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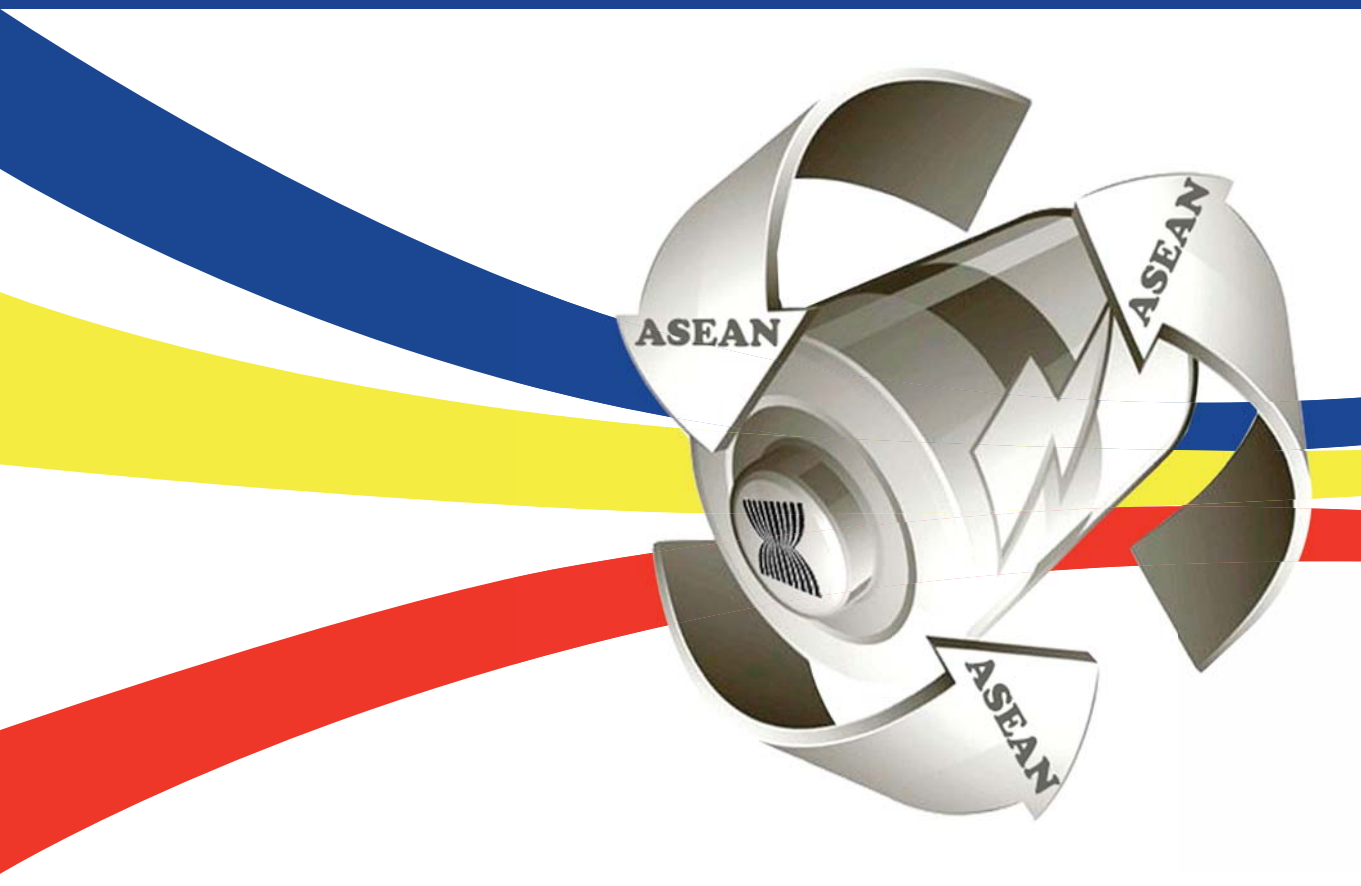
ASEAN Energy Market Integration(AEMI): From coordination to integration



