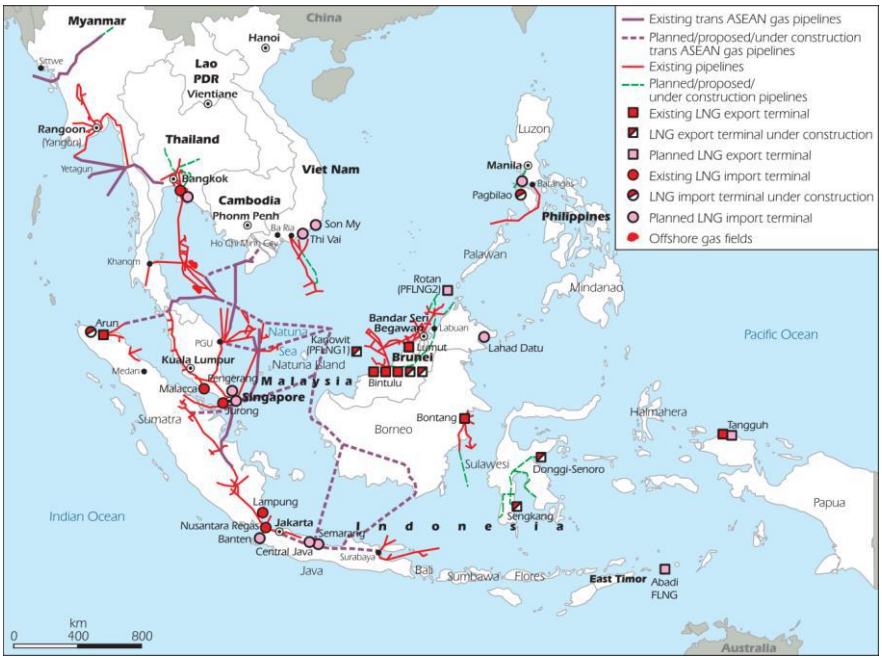
Source: Hermawanto (2016)

(ii) Trans-ASEAN Gas Pipeline (TAGP) is another project to enhance connectivity for energy security and accessibility via pipelines and regasification terminals. The ASCOPE is responsible for the effective implementation of the TAGP Project through multiple physical pipeline interconnections and regasification terminals (RGT) (Figure 2). As of 2018, a total

[24] Refer, ACE (2015)

of 13 bilateral gas pipeline interconnection projects connecting six (6) countries bilaterally and with a total length of approximately 3,673 km have been successfully commissioned. Driven by economic growth, natural gas demand in the region is expected to grow from 14.5 billion standard cubic feet per day (BSCFD) in 2013 to 23 BSCFD by 2035. Considering the challenges in global gas developments, including the east Natuna Gas Field, the strategic focus of TAGP will expand from piped gas to LNG as the option for gas supply in the region. In this regard, further to the four (4) RGTs, it is expected that there will be at least one additional RGT in operation by 2020[25].

Figure 2: Existing and Proposed Pipeline of the TAGP



Source: IEA (2014)

(iii) Coal and Clean Coal Technology has been promoted to enhance the image of coal through promotion of clean coal technologies (CCT), ASEAN Forum on Coal (AFOC) is responsible for promoting the development and utilisation of clean coal technologies and facilitating intra-ASEAN coal trade towards enhancing regional energy security and sustainable development. Coal is expected to continue to be a major fuel for power generation in the future. Consequently, CCT is important in helping to ensure that coal is used in a sustainable manner that will contribute to significant improvements in coal utilisation efficiency and environmental performance compared to existing coal plants. ASEAN will continue its effort to adopt the most appropriate, efficient and clean coal technologies in the region.

