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ASEAN ENERGY MARKET INTEGRATION (AEMI)

Energy Security and Connectivity: The Nordic and European Union Approaches

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FORUM PAPER

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

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Executive Summary

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 constructing the grid has been slower than planned and limited to bilateral connections. The construction of the APG faces numerous obstacles, the most significant of which being 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 build a regional power market. This provides further challenges relating to harmonisation and regulation.

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 these 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 in building regional electricity markets. The Nordic power pool (Nord Pool) has been adapted and applied to build regional markets in southern Africa and India.

The Nordic and European experiences reflect a number of perspectives relevant to ASEAN energy market integration in general and in relation to the APG. These lines of thought deserve further deliberation:

- ASEAN should investigate how to build on the existing expertise provided by the ASEAN Centre for Energy to develop an ASEAN-wide system for collaborative energy research, education and training that can directly and indirectly support ASEAN energy policy and planning.

- ASEAN should investigate the applicability of the approach behind the development of the Nordic power market (Nord Pool) to the ASEAN Power Grid, given the apparent success of its application in Southern Africa and India.

- ASEAN's power utilities should be fully involved in decisions relating to how the regional power market is developed, and they should develop a common approach to transitioning themselves to a commercial mode of operation.

- ASEAN should choose a sub-region to develop the initial power market, but the geographic extent of this initial market should be determined on an economic rather than political basis.

- ASEAN should take great care in designing its power systems and markets to ensure that they will be suited to the future electricity supply technologies.

Introduction

In 2003, the ASEAN Member States drew up an ambitious vision through the Bali Concord II and announced their aim 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 may, in turn, 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 and 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), including the most recent APAEC 2016–2025 (ASEAN Centre for Energy, 2015).

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 (Section 3). Section 4 highlights the lessons that can be drawn from the experiences of power market integration in the European Union and, more importantly, the Nordic countries.

ASEAN Energy Cooperation and Energy Market Integration

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

[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.

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 also allows for, but does not oblige member States to construct joint oil stockpiles.[2]