AEMI Group

ASEAN Energy Market Integration (AEMI): From coordination to integration

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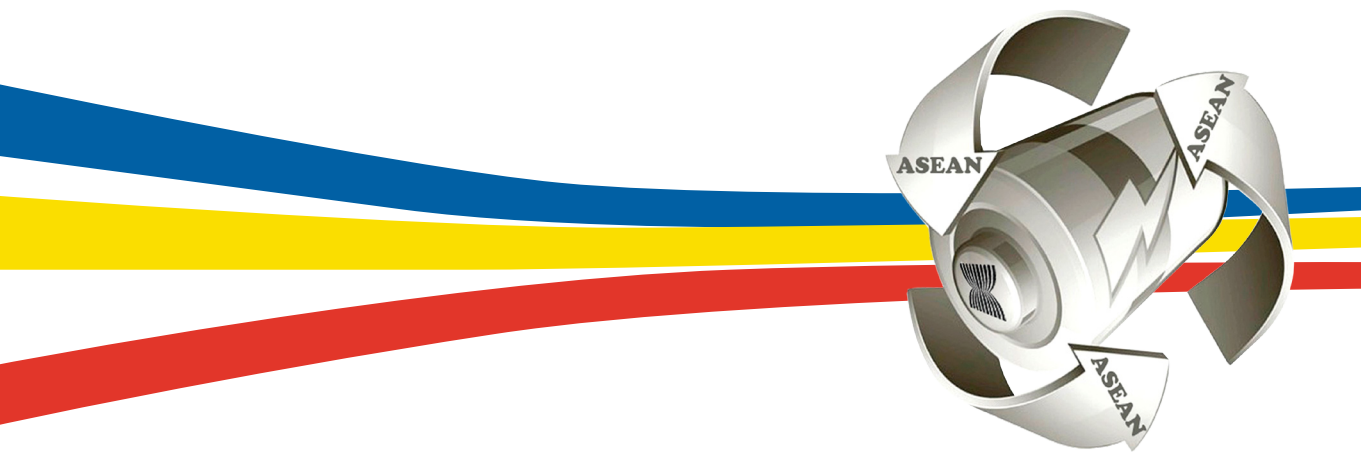

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ASEAN Energy Market Integration (AEMI): From coordination to integration. This book includes the conclusions from the AEMI Forum, convened by Chulalongkorn University and the AEMI Group, with the support of the ASEAN Secretariat and the ASEAN Centre for Energy, and held in Bangkok on August 27-28, 2013. The book also includes the Forum Discussion Paper and the AEMI papers prepared for the Forum by members of the AEMI Group.

1. Energy market integration
2. Beyond APAEC
3. Energy security
4. Energy efficiency
6. Energy poverty
7. AEMI blueprint

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PART 3: AEMI PAPERS

Foreword

The ASEAN Energy Market Integration (AEMI) initiative makes the case for energy market integration across ASEAN within the framework of the ASEAN Economic Community (AEC). A network of ASEAN academics, the AEMI Group, is working to develop the rationale for the approach, assess its benefits, design its architectural structure and formulate a strategy to deliver it through 2030. Their work has been developed in close cooperation with the ASEAN Secretariat, and draws on publications from the ASEAN Centre for Energy. The thirty-first Senior Officials Meeting on Energy (SOME) endorsed the AEMI initiative last June in Bali.

The AEMI initiative was fueled by an emerging consensus among a number of ASEAN academics that a successful AEMI would be a necessary condition for achieving sustainable growth in the framework of AEC. It would enhance energy security and environmental viability across the region and undoubtedly yield significant benefits for all involved, from the economic, social and environmental perspectives. The ultimate objective of the AEMI Group is the adoption of AEMI within the framework of AEC, and its deployment through 2030.

