

Energy Security and Energy Connectivity in the Context of ASEAN Energy Market Integration

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Executive Summary

Key observations

- Energy market integration is now firmly on ASEAN's policy agenda, and energy connectivity is a key to regional energy security and market integration in ASEAN.
- The ASEAN Power Grid (APG) is the most important element of energy connectivity, but progress in constricting the grid has been slower than planned and limited to bilateral connections.
- The construction of the APG faces numerous obstacles, of which the most important is the weak financial incentive for investment. Other obstacles relate to a range of policy, institutional, legal, regulatory and technical issues, all of which are well recognised within ASEAN.
- Only recently has ASEAN emphasised the need to move towards energy market integration and the creation of a regional power market. This provides further challenges relating to harmonisation and regulation.

Policy implications

- The obstacles faced by ASEAN in enhancing energy market integration and energy connectivity and in developing a regional power market are similar to those faced in other parts of the world.
- The European Union, with 28 member states, is an example which illustrates the scale of the challenges and the time and political will needed to resolve them.
- The Nordic states and sub-regions of the European Union provide examples of how small groups of nations can make substantial progress.

1. Introduction

In 2003, the ASEAN Member States drew up an ambitious vision through the Bali Concord II and announced that their aim was to establish an ASEAN Community built on the three pillars of “political and security cooperation, economic cooperation and socio-cultural cooperation”.¹ They also agreed to pursue closer economic integration by 2020 through the creation of an ASEAN Economic Community (AEC).

The AEC, together with the ASEAN Political-Security Community and the ASEAN Socio-Cultural Community, form the basis for the emerging ASEAN Community (Acharya, 2012). These ideas were consolidated in the ASEAN Economic Community Blueprint issued in 2007, which set out the measures to be implemented to create a single market for goods, services and capital by 2015. Economic integration has also been driven by firms (state-owned and private) as they trade and invest across the region, and build international production networks that, in turn, may develop into subregional growth polygons (Dent, 2008).

Although energy was not explicitly identified as a Priority Integration Sector, the AEC Blueprint included the ASEAN Power Grid (APG) and the Trans-ASEAN Gas Pipeline (TAGP). The principle objectives of these two infrastructure networks are to enhance regional energy security, to enhance economic efficiency by optimising energy use. These and other aspects of energy cooperation are managed through successive ASEAN Plans of Action for Energy Cooperation (APAEC).

The aims of this paper are to review the nature of energy cooperation and progress towards energy market integration in ASEAN (section 2) and then to examine the development of the APG. As a case study in increasing energy connectivity and market integration.

2. ASEAN energy cooperation and energy market integration

2.1 ASEAN energy cooperation through APAEC

ASEAN’s first policy move in the field of energy was the creation, in 1976, of the ASEAN Council on Petroleum (ASCOPE) with a specific focus on oil. This led to the ASEAN Petroleum Security Agreement (APSA) in 1986, which set up a petroleum sharing scheme for periods of shortage or oversupply in member States. This mechanism has never been implemented as supply problems have been solved bilaterally between ASEAN members, with non-ASEAN producers or through oil traders (Nicolas, 2009). A revised ASEAN Petroleum Security Agreement was signed in 2009 and ratified by all member States in March 2013. This revised agreement addresses both oil and gas. It provides for voluntary (not obligatory) measures in times of supply crisis, including emergency energy-saving measures and the sharing of oil or gas. It allows for, but does not oblige member States to construct joint oil stockpiles.²

¹ The 2003 Declaration of ASEAN Concord II adopted by the Heads of State/Government at the ninth ASEAN Summit, Bali, Indonesia on 7 Oct 2003. Available at <http://cil.nus.edu.sg/rp/pdf/2003%20Declaration%20of%20ASEAN%20Concord%20II-pdf.pdf> (accessed 3 July 2013).

² See www.aseansec.org/22326.pdf.