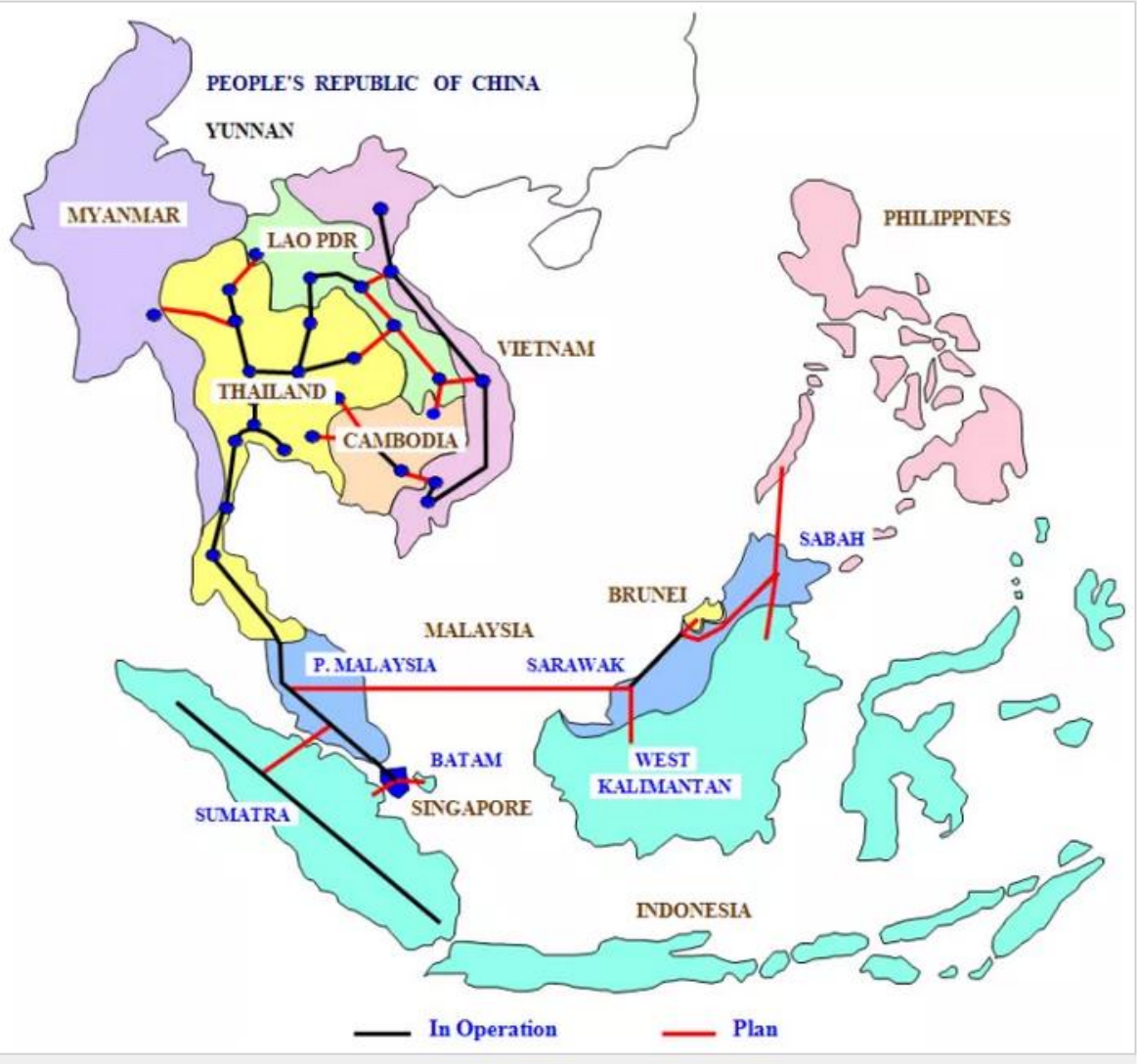
The signing of the ASEAN Energy Cooperation Agreement in 1986 marked the start of efforts to develop a more comprehensive approach to energy cooperation and policy coordination. The ASEAN Plan of Action on Energy Cooperation (APAEC), 1995–1999, established coordinating bodies for electricity, gas, coal, 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 was 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, to enhance the use of clean energy, and to provide access to modern energy to populations across the region. (International Energy Agency, 2015). 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's Working Groups have conducted a number of studies to examine different aspects of APG development (see below, Section 3).

[2] See http://www.aseansec.org/22326.pdf.

[3] See http://aseanenergy.org/index.php/about/apaec.

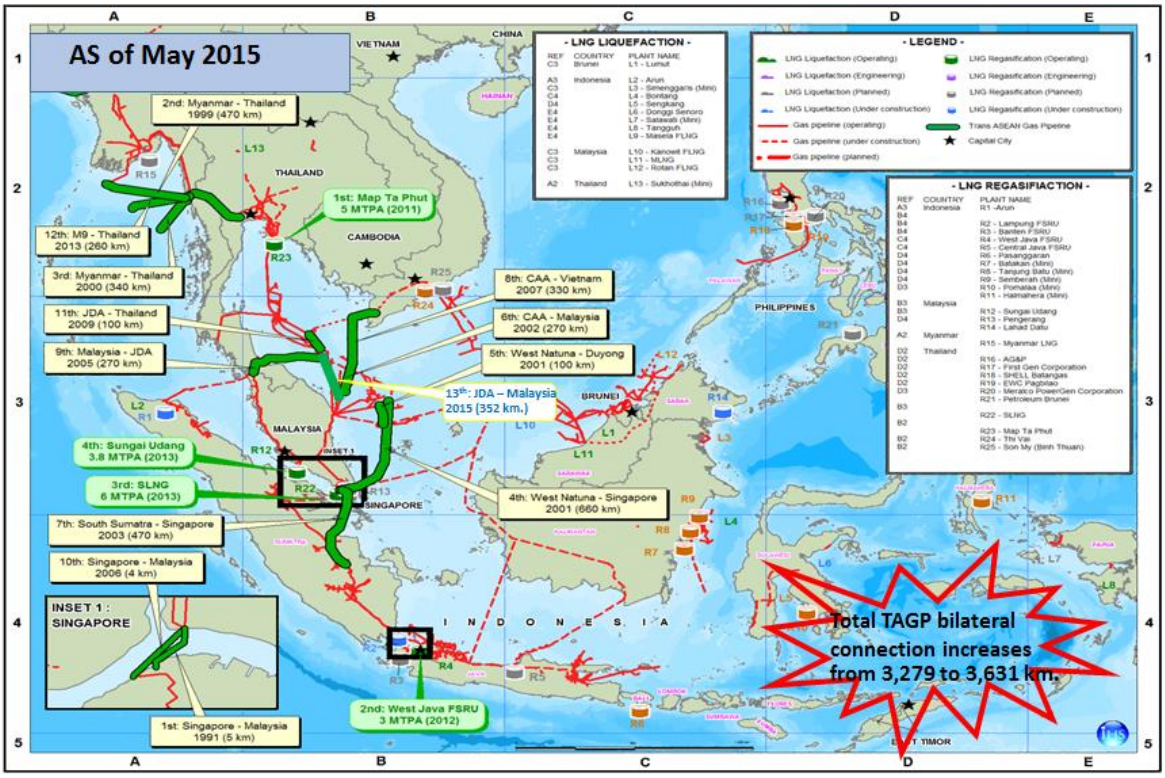
Figure 1. Simplified Map of the ASEAN Power Grid (APG).