(iv) Energy Efficiency and Conservation is promoted to reduce energy intensity by 20 per cent in 2020 based on 2005 level.[26] To address the limited global reserve of fossil fuels and volatile energy prices, the ASEAN Member States (AMS) have been following a deliberate

[25] Ibid
[26] Ibid

policy of diversifying and using energy sources efficiently. The Energy Efficiency and Conservation Sub-sector Network (EE&C-SSN) is responsible for the coordination of ASEAN's collective efforts on energy efficiency towards its target of reduction in energy intensity. A large number of programmes were implemented, jointly with DPs like the EU, Japan, Korea, the USA and international organisations like the United Nations Environment Programme (UNEP) to improve energy efficiency in all major energy consumption areas including the residential, commercial buildings, industry and transport sectors.

(v) ASEAN countries have undertaken programmes to increase the component of renewable energy to 23 per cent by 2025 in ASEAN Energy Mix.[27] The AMS deployment of renewable energy technologies was initially based on policies to reduce oil consumption, but later included policies to mitigate environmental impacts of fossil fuel use, including the potential effects of climate change. The Renewable Energy Sub-sector Network (RE-SSN) is responsible for carrying out the implementation of renewable energy programmes to increase the diversity of energy supply and to reduce the environmental impact of energy use in the region. In 2013, the amount of ASEAN's electricity produced from renewable energy sources was 169.34 terawatt hours (TWh), accounting for about 21 per cent of total electricity generation. In the same year, ASEAN marked an unprecedented success, achieving 25 per cent share of renewable energy in total installed capacity or about 45.7 GW. This exceeded the 2015 collective target set out in APAEC 2010-2015 of 15 per cent for regional renewable energy of total installed power capacity[28]. The development of renewable energy in the AMS covers hydro, geothermal, solar photo-voltaic, solar thermal, wind, bio-energy (bio-ethanol, bio-diesel, biogas, bio-oil) and waste. Others, such as ocean energy (thermal, wave, and tidal), fuel cell, hydrogen and coal liquefaction/gasification are in the research, development and demonstration stages. Solar and wind energy are still considered capital intensive and not as affordable as conventional energy. The AMS also recognise that renewable energies are crucial for increasing the diversity of energy supply and reducing the environmental impact of energy use in the region.

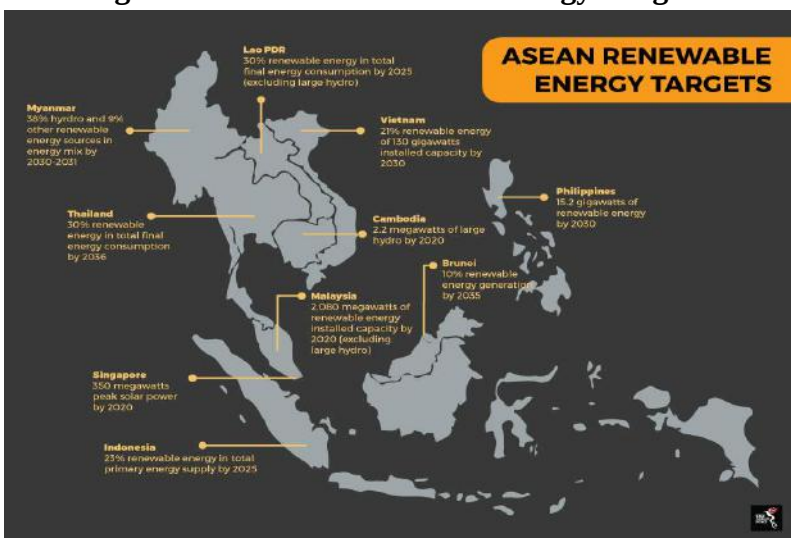
(vi) Regional Energy Policy and Planning (REPP) has been drawn to better profile the energy sector internationally. With the aim of enhancing ASEAN's engagement with development partners and international organisations, REPP-SSN's key achievement was the successful signing of the ASEAN-IEA MoU in 2011 on the sidelines of the 29th ASEAN Ministers of Energy Meeting (AMEM) in Brunei Darussalam. The MoU has enabled ASEAN to collaborate and benefit from IEA through Ministerial Dialogues and expertise in key areas of ASEAN's interest, including energy data collection/analysis, gas market industry dialogue, emergency preparedness, etc.