The work of the AEMI Group has received strong support from the ASEAN Studies Center, the Faculty of Economics and the Energy Research Institute, Chulalongkorn University. This work has also benefited from the guidance of the AEMI Advisory Committee, including: Dr. Bundhit Euaarporn, Professor, Faculty of Engineering, and Director, Energy Research Institute (ERI), Chulalongkorn University; Dr. Chayodom Sabhasri, Associate Professor, Dean, Faculty of Economics, Chulalongkorn University; Dr. Philip Andrews-Speed, Principal Fellow, Energy Studies Institute, National University of Singapore; Dr. Suthiphand Chirathivat, Associate Professor, Faculty of Economics, and Executive Director, ASEAN Studies Center, Chulalongkorn University; and Dr. Thierry Lefevre, Professor Director, Centre for Energy-Environment Resources Development (CEERD), Thailand. Finally, the AEMI initiative was coordinated by Dr. Nawal Kamel, Visiting Professor, Faculty of Economics, Chulalongkorn University.

The AEMI Forum was convened by Chulalongkorn University and the AEMI Group, with the support of the ASEAN Secretariat and the ASEAN Centre for Energy. It was held on August 27-28, 2013 at the Montien Hotel, Bangkok. In addition to the members of the AEMI Group and the AEMI Advisory Committee, participants included representatives from: Senior Officials of Energy (SOE) leaders; specialized energy bodies; sub-sector networks; the ASEAN Secretariat and the ASEAN Centre for Energy. Also, a number of government officials as well as representatives from international organizations, research institutes and bilateral donors participated to this event. Altogether, 71 participants attended the AEMI Forum, and nine ASEAN youths from Chulalongkorn University joined them as observers.

The purpose of the AEMI Forum was to establish a dialogue between policymakers (Track I) and academics (Track II) on the vision of AEMI, in order to get feedback and guidance on further developing it. This dialogue was conducted under the Chatham House Rule whereby participants are free to use the information received, but with the stipulation that neither the identity nor the affiliation of the speaker(s), nor that of any other participant, may be revealed.

This book "ASEAN Energy Market Integration: From coordination to integration" presents the conclusions from this dialogue as well as the academic basis supporting it. It is part of the AEMI Group contribution to building a strong and prosperous AEC for the benefit of its members and beyond.

The AEMI Group
October 2013

Introduction

The ASEAN Energy Market Integration (AEMI) initiative addresses the ASEAN triple energy challenge: (a) an energy gap, resulting from the expected doubling of ASEAN energy demand by 2030, due to the steady increase in energy demand to sustain continuous economic growth, population growth, greater electrification rates and the expansion of the transport sectors; (b) energy security, due to a significant increase in vulnerability to energy imports, particularly oil from the Middle East; and (c) the energy footprint, with an expected doubling of the ASEAN contribution to global carbon emissions by 2030, with direct implications on the environment in the region and beyond, and on security of vulnerable ASEAN populations.

For this purpose, the members of the AEMI Group prepared AEMI papers as a first step to providing analytical underpinnings for the rationale for AEMI, its building blocks and its implementation. The AEMI papers focus essentially on three analytical dimensions: (a) Why: Investigating the rationale for AEMI and its potential benefits for ASEAN Member States (AMS) within the AEC; (b) What: Identifying the key building blocks for AEMI from the policy and operational perspectives; and (c) How: Determining the sequencing and strategy for the deployment of AEMI through 2030 within the AEC.

AEMI Forum sessions were organized to foster the dialogue between ASEAN policymakers (Track I) and the members of the AEMI Group (Track II) by presenting the findings from their academic investigations. A Discussion Paper was prepared drawing on the AEMI papers and other related academic work. It was circulated to Forum participants to provide a synthesis of the research findings, and to serve as a guide for the discussions during the AEMI Forum. As such, it was structured along the lines of the AEMI Forum Agenda, with each section of the Discussion Paper corresponding to a session of the AEMI Forum. The presentations at the Forum by the AEMI Group were based on the AEMI papers, and were each followed by a Roundtable Discussion with policymakers, both on the main issues raised and their conclusions. At the end of each day, the participants reviewed and unanimously approved a statement encapsulating the conclusions from their interactive dialogue and outlining the agreed next steps to further develop AEMI. After the Forum, the AEMI Forum Conclusions were drafted and circulated to participants for their review and comments.