Source: Sarawak Energy newsroom, 1 October 2014.
http://www.energyforsarawak.com/asean-power-grid-sarawak/

The TAGP aims to provide gas supplies across ASEAN, 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 the 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 pipelines. The key connections that remained to be constructed are those from the East Natuna gas field in Indonesia to Thailand, Malaysia, Vietnam, Brunei Darussalam and the Philippines. These links would not only add an additional 2,000 km to the network, but the central position of the East Natuna field would also 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, the growing availability and economic attractiveness of LNG; and second, the declining availability of gas for export among ASEAN countries.

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



Source: ASEAN Council of Petroleum website, at http://www.ascope.org/projects.html

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 were 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 the ASEAN Centre for Energy (ACE), are responsible for assessing progress, but no formal agreement is in place to promote these initiatives (ASEAN Centre for Energy, 2013). Both targets were exceeded by 2013 when renewable energy accounted for 21 per cent of total electricity generation, and energy intensity had fallen by 8.5 per cent (ASEAN Centre for Energy, 2015). 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.

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 2016–20 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 of all goods 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 Vietnam are reported to be taking steps to limit the exports of coal.[6]

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[4] ASEAN Secretariat, "ASEAN Economic Community, Annex 2, Tariff Schedules", available at www.asean.org/communities/asean-economic-community/item/annex-2-tariff-schedules.

[5] ASEAN Secretariat, "ASEAN Economic Community, Non-Tariff Barriers", available at www.asean.org/communities/asean-economic-community/item/non-tariff-measures-database.

[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; and Vu Trong Khanh, "Vietnam Clamping Down on Coal Exports as Domestic Energy Needs Rise", *Wall Street*

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 suggest 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).

The scope of application, along with the exceptions and reservations of ACIA provide the host governments with great latitude in the application of the Agreement and thus the 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, notably 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.

The ASEAN Power Grid: Progress and Challenges

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 up 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, 2010a). 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, but acknowledged that there would be intermediate steps involving three geographically separate sub-systems.

By the end of 2014, 11 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), and they have all 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 interconnections are envisaged for the period after 2020 (Table 3).

Journal, 10 July 2013, available at http://online.wsj.com/article/SB10001424127887324879504578596901530238408.html.