(vii) Civilian Nuclear Energy has been promoted to build capabilities in policy, technology and regulatory aspects of nuclear energy. Civilian nuclear energy, as a clean source of energy, can help ASEAN meet its growing energy demand in the region. To enhance

[27] Ibid
[28] IRENA (2016)

cooperation in areas such as public information/awareness, capacity building, including human resource development, education & training, nuclear safety, emergency preparedness and regulatory framework of civilian nuclear power plants (NPPs) in ASEAN, the Nuclear Energy Cooperation-SSN (NEC-SSN) collaborating with international organisations made several international agreements.

Figure 3: ASEAN Renewable Energy Targets



Source: ASEAN Energy Centre (ACE)

3.2 ASEAN Renewable Energy Targets[29]

According to the ACE, regional renewable energy can also enhance energy security as it reduces import dependencies. Energy security refers to the availability of energy at affordable prices. Figure 3 illustrates ASEAN country-wise renewable energy targets. As countries invest more in renewable, they would be less dependent on energy imports to fuel their nation's energy consumption needs. For example, ASEAN countries with similar energy security challenges can coordinate the development of renewable energy in the region. Overall, this would improve the energy mix and grow their energy security.

Regional cooperation is imperative if ASEAN wants to achieve their renewable energy target for 2025. One of the benefits of cooperation among ASEAN states with regards to renewable energy is that it would create space for dialogue and better coordination. India and ASEAN may consider setting up an ASEAN-India Energy Forum (AIEF) to exchange knowledge and to put into practice examples of the implementation of renewable energy policies.

ASEAN has already made positive moves towards more cooperation within the region for renewable energy. ASEAN and IRENA signed a MoU in September 2018 for long-term cooperation between the two bodies and to harness ASEAN's renewable energy potential.

[29] Based on the inputs received from the ASEAN Centre for Energy (ACE)

ASEAN has been also implementing the ASEAN Power Grid, which aims to enhance electricity trade across regional borders – complementing the rise in demand for electricity. The ASEAN Power Grid looks to integrate infrastructure that is both, clean and sustainable. One of the projects under the ASEAN Power Grid is the Lao PDR-Thailand-Malaysia-Singapore Power Integration Project. This project involves Malaysia purchasing up to 100 megawatts (MW) of hydro power from Lao PDR through Thailand's transmission grid[30]. This is beneficial for Malaysia because it would also improve the share of sustainable energy in their total energy mix.

While there can be huge benefits from regional cooperation, there are also strong obstacles which could impede it. One of the biggest challenges is financial constraints. According to the ACE, the deployment and transfer of renewable energy technologies require large funding, which is not always easy to source[31]. This poses a serious constraint if ASEAN wants to meet its target by 2025. Especially with IRENA reporting that the region's energy demand has grown by 60 percent over the past 15 years, and is only expected to keep on growing. Clearly, ASEAN governments must seriously consider renewable energy.

3.3 ASEAN's Energy Cooperation Programme with Neighbouring Countries

ASEAN has been engaging in a number of bilateral and multilateral initiatives with the neighbouring countries on energy cooperation. Energy cooperation related issues are the focused areas in the meetings among the ASEAN+3 energy ministers (AMEM)[32], to promote wider use of energy efficiency and conservation measures, diversification of types and sources of energy and development of indigenous petroleum. ASEAN+3 cooperation on energy security also encourages effective dialogue and cooperation between ASEAN+3 and major energy producing countries both within and outside of the region. ASEAN has also organised the Energy Security Forum in cooperation with China, Japan and Korea to work in formalizing a mechanism for regional consultation and coordination strategies in case of emergency energy shortages within the region.