This book, "ASEAN Energy Market Integration: From coordination to integration", includes the AEMI Forum Conclusions, the forum Discussion Paper as well as the AEMI papers. It is a contribution by the AEMI Group, working together from their respective academic institutions, to address the ASEAN energy challenge and to formulate relevant policy advice. It is published by the ASEAN Studies Center, Chulalongkorn University, and is available for distribution upon request.

The AEMI Group stands ready to provide additional support to ASEAN policymakers in further developing the AEMI vision and in designing a blueprint and road map for its implementation through to 2030 within the AEC, for the benefit of all AMS and for the well-being of their people.

Dr. Nawal Kamel
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October 2013

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This book represents the outcome of the Forum on ASEAN Energy Market Integration (AEMI), convened by Chulalongkorn University and the AEMI Group, with the support of the ASEAN Secretariat and the ASEAN Centre for Energy (ACE), and held in Bangkok on August 27-28, 2013.

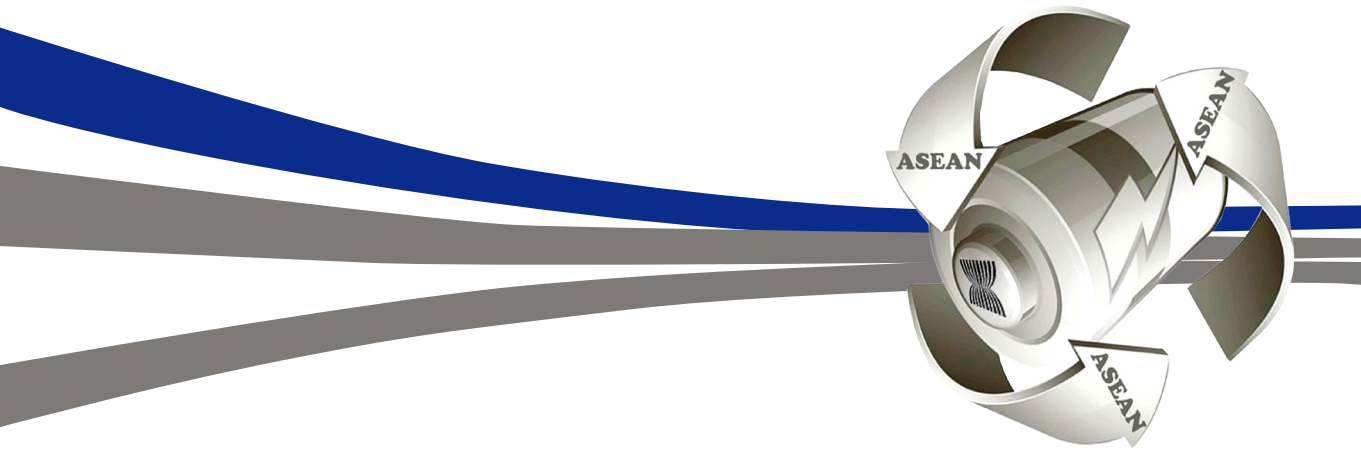
Within Chulalongkorn University, the ASEAN Studies Center, the Faculty of Economics and the Energy Research Institute have all provided outstanding support (including financial support) to the AEMI initiative and Forum. The AEMI Group has also benefited from the continuous cooperation with the ASEAN Secretariat, and from ACE publications.