The signing of the ASEAN Energy Cooperation Agreement in 1986 marked the start of efforts to develop a more comprehensive approach to energy cooperation and policy coordination. The ASEAN Plan of Action on Energy Cooperation (APAEC), 1995-1999, established coordinating bodies for electricity, gas, coal, new and renewable sources of energy, and energy efficiency and conservation, as described above. The “ASEAN Vision 2020”, published in 1997, placed emphasis on the need to construct transboundary energy networks, and this priority was embodied in the ASEAN Plans of Action for Energy Cooperation for 1999-2004 and 2004-2009, and reiterated in the Plan of Action for 2010-2015.³ The strategy for transboundary energy networks had two main components: the ASEAN Power Grid (APG) and the Trans-ASEAN Gas Pipeline (TAGP), both of which were included in the AEC Blueprint (ASEAN, 2008).

The ASEAN Power Grid (APG) aims to link the member states in a single network in order to maximise the efficiency and flexibility of electricity supply, and to provide access to modern energy to populations across the region. Responsibility for implementation lies with the Working Group 2 (APG/Transmission) of the Heads of ASEAN Power Utilities/Authorities Council (HAPUA) and with the ASEAN Power Grid Consultative Committee (APGCC). Several bilateral connections exist, and a number of other projects are to be completed by 2020 (Figure 1; Tables 1-3). To expedite the harmonisation of regulatory practices and technical standards, the ASEAN Energy Regulators’ Network (AERN) was established in 2012, to focus on regulatory issues related to regional power and gas trade, and HAPUA Working Group 4 (Policy Studies and Commercial Development) is addressing matters related to taxation and public private partnerships (PPP) for investment in the grid.

The TAGP aims to provide gas supplies across region, to raise the share of natural gas in the fuel mix as it is cleaner than coal, and to encourage investment in gas exploration. Responsibility for implementation lies with Trans-ASEAN Gas Pipeline Task Group of ASCOPE. As of May 2015, 13 bilateral connectors had been built, totalling about 3,600 km of pipelines (Figure 2). These are bilateral connections driven by local private and state interests, sometimes with assistance from the World Bank and the Asian Development Bank. The original plan for the TAGP included a further 4,000 km of gas pipeline. The key connections that remained to be constructed are those from the East Natuna gas field in Indonesia to Thailand, Malaysia, Viet Nam, Brunei Darussalam and the Philippines. These links would not only add an additional 2,000 km to the network, and the central position of the East Natuna field would make them essential to the realisation of a truly regional grid. However, the development of this field continues to be delayed by commercial viability concerns (Nicolas, 2009; Doshi, 2013). Two other factors are undermining the case for such an extensive regional gas grid: first is the growing availability and economic attractiveness of LNG; second is the declining availability of gas for export among ASEAN countries.

The other main priority set down by successive versions of APAEC has been the promotion of renewable energy and energy efficiency. The APAEC for 2010-2015 set targets for 2015 of an 8 per cent reduction of energy intensity compared with 2005 and an aggregate of 15 per cent of renewable energy in power generation. These collective targets are non-binding and it has been left to individual member States to set their own targets. The Sub-Sector Networks for renewable energy and energy efficiency, with the assistance of ACE, are responsible for assessing progress, but no formal agreement is in place to promote these initiatives (ASEAN Center for Energy, 2013). It is anticipated that the collective share of renewable energy will be

³ See <http://aseanenergy.org/index.php/about/apaec>.

reach 19 per cent of installed capacity by 2015, well exceeding the target. ASEAN is also on track to reduce energy intensity by more than 12 per cent compared to 2005 (ASEAN Center for Energy, 2013). However, a closer look at the data provided by ACE (2013) reveals that the targets set for 2015 had already almost been reached in 2010, showing that the targets were set at far too low a level.

2.2 Energy trade and investment under AEC

The free flow of trade and investment lies at the heart of the AEC. This principle should apply equally to trade in energy commodities and services and to investment in energy in order to pursue energy market integration. In line with this principle, the 32nd ASEAN Ministers of Energy Meeting (AMEM) held in September 2014 endorsed the idea that the APAEC for 2016-2020 should embrace the theme of energy market integration as well as energy connectivity.