ASEAN and China have energy cooperation in the areas of planning nuclear energy programmes and promotion of clean energy and also support at capacity building on civilian nuclear energy[33]. Japan has initiated the Hiranuma Initiative at the 8th International Energy Forum in 2002 at Osaka to promote cooperative dialogue between energy producing and consuming countries. The initiative has listed five priority areas for Asian energy cooperation: (i) energy security network; (ii) oil stockpiling; (iii) studies on the oil market; (iv) promotion of natural gas usage and (v) renewable energy[34].

[30] https://theaseanpost.com/article/need-renewable-energy-cooperation
[31] Refer, for example, The ASEAN Post (2018)
[32] Post 1997-98 financial crisis, ASEAN countries started meeting regularly with Northeast Asian countries, which is known as ASEAN+3 grouping (ASEAN + Japan + South Korea + China).
[33] Refer, ACE (2017)
[34] Refer Nicolas (2009) for more details

In the event of East Asia Economic (EAS) Summit in 2007 (including India, Australia and New Zealand in addition to ASEAN+3 countries) has initiated the Cebu Declaration on East Asian Energy Security for the promotion of energy efficiency and conservation, voluntarily formulate energy efficiency goals and action plans. In support of Cebu Declation, Japan proposed Abe Initiative to help promote energy conservation, the use of biomass energy, the development of clean coal technology and the use of energy for poverty eradication.

4. Prospects in India–ASEAN Energy Cooperation

From the previous section, it is evident that ASEAN has introduced a comprehensive regional energy cooperation programme, whereas India's regional cooperation within South Asia is mostly at the bilateral level. Given the high potentials in the Southeast Asia, India is yet to explore the potential energy resources to access natural gas and hydro power with the region. India has already engaged in energy infrastructure development in the ASEAN region, particularly in the CLMV countries such as building hydropower projects, power transmission lines and substations and oil and gas pipelines, etc.

Energy sector machineries, equipments and other goods can also open up possibilities for substantial trade. As discussed earlier, ASEAN has been developing a region-wide grid of natural gas pipelines and electricity transmission lines. India can possibly get connected through these two ASEAN-wide grids by developing transmission line and gas pipeline connections with Myanmar.

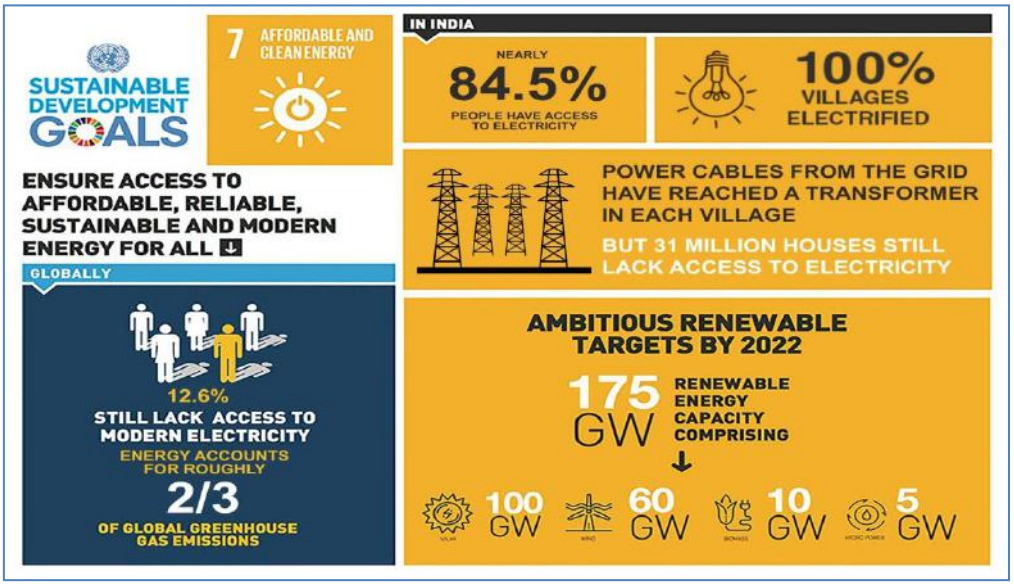
India is the fourth largest energy consumer in the world, next to China, US, and Russia, importing 80 percent of its crude oil and 25 percent of its natural gas requirements[35]. India is one of the top investing countries in renewable energy. In case of solar energy, India stands as a low-cost destination for grid-connected solar power. Further development of solar power in India would reduce emissions per unit of GDP by 20 to 25 percent in 2020 and produce clean energy for the country[36]. The Indian Ministry of New and Renewable Energy (MNRE) has set up a Solar Energy Centre to test solar thermal and solar photovoltaic materials, devices, and systems in addition to its applied research and training on solar power development. In addition, wind power dominates the renewable energy industry of India, representing 70 percent of its total renewable energy capacity. This can be attributed to the considerable support from government by providing significant tax incentives that have induced substantial investments in wind energy projects.