In the preparation and production of this book, special acknowledgement is due for the support provided by Dr. Isabel Pereira Rodrigues, formerly Policy Specialist at UNDP-New York Headquarters and recently Statistician at UNESCAP, and by Acting Sub Lt. Seksan Anantasirikiat, Academic Officer at the ASEAN Studies Center, Chulalongkorn University. Special thanks are also due for the editing work undertaken by Mr. Robert Oliver, formerly Editor and Information Officer at UNESCAP and UNICEF-Cambodia. Finally, the graphic design work for the cover by Mr. Thienthong Wachirawichai and the layout and printing services of KAB Communications are highly appreciated.

Acronyms and abbreviations

ACE	ASEAN Centre for Energy
ACIA	ASEAN Comprehensive Investment Agreement
ADB	Asian Development Bank
AEC	ASEAN Economic Community
AEMI	ASEAN Energy Market Integration
AERN	ASEAN Energy Regulatory Network
AFOC	ASEAN Forum on Coal
AMEM	ASEAN Ministers of Energy Meetings
AMS	ASEAN Member States
APAEC	ASEAN Plan of Action for Energy Cooperation
APG	ASEAN Power Grid
APSA	ASEAN Petroleum Security Agreement
ASCOPE	ASEAN Council on Petroleum
ASEAN	Association of Southeast Asian Nations
ATIGA	ASEAN Trade in Goods Agreement
CDM	Clean Development Mechanism
CERM	Coordinated Emergency Response Measures
EAS	East Asia Summit
EE	energy efficiency
EE&C-SSN	Energy Efficiency & Conservation Sub-Sector Network
EMI	energy market integration
GDP	gross domestic product
GMS	Greater Mekong Subregion
HAPUA	Heads of ASEAN Power Utilities/ Authorities
HSE	health, safety and environment
IEA	International Energy Agency
KEEI	Korea Energy Economics Institute
MERCOSUR	Mercado Comun del Sur or Common Market of the South
MDGs	United Nations Millennium Development Goals
MoUs	Memoranda of Understanding
NAFTA	North American Free Trade Agreement
NEC-SSN	Nuclear Energy Cooperation Sub-Sector Network
R&D	research and development
RE	renewable energy
REPP-SSN	Regional Energy Policy and Planning Sub-Sector Network
RE-SSN	Renewable Energy Sub-Sector Network
SOEs	Senior Officials of Energy
SOME	Senior Officials Meeting on Energy
TAGP	Trans-ASEAN Gas Pipeline

PART 1:
ASEAN ENERGY MARKET INTEGRATION (AEMI) FORUM CONCLUSIONS



AEMI FORUM CONCLUSIONS

August 27-28, 2013, Montien Hotel Bangkok
Forum held under the Chatham House Rule

The context

1. The ASEAN Energy Market Integration (AEMI) initiative makes the case for energy market integration across ASEAN in the framework of the ASEAN Economic Community (AEC). A network of ASEAN academics, the AEMI Group, is working to develop the rationale for such an approach, assess the benefits it would deliver, design its architectural structure, and draw a strategy for its deployment through 2030 in the framework of the AEC. The 31st Senior Officials Meeting on Energy (SOME) endorsed the AEMI initiative last June in Bali.

2. The AEMI Forum was convened on behalf of the Chulalongkorn University and the AEMI Group, with the support of the ASEAN Secretariat and the ASEAN Centre for Energy, to engage a dialogue between ASEAN academics and policymakers on the vision for AEMI, and to seek their guidance in further developing it. Within Chulalongkorn University, the ASEAN Studies Center, the Faculty of Economics and the Energy Research Institute have all provided support (including financial support) to the AEMI initiative and the Forum. The AEMI Group has also benefited from the continuous support and guidance by the ASEAN Secretariat, and has relied on ASEAN Centre for Energy (ACE) publications. The Agenda of the AEMI Forum is provided as an Annex to the AEMI Forum Conclusions.