The two key agreements covering trade and investment are the ASEAN Trade in Goods Agreement (ATIGA) and the ASEAN Comprehensive Investment Agreement (ACIA). The goal of ATIGA is to reduce import tariffs all goods products to zero by 2015. Today, only four ASEAN members retain import tariffs for energy products such as crude oil, oil products, natural gas and coal, but these are due to be removed by 2015.⁴ However, although import tariffs have been removed by most of the ASEAN members, a wide range of non-tariff barriers were identified by the ASEAN Secretariat in 2007.⁵

Many of these barriers persist today including, for example, state import monopolies and complex procedures for obtaining certificates of origin (Yulisman, 2013; Waller, 2014). As a result, the prospects for seaborne trade within ASEAN for crude oil, oil products and coal by 2015 are relatively good, but trade in oil and gas by pipeline and trade in LNG will require substantial investment. Despite this progress, some countries have long-standing domestic market obligations written into their production-sharing agreements for oil and gas, and both Indonesia and Viet Nam are reported to be taking steps to limit the exports of coal.⁶

At first sight, ACIA appears to be, as its name suggests, a comprehensive international investment agreement designed to promote the free flow of investment across the region by providing for national treatment and investor protection. However, this appearance is deceptive, as a number of aspects of the agreement provide it with a very regional character, reflecting its origin in the process of ASEAN decision-making and the need to achieve consistency with the values and priorities of ASEAN members (Zhong, 2011).

⁴ ASEAN Secretariat, ASEAN Economic Community, Annex 2, Tariff Schedules, available at www.asean.org/communities/asean-economic-community/item/annex-2-tariff-schedules (accessed 12 July 2013).

⁵ ASEAN Secretariat, ASEAN Economic Community, Non-Tariff Barriers, available at www.asean.org/communities/asean-economic-community/item/non-tariff-measures-database (accessed 12 July 2013).

⁶ “Indonesia eyes coal export curbs, tax”, Reuters, 4 June 2012, available at www.reuters.com/article/2012/06/04/coal-asia-indonesia-exports-idUSL3E8H41QS20120604 (accessed 17 July 2013); and “Vietnam clamping down on coal exports as domestic energy needs rise”, *Wall Street Journal*, 10 July 2013, available at <http://online.wsj.com/article/SB10001424127887324879504578596901530238408.html> (accessed 17 July 2013).

The scope of application, and the exceptions and the reservations of ACIA provide the host governments with great latitude in the application of the Agreement and thus capability to undermine the intent of ACIA in many sectors, including energy. With regard to energy, the scope of application includes the extraction of mineral and hydrocarbon resources as well as services incidental to this extraction, but does not include the construction and operation of energy networks and utilities, notable electricity and gas. In general, ACIA is a very cautious document (Desierto, 2013) that provides little support for the free flow of investment in the energy sector.

3. The ASEAN Power Grid: progress and challenges

3.1 Building connectivity across ASEAN

The physical connectivity of the APG has developed and continues to develop through a series of bilateral, inter-state connections, the earliest of which were built in the 1980s, well before the formulation of the APG vision. The first ASEAN Interconnection Master Plan Study (AIMS I) was completed in 2003 (HAPUA, 2003). This study concluded that it was uneconomic to create a single ASEAN grid, and recommend 11 bilateral interconnections to be built over the period to 2019. After the re-organisation of HAPUA in 2004, Working Group 4 embarked on a second study (AIMS II) which was published in 2010 (HAPUA, 2010). This study was much more ambitious. In addition to the five interconnections that already existed at that time, the report listed another 12 projects that were classified as “committed” and 17 as “generic”. Moreover, the AIMS II report, unlike AIMS I, concluded that it was economically viable to construct an ASEAN-wide power grid, albeit that there would be intermediate steps involving three geographically separate sub-systems.

By the end of 2014, eleven interconnections between 6 pairs of countries were in commercial operation, with a total capacity of nearly 3,500 MW (Table 1). Most of these were already operational or under construction by the time the AIMS II report was published. Another 13 projects are under development totalling over 7,000 MW (Table 2), all of them having been identified in the AIMS II report. Most of them are two years or more behind the original schedule, but due for completion by 2020. Another 20,000 MW or more of interconnections are envisaged for the period after 2020 (Table 3).