India is projected to be a significant contributor to the rise in global energy demand. Around 750 million people in India gained access to electricity between 2000 and 2019, reflecting strong and effective policy implementation[37]. Figure 4 illustrates India's commitments under the SDG 7. The government's National Solar Mission has been playing an important role in the work towards renewable energy, and interventions in rural

[35] Refer, for example, IEA (2020)
[36] Refer, for example, Down To Earth (2017)
[37] Refer, for example, IEA (2020)

electrification and new ultra-mega power projects are moving India towards achieving universal energy access.

Figure 4: SDG 7 and India



Source: UN SDG

In exploration of renewable energy, particularly solar and wind energy, India has initiated International Solar Alliance (ISA), which is now having more than 121[38] prospective member countries. Most of the ASEAN countries are prospective members of ISA, among which Cambodia has signed and Myanmar has signed and ratified the ISA Framework Agreement. ISA motive is bringing together a group of nations to endorse clean energy, sustainable environment, public transport and climate through solar power utilization and moving towards low-carbon growth path. India has aims to achieve 100 GW solar energy, 175 GW renewable energy by 2022, and reduction in emission intensity by 33–35 percent by 2030. The ISA has also been committed to invest US$ 1 trillion in the exploration of solar energy.[39]

ASEAN and India have been implementing the 3rd Plan of Action (2016-2020). This Plan of Action lays out priorities and measures to be undertaken by both sides to further deepen and enhance their political-security, economic and socio-cultural ties as well as to realise the full potential of the ASEAN-India strategic partnership in all areas of common interests including energy (see Box 2). The official discussion on energy cooperation between India and ASEAN has focused widely on renewable energy. The first meeting on ASEAN-India renewable energy cooperating in 2012, both parties emphasised on ways to complement each other on respective renewable energy policies to mutually address the energy needs. India has developed significant capability in electricity generation through wind energy, Similarly, Indonesia and Philippines have developed capacity in geothermal energy whereas Singapore has been generating significant electricity from waste. India and Thailand have gained

[38]So far 86 countries have signed among which 66 countries have been ratified the ISA framework Agreement till March 2020. http://isolaralliance.org/MemberCont.aspx
[39] Refer, for example, IRENA (2017)

capacity and resources in solar power as well. India is the only country to generate nuclear power and use bio-fuel to generate significant quantity of electricity. These countries can help others in developing energy production capabilities in the respective sub-sectors. Therefore, both ASEAN and India have high prospect in renewable energy cooperation through information and knowledge sharing. ASEAN member states stand to benefit from India's expertise on wind and solar energy. In this case, ASEAN and India may consider establishing a coordinating mechanism through which energy experts from ASEAN and India will be able to share knowledge and expertise necessary in formulating sound, feasible, and practical policies on energy collaboration. At the same time, more energy market integration would take place if electricity exchange is expanded between India and ASEAN through Myanmar.[40]

Box 2:
Plan of Action to Implement the ASEAN-India Partnership for Peace, Progress and Shared Prosperity (2016-2020)