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, at 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	2012–16	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	2011–16	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

Project	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	2015–21	2025	4 x 800
Batam–Singapore	PP: Bt->Sg	2015–17	2020	3 x 200
Philippines–Sabah	EE	2020	2020	500
Sarawak–Sabah–Brunei	PP: Sw->Sb	2020	2020	100
Thailand–Lao PDR	PP: La->Th (+ EE)	2015–23	2019–23 ->	1,000 +
Lao PDR–Vietnam	PP: La->Vn	2011–16	TBC	TBC
Thailand–Myanmar	PP: Mm->Th	2016–25	2016–26 ->	13,000 +
Vietnam – Cambodia	PP	2016	TBC	TBC
Thailand–Cambodia	PP: Kh->Th	2015–17	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/

Whilst there has been significant progress in the construction of interconnections, the projects are lagging behind in terms of the schedule set by AIMS II. The reasons for this delay are well understood and documented (eg HAPUA, 2003; Mulqueeny, 2011; ASEAN Centre 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 Thailand 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 public–private partnerships (PPPs).

A second set of challenges arises from the contrasting ways in which different countries manage their energy sectors. These gaps or mismatches in policy, structure and regulation were the subject of a project report by HAPUA Working Group 5 published in 2010 (HAPUA, 2010b), and were explicitly recognised in the APAEC for 2010–15. In addition, HAPUA Working Group 2 (APG/Transmission), together with the Asian Development Bank, carried out a joint study on the harmonisation of technical codes and guidelines for grid planning design, operation and maintenance, which was completed in 2013. These documents all emphasise the need to harmonise legal and regulatory frameworks with regard to power interconnection and trade, as well as

technical standards and codes relating to planning, design, system operation and maintenance. In addition, it is necessary to develop institutional and contractual arrangements for cross-border trade, including such matters as taxation, transmission tariffs, and third-party access. In this context, HAPUA Working Group 4 has completed a study on the taxation of cross-border power transactions (HAPUA, 2015), 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 consist of 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.

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) (Figure 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 in1995 to build regional cooperation and specifically to promote cross-border interconnection 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)

Building a Regional Power Market

In the past, formal ASEAN documents on energy matters, such as successive APAECs and both of the AIMS reports, have been silent on the issue of building a regional power market. This has now changed, with the latest APAEC for the period 2016–25 setting out its objective to introduce multilateral power trading in the first phase of this 10-year period, 2016–20 (ASEAN Centre for Energy, 2015).

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 is to establish a Regional Power Coordination Centre (RPCC), which involves the synchronisation of operations across the national power markets. The need to create the RPCC was first mentioned at the Ninth RPTCC meeting held in October 2010. However, as of July 2015, the Centre has not been established because the GMS Member States have yet to agree on the country that should host it.

The Laos–Thailand–Malaysia–Singapore Power Integration Project (LTMS-PIP) is a more recent initiative to establish a power market within ASEAN. This idea was launched in September 2014 to enable electricity trade from Lao PDR to Singapore using existing infrastructure. This was designed as a pilot project to trade up to 100 MW of power to be wheeled from Lao PDR to Singapore (Abidin et al., 2015). Whilst the technical aspects of the projects are can be easily addressed, those relating to commercial arrangements and legal and regulatory matters will prove more challenging. This was highlighted at the annual meeting of the ASEAN Minsters of Energy in October 2015, when a way forward for LTMS-PIP could not be agreed. Whilst Laos PDR appears to be keen to sell electricity, the government of Singapore cannot commit to purchase a fixed quantity, let alone agree to a price, as electricity in Singapore is sold in a competitive market. The power from Laos could well be competitive in this market if Thailand and Malaysia do not set their transmission tariffs too high. However, even if the government of Singapore might welcome the availability of cheaper, cleaner electricity, the interests of the incumbent power generators may be undermined, as the domestic market is already oversupplied with generating capacity.

In addition to the institutional, regulatory and technical challenges identified above in respect of connectivity, a further obstacle 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. Though the insistence of the investors on the use of PPAs and the lack of third-party access are understandable, these pose 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. As a consequence, developing sub-regional power markets from coalitions of the willing (e.g. GMS and LTMS) is probably the best way to proceed (Mundaca et al., 2013).

Relevance of the Nordic Experience to ASEAN

The Nordic experience of energy cooperation has direct relevance to ASEAN energy cooperation in general and, in particular, to the development of the APG and an integrated ASEAN electricity market. This section examines the Nordic experience at three levels, drawing on the accompanying papers:

- The general approach to political, economic and cultural cooperation (Strang, 2016)
- Energy cooperation in general (Joergenson, 2016)
- The Nord Pool, a competitive electricity market (Bredersen, 2016)

Finally, we briefly identify some key aspects of the European Union experience of energy integration that contrast with or supplement the Nordic experience.