Whilst progress in constructing interconnections has been significant, it continues to lag behind the schedule set by AIMS II. The reasons for this lag are well understood and documented (eg HAPUA, 2003; Mulqueeny, 2011; ASEAN Center for Energy, 2013; Shi and Malik, 2013; Shi, 2014; Hermawanto, 2015). The primary obstacle has been the lack of capital. National governments and state-owned enterprises have been unable, unwilling or slow to invest and, at the same time, many interconnection projects remain commercially unattractive to private investors. The major exceptions are the numerous projects that take power from Lao PDR to Thailand (Tables 1 and 2), as the country has a great need for more electricity and the end-user tariffs are relatively high. HAPUA recognises the challenge of attracting private sector investment and has commissioned Working Group 4 to carry out a study and recommend an appropriate model for PPP.

As explicitly recognised documents in APAEC 2010-2015, a second set of challenges arises from the contrasting ways in which different countries manage their energy sectors. This creates the need to harmonise legal and regulatory frameworks relating to power interconnection and trade, and to harmonise technical standards and codes relating to planning,

design, system operation and maintenance. In addition, it will be necessary to develop institutional and contractual arrangements for cross-border trade including such matters taxation, transmission tariffs, and third-party access. In this context, HAPUA Working Group 4 is conducting a study on the taxation of cross border power transactions, and Working Group 2 is embarking on studies relating to setting up an APG Transmission System Operator (ATSO) and an APG Generation and Transmission System Operating Group (AGTP). The AERN has two working groups devoted to, respectively, technical and regulatory harmonisation and creating a database of legal and regulatory documents.

A number of other aspects of national policies and laws may also constrain investors. These include such matters as access to land, licensing procedures, anti-competitive practices on the part of state-owned companies, the risk of expropriation, and national priorities relating to energy security. This last issue has the consequence of national governments preferring to give priority to national energy self-sufficiency over regional integration.

A final challenge in building a regional energy grid arises from the need to integrate an ever-increasing proportion of intermittent renewable energy.

3.2 Building connectivity in the Greater Mekong Subregion (GMS)

The GMS embraces five ASEAN states (Cambodia, Lao PDR, Myanmar, Thailand and Vietnam) and two regions of China (Yunnan and Guangxi) (Fig.2). Led by the Asian Development Bank (ADB), energy cooperation has been on the agenda of the GMS since 1992 (Asian Development Bank, 2012). The region is particularly well endowed with hydro-electricity resources, as well as modest amounts of fossil fuels, but the geographic distribution of these resources is uneven and does not match the centres of demand. As a consequence, an Electric Power Forum was established in 1995 to build regional cooperation and specifically to promote cross-border inter-connection and power despatch and to develop an institutional framework for regional trade.

As can be seen from Tables 1 and 2, the GMS is the major centre of success in building connectivity in ASEAN. In addition to the connections between ASEAN Member States, there are links between China and three of its neighbours, namely Myanmar, Lao DPR and Vietnam, totalling about 6,500 MW (Zhong, 2014). Total trade in 2010 amounted to 34,139 GWh and could reach close to 100,000 GWh by 2020 (Asian Development Bank, 2012, 2013). However, the continued construction of interconnection infrastructure faces similar obstacles to those described above for ASEAN (Antikainen et al., 2011)

1.3 Building a regional power market

In the past, formal ASEAN documentation on energy matters, such as successive APAEC's and both of the AIMS reports, have been silent on the issue of building a regional power market. This has now changed, for the latest APAEC for the period 2016-2025 sets out the objective of introducing multi-lateral power trading in the first phase of this ten year period, 2016-2020.

In contrast, the strategy for the GMS has, for several years, been quite explicit that trade will develop from initial sales through power purchase agreements (PPAs), through grid-to-grid trading to a wholly competitive regional power market (Asian Development Bank, 2013). A Regional Power Trade Coordinating Committee (RPTCC) was established in 2005 to lay the groundwork for this evolution. A key component of the RPTCC's work has been to establish a Regional Power Coordination Centre (RPCC) the role of which would be to synchronise

operations across the national power markets. The need to create the RPCC was first mentioned at the Ninth RPTCC meeting held in October 2010. As of July 2015, the Centre has not been established, because agreement the GMS Member States could agree on which country should host it.