2.3.1. Support the implementation of the ASEAN Plan of Action on Energy Cooperation (APAEC) 2016-2025;
2.3.2. Further promote the ASEAN-India New and Renewable Energy initiative;
2.3.3. Initiate meetings between ASEAN Senior Officials on Energy (SOME) and Ministry of New and Renewable Energy of India to advance energy cooperation;
2.3.4. Promote cooperation to pursue energy security and to minimise environmental impacts through research, capacity building, development, production and use of renewable and alternative energy sources;
2.3.5. Increase private sector engagement cooperation in the development and utilization of renewable and alternative energy sources;
2.3.6. Promote clean energy technologies and energy efficient technologies through institutional capacity building;
2.3.7. Promote the facilitation of trade and investment in the energy sector, including energy infrastructure and oil and natural gas related projects, pursue an integrated and coordinated development programme to establish compatibility of electricity grids, and work towards liberalization of power trade among ASEAN Member States and India;
2.3.8. Develop and strengthen institutional linkages between ASEAN and India, including the ASEAN Centre for Energy (ACE), to cooperate on R&D into energy efficiency and conservation, renewable energy, energy security, policy and planning, and to establish programmes of cooperation;
2.3.9. Support the rural household electrification programmes of ASEAN Member States, including through solar, bio mass, bio gas, micro hydro and off-grid electrification to narrow development gaps in ASEAN.

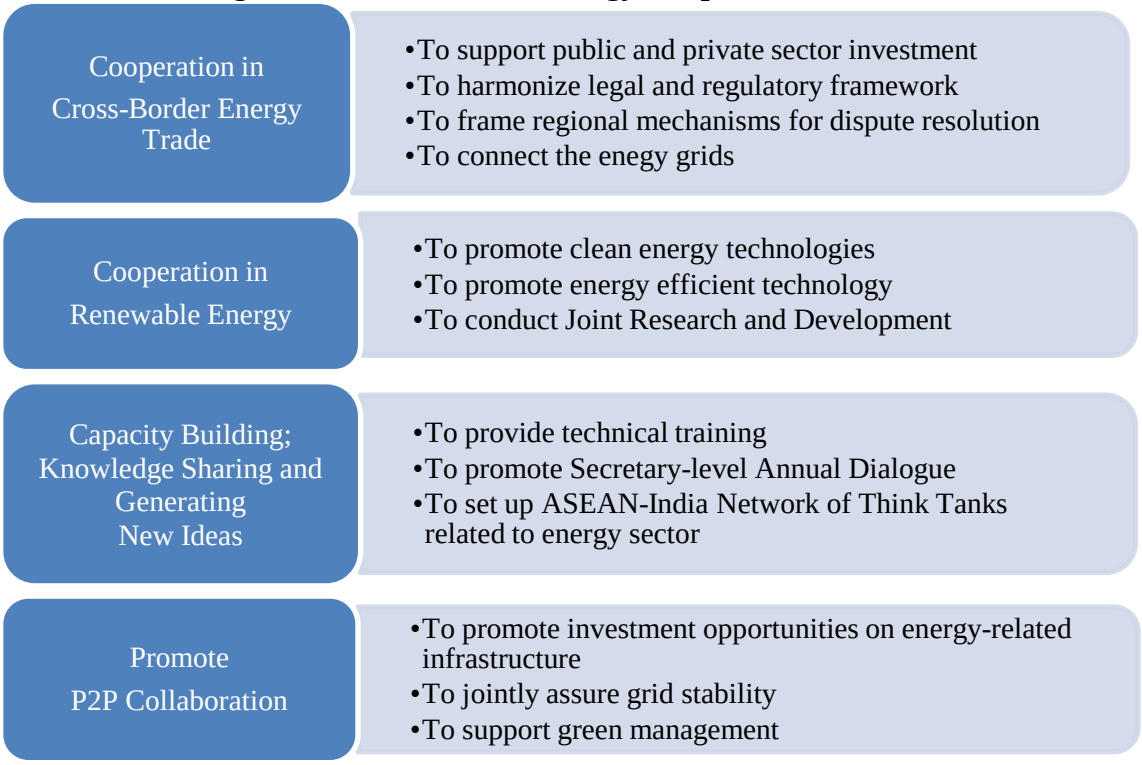
Source: ASEAN Secretariat, Jakarta

[40] Refer, for example, Venkatachalam et al (2019)