Nordic Cooperation

Within the context of this paper, the principal Nordic countries referred to are Norway, Sweden, Denmark and Finland. These countries are geographically close and have a long history of political, economic and cultural interaction. With the exception of Finnish, their languages are very similar and the countries share a common Lutheran Christian religious heritage. The Nordic countries all have advanced economies, despite having industrialised later than most western European nations, and they share a common belief in the role of the state in providing social welfare (Strang, 2016).

Formal political cooperation began in 1952 with the creation of the Nordic Council which comprises elected politicians from each of the Nordic countries. This was reinforced in 1972 by the establishment of the Nordic Council of Ministers in 1972. This latter council has an annual budget of about €125 million and runs a number of sectoral councils, including one which addresses energy. In addition to these two high-level Councils, there are a large number of formal and informal organisations which support cooperation and communication at all levels of society and in most sectors of political, economic and societal activity.

The key principle of Nordic cooperation is consensus, as with ASEAN. As a consequence, many grand schemes proposed by the political elites from one or more Nordic countries fail to gain traction. Conversely, many successful initiatives are driven from the "bottom", by the relevant, interested actors. This success derives from the strong people-to-people connections that have been built up as a result of deliberate policy over decades in political, economic, technological, academic and social sectors. Such extensive people-to-people interaction has yet to take place between ASEAN member states despite the establishment of the ASEAN Socio-Cultural Community, on account of the strong role of the state on most member states. As a result, most cross-country collaborative initiatives require official state support.

Nordic Energy Cooperation

Energy has been an important field of Nordic cooperation ever since the creation of the Nordic Council of Ministers, on account of the oil supply crisis of the 1970s (Joergenson, 2016). One of the first grand schemes was to cooperate in oil and gas supplies, but Norway had no interest in this regard as it wished to sell its hydrocarbons on international markets. Nevertheless, an agreement was reached to work together in a number of fields such as energy policy and planning, energy efficiency, energy and the environment, and research and development. Meanwhile, efforts to build a Nordic energy market continued. Two external trends had significant consequences for Nordic energy cooperation: the sustained moves by the European Union to build a single energy market, and the international recognition of the need to address the challenges posed by global climate change. Together, these led to the progressive alignment of many components of Nordic energy markets and policies with those of the European Union.

The voluntary and consensus-based nature of Nordic cooperation has meant that formal, top-down proposals are not always successful in the energy sector. Nevertheless, the proliferation of working groups on different energy topics has led to a convergence of outlooks and practices in energy policy and planning, especially with respect to energy efficiency and clean energy. Two notable successes have been in the fields of energy research and the development of a Nordic electricity market, the Nord Pool.

The Nordic Energy Research Programme was created in 1985 with the aim to build expertise, analysis and data for decision-making, and to pool resources. Initiatives included the establishment of Nordic energy research centres and financial support for doctoral research students. This led to the creation of Nordic Energy Research (Norden), a permanent organisation with a small staff to coordinate these activities and to work with Nordic governments to set research priorities. The initial annual budget was set at 30 million Norwegian kroner in 1985, approximately US$4–6 million at the prevailing exchange rates. The size of the funding for research projects grew as Norden developed partnerships with other research institutions. After 30 years, the Norden programme has created a large cadre of research and policy expertise in the Nordic countries, and has supported different forms of energy cooperation within and outside the Nordic region. ASEAN has yet to develop such research capacity, and this deficiency greatly constrains the ability of member states to cooperate effectively in energy policy making and implementation.

The Nordic Electricity Market—"Nord Pool"

The single most important, tangible outcome of Nordic energy cooperation has been the establishment of a single, Nordic electricity market (Nord Pool), which not only links the four main Nordic nations but is also well integrated with EU power markets (Bredersen, 2016). The development of the Nordic power market began in the early 1990s in response to two pressures: to improve the economic performance of national power sectors through market liberalisation, initially in Norway; and to take advantage of the

complementary fuel mix in each of the four countries. In contrast to the top-down EU approach to market integration, the development of the Nordic power market took place on an incremental and voluntary basis, driven by the utilities themselves: first Sweden joined Norway, then Finland and, finally, Denmark. A distinctive feature of the Nord Pool power market is that it is regulated on the basis of principles rather than by an adherence to detailed rules.