3. The dialogue throughout the AEMI Forum has been conducted under the Chatham House Rule, whereby participants are free to use the information received, but with the stipulation that neither the identity nor the affiliation of the speaker(s), nor that of any other participant, may be revealed. Forum participants included AEMI Group members, seven Senior Officials of Energy (SOEs) or their delegates, the ASEAN Secretariat, the ACE, two ASEAN specialized bodies (ASCOPE and HAPUA), and one sub-sector network (REPP-SSN). The participants also included a number of government officials, international organizations, bilateral donors, and research institutes. Overall, 71 participants attended the AEMI Forum, as well as 9 ASEAN youth from Chulalongkorn University. In line with the Chatham House Rule, there will be no publication of the full list of participants.

4. A Discussion Paper was circulated to Forum participants, to serve as a guide for the discussions. It was written on the basis of the seven AEMI papers produced by the AEMI Group for the Forum as well as other academic work. It is structured along the lines of the Forum agenda, with each section of the paper corresponding to a session of the Forum. The Discussion Paper has been revised, and is provided as part of this book.

5. The Forum sessions were organized to foster a dialogue between ASEAN policymakers (Track I) and AEMI Group members (Track II), presenting the findings from their academic investigations. The presentations by the AEMI Group were based on seven AEMI papers, prepared by members of the group and circulated to participants in their initial draft form. AEMI Group presentations were each followed by a Roundtable Discussion with policymakers on the main issues raised and their conclusions. The final version of the AEMI papers is provided as part of this book.

6. The AEMI Forum Conclusions summarizes the agreed discussions from each of the four sessions of the AEMI Forum, i.e.: (a) Rationale for AEMI; (b) Benefits and challenges; (c) The promise of AEMI within the AEC; and (d) The way forward for AEMI within the

AEC. It also includes the two statements circulated at the end of the first and second day of the AEMI Forum and adopted unanimously by all its participants. The AEMI Forum Conclusions has been circulated to all Forum participants for their review and comments, which have all been incorporated.

Session 1: Rationale for AEMI

7. AEMI Group members presented the paper on the "Rationale for AEMI", which described the looming ASEAN energy gap and the challenges ahead. The AEC provides for arrangements and agreements to transform ASEAN into a single market with a free flow of goods, services, investment and skilled labor, so that resources go into their most productive uses within ASEAN for the benefit of all. The objective of AEMI is to extend the scope of such provisions to the energy sector – that is, to allow the free flow of energy products, services, investment and skilled labor in the framework of AEC, in order to achieve access to secure, affordable and sustainable energy sources for all ASEAN Member States (AMS).

8. AEMI would build on the ASEAN Plan of Action for Energy Cooperation (APAEC, 2010-2015), taking it a step further, from regional energy cooperation into energy integration. AEMI would deepen APAEC accomplishments by lifting the challenges it faces, and would broaden them by capturing the new opportunities provided within the AEC. The approach would move from Memoranda of Understanding to policy agreements at the ASEAN level; from coordination and harmonization on a bilateral basis, to framework agreements on a broader basis within the AEC; from piecemeal disparate actions as agreed upon during forums, to regional ASEAN energy policy formulation designed within an agreed framework; and from disparate decision-making entities, into a cohesive institutional framework within the AEC.

9. Overall, AEMI would be a logical progression of the APAEC and a credible successor to it in the broader context created by the AEC. AEMI would elevate key energy challenges to the AEC level, taking them beyond piecemeal trading arrangements to fully integrated policies and frameworks across ASEAN – thereby "Aseanizing" the approach. Such "Aseanization" of challenges would focus on those energy policies and institutional frameworks that would gain from being elevated to the ASEAN level for greater cohesion, efficiency and leverage within the AEC. If designed properly and implemented efficiently, AEMI has the potential to insulate net energy importers within the AEC from uncertainties of international oil markets, while offering net energy exporters a readily available and efficient market for their energy products and services, with leveraged investments to develop them. AEMI would also have the potential to preserve long-term secure and reliable supply of energy in the region, and to provide opportunities for private sector involvement in terms of investment, including financing, and technology transfer.