5. Conclusions and Way Forward

Both ASEAN and India are committed to the Sustainable Development Goals. ASEAN and India have been working to ensure access to affordable, reliable, sustainable and modern energy for all by 2030 and aim to reduce global warming emissions through promoting different means of renewable energy source, which show the need of deeper energy cooperation between ASEAN and India (Figure 5). The energy cooperation between ASEAN and India appears to be more promising if we consider the countries commitments under the ASEAN-India POA (2016-2020). ASEAN and India should engage in joint research and development in energy sector. Grid stability, cleaner deeper management and green management are the potential areas for cooperation. There exists business opportunities for private sector in both conventional and renewable energy sector in ASEAN and India.

Figure 5: ASEAN-India Energy Cooperation Outline



Source: Authors' own

India can possibly engage in regional and sub-regional cooperation with SAARC, BIMSTEC and ASEAN. The gap in energy demand and supply in the SAARC and BIMSTEC regions offer a potential for regional cooperation. Some recommendations are as follows:

- Cooperation in renewable energy sector shall cover followings: (i) energy efficiency; (ii) technology cooperation; and (iii) joint research and development.
- While moving towards low-carbon growth path, trade in clean / green energy is essential. India and ASEAN shall strengthen energy cooperation through trade in clean energy products.

- India's oil companies such as Indian Oil (and other oil companies) to improve the outreach in ASEAN.
- India may develop a structure for a regional energy exchange along with their operational procedures and regulatory and commercial requirements for cross-border trade with ASEAN.
- Both ASEAN and India shall identify the technically and economically feasible cross-border interconnections. Besides, India and ASEAN shall improve investment environment in both electricity generation and transmission.
- ASEAN and India may consider harmonising legal and regulatory frameworks dealing with cross-border trade along with an Energy Charter Treaty for greater security for cross-border energy transfer related investments and transactions.
- Training and capacity building is another field, which offers immense learning opportunities, particularly in the renewable energy sector. India could be a major source of training and capacity building in energy services for ASEAN countries.
- There are several investment opportunities in energy pipelines and energy-related infrastructure, showing scope of further P2P collaboration between ASEAN and India.
- ASEAN countries and India may undertake projects to support sustainable energy and livelihood. Energy cooperation between India and Myanmar in the border areas shall be taken up on priority basis.
- ASEAN and India may consider setting up an ASEAN-India Energy Forum (AIEF), starting Secretary-level annual dialogue in energy cooperation and also between the energy think-tanks of ASEAN and India. Also setting up of ASEAN-India Network of Energy Think-Tanks (AINETT) may pave the way in generating knowledge products and new ideas.

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Considering the work of the ASEAN-India Eminent Persons Group (AIEPG), and its Report with recommendations for forging a closer partnership for peace, progress and shared prosperity, the Heads of the State/Government of ASEAN and India at the ASEAN-India Commemorative Summit 2012, held at New Delhi on 19-20 December 2012, recommended the establishment of ASEAN-India Centre (AIC), which was formally inaugurated by the External Affairs Minister of India on 21 June 2013 at RIS. AIC serves as a resource centre for ASEAN Member States and India to fill the knowledge gaps that currently limit the opportunities for cooperation. The AIC is closely working with the Indo-Pacific Division of the Ministry of External Affairs (MEA), Government of India to undertake and disseminate evidence based policy research and provide policy recommendations.

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