Whilst the Nord Pool today is a sophisticated market involving highly developed nations with slow or negligible demand growth, the basic mechanisms can be adapted and applied to build regional power markets under quite different circumstances. The most notable example is the Southern Africa Power Pool, which allows the vertically-integrated and state-owned power companies in 12 southern African nations to trade with one another, despite the absence of any liberalisation to domestic markets and the persistence of energy subsidies to consumers. These and other successes, in India for example, show that the path to electricity market integration in ASEAN need not be so difficult, provided it is approached in a pragmatic and stepwise manner.

The European Union Experience

A key difference between the EU and the Nordic states lies in the nature of their collaborative decision-making. Whereas the Nordic nations rely on consensus at all stages, the EU has a wider range of approaches. Consensus is required in order to make a decision relating to a long-term strategic objective, but later decisions relating to implementation can be taken by a procedure known as “qualified majority”, which takes into account not just the number of countries voting in favour but also the proportion of the total EU population represented by those countries. If a member state fails to subsequently implement the agreed legislation, the European Commission can take that country to court.

The European experience of energy cooperation dates back to the 1950s with the creation of the European Coal and Steel Community and Euratom (Egenhofer, 2016). More wide-ranging engagement of the EU with energy policy matters started to emerge in the 1980s, not least due to the oil crises of the 1970s. Whilst decisions on energy mix were left to member states, the EU developed policy initiatives, first to build a single European energy market and, later, to mitigate global climate change through the use of renewable energy and the enhancement of energy efficiency.

The need to build a single energy market was identified in 1988 as an essential component of the more comprehensive single European market for goods, services, capital and labour. After much deliberation and negotiation, the first legislation appeared in 1996 for electricity and in 1998 for gas. Despite some progress made, obstacles faced included a lack of third-party access, weak regulatory authority, high market concentration and a shortage of cross-border infrastructure. Further steps were taken in 2003 and 2011 to address these and other deficiencies, along with a recognised need to create formal institutions for energy regulators and for transmission system

operators to collaborate. As at the end of 2015, national markets across most of the 28 EU states have been coupled for day-ahead markets.

The slow development of the EU internal energy market has arisen from the ability of national governments to obstruct, delay or amend EU proposals, often on account of the interests of their own utilities. In this, the EU is no different from ASEAN despite the apparently strong authority of the European Commission. One key difference is that once EU legislation is passed, the European Commission can take to court those who break the law. In other words, participation in the market is voluntary, but once a country joins the market, it must obey the rules. Two major lessons from Europe are: first, that important policy decisions must be supported by high-quality, region-wide analyses of costs and benefits; and second, that it is easier to begin the process of building a regional market by developing markets at the sub-regional scale.

At the same time that progress has been made to develop the single European electricity market, the drive to promote the deployment of renewable energy, notably wind and solar PV, has become more intense. Given that the marginal cost of these forms of renewable energy is essentially zero, this has put downward pressure on wholesale prices, and undermined the commercial viability of thermal power. This problem is exacerbated by the intermittency of renewable energy. As a result, member states are increasingly introducing capacity payments for thermal power stations. This creates a tension between the desire to reduce carbon emissions and the need for security of supply and system stability, a dilemma for which no EU-wide solution has yet been identified. ASEAN is also promoting the deployment of different forms of renewable energy, and so will face a similar challenge as it develops an integrated power market. It is therefore essential for ASEAN to design its market mechanisms such that they take into account the challenges arising from the growing deployment of renewable energy and other new technologies.