10. Participants overwhelmingly agreed with the vision of AEMI. Several reinforced the importance of focusing not only in the management of energy resources, but also on addressing the legal and regulatory frameworks as well as the technical, environmental and business perspectives for the production, distribution and consumption of energy. Several participants felt that the AEMI vision was not new, and that there was a strong case for energy market integration across ASEAN. However, they argued that the current formulation of AEMI was still missing a clear mechanism for its implementation as well as a timeline for its deployment, with specific goals and required next steps for the short, medium and long-term. Some felt that AEMI should also describe existing gaps in the current approach.

11. Most participants agreed that there were currently several challenges to achieving the AEMI vision, including political commitments, regulatory and legal frameworks, costly investments and a lack of a coherent roadmap to achieve it. AMS are currently relying mainly on bilateral agreements and domestic regulations to fulfill their national energy plans. However, such an approach is not sufficient. The ASEAN Power Grid (APG) and Trans-ASEAN Gas Pipeline (TAGP) projects are facing several challenges, including institutional bottle necks, legal and regulatory problems as well as technological limitations. Moreover, energy policy and pricing is also an obstacle to forming an integrated power market, with many AMS using different pricing and subsidies. Environmental concerns, national interests and private sector issues were also raised as challenges in the context of the current approach to energy coordination.

12. Regarding support for the completion of the APG, some participants stressed the need to address legal, institutional and regulatory challenges, including: harmonization of legal and regulatory frameworks for bilateral and cross border power interconnection and trade; formulation of institutional and contractual arrangements for cross border trade as well as legally binding commercial agreements. Moreover, the current approach needs to be broadened to address policy and technical issues, including: pricing, taxation, and tariffs; as well as agreements on technical codes and standards. Regarding support for the completion of the TAGP, some participants mentioned the need to tackle issues related to third party access, use/transit rights, as well as health, safety and environment (HSE).

13. Several participants recognized that AEMI was essential to the realization of the AEC. The importance of existing bilateral agreements and initiatives for further integration were acknowledged, but were deemed insufficient to achieve access to secure, affordable and sustainable energy sources within the AEC. It is important to move together as a region, rather than on a disparate bilateral or trilateral basis.

Session 2: Benefits and challenges

14. AEMI Group members presented three papers: "AEMI Benefits"; "AEMI and ASEAN energy poverty"; and "Addressing national constraints, energy pricing and subsidies in joining AEMI". The development of AEMI is an imperative requirement for the success of the AEC, given the vital role that energy plays in sustaining economic growth and in securing the well-being of people. AEMI holds the promise of enabling AMS to share the least cost energy resources, with the best attainable environmental impact, in order to achieve greater regional economic integration and international competitiveness. Based on their academic investigations, AEMI Group members reported that AEMI would be expected to reduce the cost of electricity generation, leverage regional investment on power infrastructure development projects and enhance reliability and energy security. By ensuring free flow of energy, AEMI would also result in more stable and converging energy prices across ASEAN, and would yield increased efficiency in the use of energy, improved access to it and an overall enhanced GDP growth across the AEC.

15. Furthermore, AEMI could be structured to improve access to energy as a key element for the success of the AEC. Within ASEAN, there are still more than 127 million people lacking access to electricity, and at least 228 million people without access to modern clean cooking fuels. AEMI could aim at developing a set of policies and frameworks for increasing access to energy through more efficient extensions of energy networks across ASEAN, and through the promotion of investment required for achieving the international development goal of "universal access to energy" by 2030.

16. Some participants suggested further studies of the key drivers of environmental benefits. This would include the impact of energy trading across a larger energy market within the AEC. It would also take into account the use of low carbon energy sources and the increasing role of low-carbon and zero-carbon energy technologies, and the reduction of the energy carbon content. Finally, one participant suggested that identified AEMI benefits are underestimated, as they do not take into account the potential reduction in energy poverty and the new job opportunities made possible by AEMI, which would have a multiplier effect in terms of economic growth and well-being.