A more recent initiative to create a power market within ASEAN is the Laos-Thailand-Malaysia-Singapore Power Integration Plan (LTMS-PIP). This idea was launched in September 2014 to enable electricity trade from Lao PDR to Singapore using existing infrastructure.

In addition to the institutional, regulatory and technical challenges identified above in respect of connectivity, the key obstacles to converting the growing connectivity into a regional or sub-regional market is the predominance of 25-year PPAs in the governance of most of the interconnections, particularly those between members of the GMS. These PPAs provide the generator with exclusive use of the transmission infrastructure with no third-party access (Antikainen et al., 2011). Of the existing and ongoing interconnections, only those involving Malaysia are based on energy exchange. Whilst the insistence of the investors on the use of PPAs and the lack of third-party access is understandable, it poses a serious obstacle to any move to a truly competitive regional power market.

Whilst these constraints to energy market integration appear formidable, they are not unique to ASEAN and are faced by any regional grouping of diverse nations.

4. The Challenge of enhancing energy connectivity and ASEAN energy market integration

ASEAN has proved to be strong on visions and plans for energy, but weak on delivery. The most important components of the ASEAN Plans of Action on Energy Cooperation have been TAGP and APG. Although progress has been made on these networks, this has been driven mainly by bilateral action by member States and their enterprises (state-owned and private), with external assistance from development banks. The role of ASEAN itself has been limited. As a consequence, critical policy and regulatory tasks to ensure that these networks can indeed benefit the whole region have not yet been undertaken (ACE, 2013).

The obstacles to implementing ASEAN's energy ambitions are numerous. First is the long-standing importance to the member States of sovereignty and nationalism, which easily translate into protectionism. Second, some member States have relatively weak capacity to govern a sector as technically and economically complex as energy. Third, the degree of variability across ASEAN is much greater than across the European Union or the Nordic countries. Political, economic and social cultures vary greatly, as does the physical state of the energy sector, the manner in which it is managed and the way in which energy is priced. Finally, the ASEAN region does not occupy a single, clearly bounded continental region; instead, it is archipelagic in nature, spread over a wide area of peninsulas and islands. A further deficiency related to ASEAN energy market integration lies in the failure within successive versions of APAEC to address trade and investment, and the deficiencies of the two relevant agreements (ATIGA and ACIA).

As a consequence, individual States only undertake activities that have a low cost, such as attending meetings and agreeing plans, or which bring direct national benefits. Undertakings

that involve substantial short-term costs, or sophisticated harmonisation or agreements with partners, are either left to the wealthy and willing states or are postponed. Institutions to implement collective policy decisions are weak, and national priorities have generally trumped aspirations for collective action.

These factors have constrained progress in building energy connectivity and market integration across ASEAN, notable for electricity (APG) and gas (TAGP). Whilst the TAGP programme has lost some momentum due to the growth of LNG, ASEAN is now boosting its efforts to construct the APG and to develop a multi-lateral power market. A significant amount of groundwork is under way to support the achievement of these goals but, as the experience of the European Union shows the road is long and twisted for a large and diverse group of countries. In contrast, the Nordic case shows what can be achieved by a small group of countries.