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. The first challenge is the long-standing importance that member states attach to concepts of sovereignty and nationalism, which easily translates into protectionism. Second, some member states are relatively weak in their 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 do 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, and 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 have tended to undertake only those collaborative activities that involve low costs, such as attending meetings and agreeing to plans, or which bring direct national benefits. Undertakings that entail substantial short-term costs, or sophisticated harmonisation or agreements with partners, are either left to the wealthy and willing states, or are postponed. Institutions seeking to implement collective policy decisions tend to be 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, and notably 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 multilateral power market. A significant amount of groundwork is underway to support the achievement of these goals, but as the experience of the European Union shows, the road is long and winding for a large and diverse group of countries.

In contrast, the Nordic case shows what can be achieved by a small group of countries with convergent interests. In this respect, the LTMS-PIP is an important test for ASEAN, and the way in which the Nordic experience has been applied in southern Africa indicates that a regional power market can be built even if the national utilities remain state-owned and vertically integrated.

The Nordic and European experiences suggest several lines of thinking that are of relevance to ASEAN energy market integration in general and in relation to the APG, and that deserve further deliberation.

- *Lesson*: Coherent and effective national and collaborative energy policy and planning cannot be successfully achieved without a region-wide cadre of energy professionals in government, research institutes, think-tanks and universities. This cadre of professionals should have the expertise and funds to carry out research and analysis and have frequent opportunities to interact with one another and with policy makers, both formally and informally.

    - *Recommended action*: ASEAN should investigate how to build on the existing expertise provide by the ASEAN Centre for Energy to develop an ASEAN-wide system for collaborative energy research, education and training that can directly and indirectly support ASEAN energy policy and planning.

- *Lesson*: The application of the Nordic experience to southern Africa and India shows that it is possible to establish a regional electrical power market between states or sub-national entities even though some of the power industries remain fully state-owned and vertically integrated, and consumer subsidies remain in place.

    - *Recommended action*: ASEAN should investigate the applicability of the Nordic experience to the ASEAN Power Grid.

- *Lesson*: The Nordic experience shows not only that the drive for developing a regional power market can come from the power industry itself, but also that the industrial entities may be the most appropriate ones to work out the modalities of the market.

    - *Recommended action*: ASEAN's power utilities should be fully involved in decisions relating to how the regional power market is developed and they should develop a common approach to transitioning themselves to a commercial mode of operation.

- *Lesson*: The European experience shows that success in building an electricity market across a large region like ASEAN is likely to make better progress if integration starts at a sub-regional rather than regional level.

    - *Recommended action*: ASEAN should choose a sub-region to develop the initial power market, but the geographic extent of this initial market should be determined on an economic rather than political basis.

- *Lesson*: Given ongoing technological advances and the growing roles played by renewable and distributed energy, a further lesson from Europe is that the designs of power systems and power markets of 20 years ago may no longer be suited to the world of today and tomorrow.

    - *Recommended action:* ASEAN should exercise great care in designing its power systems and markets to ensure that they will be suited to future electricity supply technologies.

References

Abidin, Nor Ziha Zainol, Aeni Haryati Hasim and Joon bin Ibrahim (2015) "Borderless ASEAN Energy Co-operation". *The Ingenieur* 61 (January–March): 5–57.

Acharya, Amitav (2012) *The Making of Southeast Asia*: *International Relations of a Region*. Singapore: Institute of Southeast Asian Studies.

Antikainen, Juhani, Rita Gebert and Ulf Moller (2011) *Review of the Greater Mekong Sub-Region Regional Power Trade*. SIDA Review 2011:9. Stockholm: Swedish International Development Cooperation Agency.

ASEAN (2008) *ASEAN Economic Community Blueprint.* Jakarta: ASEAN Secretariat.

ASEAN Centre for Energy (2015) *ASEAN Plan of Action for Energy Cooperation (APAEC) 2016–2025. Phase 1: 2016–2020*. Jakarta: ASEAN Centre for Energy.

_____ (2013) *Development of ASEAN Energy Sector*. Jakarta: ASEAN Centre for Energy.

Asian Development Bank (2013) *Assessment of the Greater Mekong Subregion Energy Sector Development: Progress, Prospects and Regional Development Priorities*. Manila: Asian Development Bank.

_____ (2012) *Greater Mekong Subregion Power Trade and Interconnection: 2 Decades of Cooperation.* Manila: Asian Development Bank.

Dent, Christopher M. (2008) *East Asian Regionalism*. London: Routledge.

Desierto, Diane A. (2013) "Investment Treaties: ASEAN". In *Asia Rising: Growth and Resilience in an Uncertain Global Economy*, ed. Hal Hill and Maria Socorro Gochoco-Bautista. Cheltenham: Edward Elgar, pp. 184–210.

Doshi, Tilak K. (2013) "ASEAN Energy Integration: Interconnected Power and Gas Pipeline Grids". In *Enhancing ASEAN's Connectivity*, ed. Sanchita Basu Das. Singapore: Institute of Southeast Asian Studies, pp. 142–62.

HAPUA (2015) *Study on Taxation on Cross Border Power Transaction*. HAPUA Working Group 4—Policy and Commercial Development. Project No. 1, Final Report. Jakarta: HAPUA Secretariat.

_____ (2010a) *AIMS II Report*. Jakarta: HAPUA Secretariat.

_____ (2010b) *Regulatory Issues and Challenges of Regulated Entity/Owner/Investor and Consumers.* HAPUA Working Group 5—ESI Services. Project No. 5, Final Report. Jakarta: HAPUA Secretariat.

_____ (2003) *AIMS I Report*. Jakarta: HAPUA Secretariat.

Hermawanto, Bambang (2015) *ASEAN Power Grid: Road to Multilateral Power Trading.* Presentation to the 5th Annual International Forum, Regional Energy Alliance,

Regulators' Insights, Bangkok, 1 October, available at http://www.energyforum2015.com/.

International Energy Agency (2015) *Development Perspectives of the ASEAN Power Sector*. Paris: OECD/IEA.

Mulqueeny, Kala (2011) *Case Studies on Regional Cooperation: Report on ASEAN Energy Regulators' Network*. Presentation at IPEEC Policy Dialogue on Energy Efficiency in Asia, 20 October, Jakarta, available at https://www.iea.org/media/workshops/2011/.../s7_Mulqueeny.pdf.

Mundaca, Luis T., Carl Dalhammar and David Harnesk (2013) "The Integrated NORDIC Power Market and the Deployment of Renewable Energy Technologies: Key Lessons and Potential Implications for the Future ASEAN Integrated Power Market". In *Energy Market Integration in East Asia: Renewable Energy and its Deployment into the Power System*, ed. Fukunari Kimura, Han Phoumin and Brett Jacobs. ERIA Research Project Report 2012-26 Jakarta: ERIA, pp. 25–97.

Nicolas, Françoise (2009) *ASEAN Energy Cooperation: An Increasingly Daunting Challenge*, Note de l'IFRI. Paris: Institute Français des Relations Internationales.

Shi Xunpeng (2014) "ASEAN Power Grid, Trans-ASEAN Gas Pipeline and ASEAN Economic Community: Vision, Plan and the Reality". *Global Review* (Fall): 116–31.

Shi Xunpeng and Cecilya Malik (2013) *Assessment of ASEAN Energy Cooperation within the ASEAN Economic Community*. ERIA Discussion Paper ERIA-DP-2013-37. Jakarta: ERIA.

Waller, James (2014) *Achieving the Promise of the ASEAN Economic Community: Less than You Imagine, More than You Know*. Seattle: National Bureau of Asian Research.

Yulisman, Linda (2013) "New Govt System to Oil Wheels of Trade in ASEAN". *The Jakarta Post*, 1 February, available at http://www.thejakartapost.com/news/2013/02/01/new-govt-system-oil-wheels-trade-asean.html.

Zhong Xioatao (2014) *Prospects of Energy Resources, Power Industry and Electric Power Cooperation in Greater Mekong Sub-region*. Presentation at Regional Energy Trade Workshop, Central Asia Regional Economic Cooperation, 8–9 September,

Manila, available at http://www.carecprogram.org/index.php?page=regional-energy-trade-workshop/.

Zhong Zewei (2011) "The ASEAN Comprehensive Investment Agreement: Realizing a Regional Community". *Asian Journal of Comparative Law* 6, 1: Article 4.