Table 1. Existing ASEAN Power Grid projects, as of November 2014

Project	System	Type	Original COD	Current SCOD	MW
P.Malaysia - Singapore					
Plentong - Woodlands	HVAC: 230 kV	EE	-	1985	450
Thailand - P.Malaysia					
Sadao - Chuping	HVAC: 132/115 kV	EE	-	1980	80
Khlong Ngae - Gurun	HVDC: 300 kV	EE	-	2002	300
Thailand - Lao PDR					
Nakhon Phanom - Thakhek - Theun Hinboun	HVAC: 230 kV	PP: La->Th	-	1998	220
Ubon Ratchathani 2 - Houay Ho	HVAC: 230 kV	PP: La->Th	-	1999	126
Roi Et 2 - Nam Theun 2	HVAC: 230 kV	PP: La->Th	-	2010	948
Udon Thani 3 - Na Bong - Nam Ngum 2	HVAC: 500 kV	PP: La->Th	-	2011	597
Nakhon Phanom 2 - Thakhek - Theun Hinboun (Expansion)	HVAC: 230 kV	PP: La->Th	2012	2012	220
Lao PDR -Vietnam					
Xekaman 3 - Thanhmy	HVAC: 230 kV	PP: La->Vn	-	2013	248
Vietnam - Cambodia					
Chau Doc - Takeo - Phnom Penh	HVAC: 230 kV	PP: Vn->Kh	-	2009	200
Thailand - Cambodia					
Aranyaprathet - Banteay Meanchey	HVAC: 115 kV	PP: Th->Kh	-	2007	100
			Total		3,489

Notes:

Original COD: Original Commercial Operation Date according to AIMS II Report

SCOD: Scheduled Commercial Operating Date

EE: Energy exchange

PP: Power purchase

Source: HAPUA Secretariat, <http://www.hapuasecretariat.org/>

Table 2. Ongoing ASEAN Power Grid projects, as of November 2014

Project	System	Type	Original COD	Current SCOD	MW
Thailand - P.Malaysia					
Su - ngai Kolok - Rantau Panjang	HVAC: 132/115 kV	EE	2014	TBC	100
P.Malaysia - Sumatra					
Melaka - Pekan Baru	HVDC: TBA kV	PP: SM->PM & EE	2015	2020	600
Sarawak - W.Kalimantan					
	HVAC: 275 kV	EE	2012	2015	230
Sarawak - Sabah - Brunei					
Sarawak - Brunei	HVAC: 275 kV	EE	2012-2016	2018	2x100
Thailand - Lao PDR					
Mae Moh 3 - Nan 2 - Hong Sa	HVAC: 500 kV	PP: La->Th	2015	2015	1473
Udon Thani 3 - Na Bong - Nam Ngiep 1	HVAC: 500 kV	PP: La->Th	2017	2019	269
Ubon Ratchathani 3 - Pakse - Xe Pien Xe Namnoi	HVAC: 500 kV	PP: La->Th	2018	2019	390
Khon Kaen 4 - Loei 2 - Xayaburi	HVAC: 500 kV	PP: La->Th	2019	2019	1220
Lao PDR - Vietnam					
Xekaman 1 - Ban Hat San - Pleiku	HVAC: 500 kV	PP: La->Vn	2011-2016	2016	1,000
Nam Mo - Ban Ve	HVAC: 230 kV	PP: La->Vn			TBC
Luang Prabang - Nho Quan	HVAC: 500 kV	PP: La->Vn		2020	1,410
Lao PDR - Cambodia					
Ban Hat - Stung Treng	HVAC: 230 kV	PP: La->Kh	2011	2017	300
			Total		7,192

Notes:

Original COD: Original Commercial Operation Date according to AIMS II Report

SCOD: Scheduled Commercial Operating Date

TBC: To be confirmed

EE: Energy exchange

PP: Power purchase

Source: HAPUA Secretariat, <http://www.hapuasecretariat.org/> (With updates from HAPUA Council Joint Statement of May 2015)

Table 3. Summary of future ASEAN Power Grid projects, as of November 2014

	Type	Original COD	Current SCOD	MW
P.Malaysia - Singapore	PP: PM->Sg	2018	post 2020	600
Thailand - P.Malaysia	EE	2016	TBC	300
Sarawak- P.Malaysia	PP: Sw->PM	2015-2021	2025	4x800
Batam - Singapore	PP: Bt->Sg	2015-2017	2020	3x200
Philippines - Sabah	EE	2020	2020	500
Sarawak - Sabah - Brunei	PP: Sw->Sb	2020	2020	100
Thailand - Lao PDR	PP: La->Th (+ EE)	2015-2023	2019 -2023 ->	1,000 +
Lao PDR -Vietnam	PP: La->Vn	2011-2016	TBC	TBC
Thailand - Myanmar	PP: Mm->Th	2016-2025	2016-2026 ->	13,000 +
Vietnam – Cambodia	PP	2016	TBC	TBC
Thailand - Cambodia	PP: Kh->Th	2015-2017	Post 2020	2,200
E.Sabah - E.Kalimantan	EE		post 2020	TBC
Singapore - Sumatra	PP: Sm->Sg	2020	post 2020	600
			Total	22,274 -
				25,424

Notes:

Original COD: Original Commercial Operation Date according to AIMS II Report

SCOD: Scheduled Commercial Operating Date

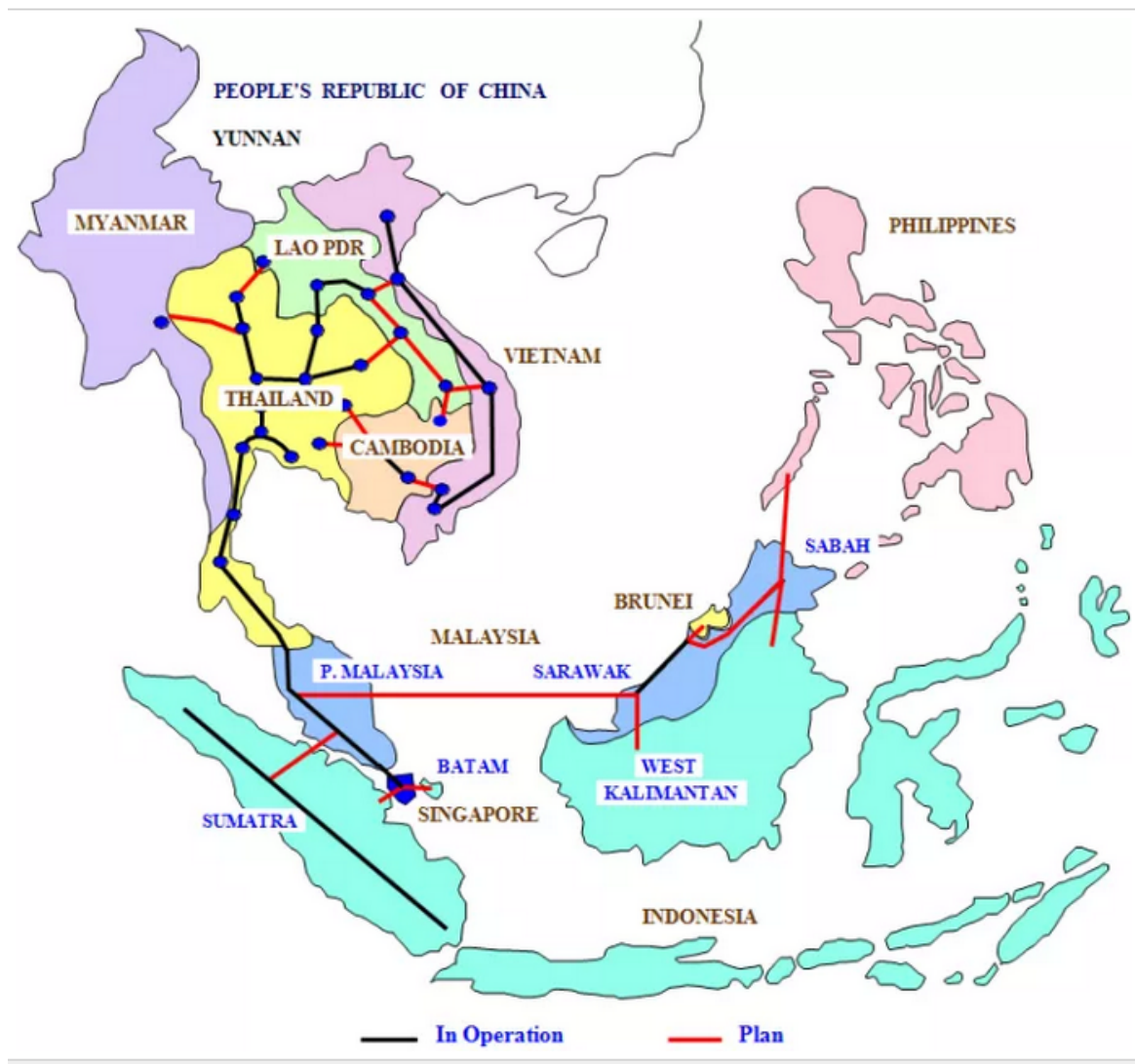
TBC: To be confirmed

EE: Energy exchange

PP: Power purchase

Source: HAPUA Secretariat, <http://www.hapuasecretariat.org/>

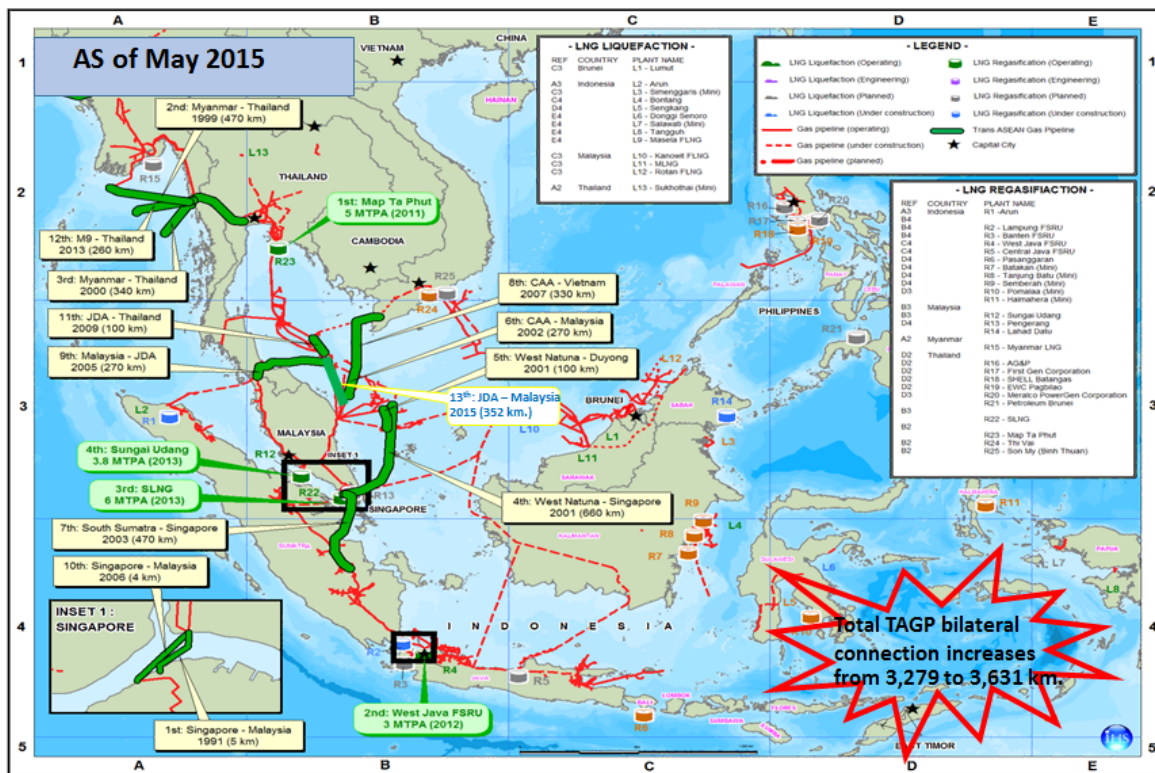
Figure 1. Simplified map of the ASEAN Power Grid (APG).



Source: Sarawak Energy newsroom, 1 October 2014.

<http://www.sarawakenergynewsroom.com/2014/10/01/asean-power-grid-sarawak/>

Figure 2. The Trans ASEAN Gas Pipeline (TAGP) as of May 2015



Source: Website of ASEAN Council of Petroleum. <http://www.ascope.org/projects.html>