17. Forum participants broadly agreed that AEMI benefits would not only encompass the economic dimensions exposed, but also the environmental and social ones, thereby contributing to a reduction of energy poverty and an improvement of the quality of life for ASEAN citizens. However, the majority of participants agreed that, in order to reap AEMI benefits, AMS would need to address a number of constraints. The AEMI Group identified some of these constraints at the national level:

    (a) The exit strategy on energy subsidies has not been discussed in-depth at ASEAN Ministers of Energy Meetings (AMEM);

    (b) There is still a high level of national resistance to conducting institutional reform of the energy market, due to political considerations;

    (c) For the APG to become efficient, each country needs to develop grid connections close to its borders, harmonize technical standards, minimize environmental impact, and reduce transmissions and distribution loss; and

    (d) While investing in pipelines is important for supporting the TAGP, it is equally important to build a trading hub, promote a competitive natural gas market, and develop a national gas infrastructure.

18. Several participants acknowledged these national challenges and recognized that addressing them was difficult. Others argued that efforts deployed so far to address them had been insufficient, e.g., the agreement on oil reserves (ASEAN Petroleum Security Agreement, APSA) is yet to be implemented. Several participants further highlighted national energy challenges, including: (a) the lack of access to modern clean energy sources, especially among the poorest population; (b) constraints on investment and technical knowledge; (c) the lack of political commitments to support energy investments that would be sustained beyond the political cycles; (d) the need to provide higher certainty to the private sector when designing and signing international agreements; and (e) the need for standardization and harmonization of regulatory systems, pricing strategies and technical standards, in order to realize the benefits of complementary energy endowments among AMS.

AEMI Forum first-day statement

19. At the conclusion of the first day of the Forum, a short summary of the discussions was circulated to participants for their review and approval. Participants unanimously agreed on the following statement:

    (a) Participants agree with the vision for AEMI within the AEC, building on the success and achievements of APAEC and going beyond.

    (b) Participants agree that there are key issues not adequately addressed in the current description of AEMI and recommend that they be further developed through:

        (i) A better understanding of national perspectives in joining AEMI, including national energy policies and pricing as well as the underlying political and cultural dimensions;

(ii) The environmental dimension, including resilience of energy supply, vulnerability assessment of energy infrastructure, and disaster preparedness and management;

(iii) Private sector involvement, in particular to attract investors in developing the energy business and attract needed investment;

(iv) The identification of concrete mechanisms that need to be employed to deliver AEMI;

(v) The highlighting of national perspectives in so far as benefits from AEMI and challenges in joining it are concerned, so as to clarify for national governments what needs to be done and when;

(vi) The identification of the minimum requirements for supporting the implementation of AEMI, both at the policy and institutional levels, starting with understanding the current conditions and identifying the barriers and challenges at both the regional and national levels, as the basis to establish the way forward. Among these minimum requirements, the Forum has already identified three:

a. The need to design a roadmap identifying the steps and their required key elements, the sequence and the timing for the delivery of AEMI as part of the AEC through 2030, with immediate, short-term as well as medium and long-term steps;

b. The need to harmonize the regulatory and legal frameworks across ASEAN, already started in APAEC but not yet sufficient;

c. The need to enhance cohesion at the institutional and governance levels for decision making within ASEAN.

(c) Regarding energy pricing, Forum participants more specifically unanimously agreed that:

(i) AEMI implementation would require more structured energy pricing policies across ASEAN;

(ii) Energy subsidies rationalization is important for the functioning of a free market. However, the rationalization of such subsidies can only be gradual through 2030, particularly in the context of addressing energy poverty;

(iii) There is a need to formulate more imaginative pricing and taxation options in the short and medium-term. For example, the use of equalization mechanisms, or the formulation of different instruments to tackle energy poverty and to support the most vulnerable communities;

(iv) A need to "decouple" energy pricing and welfare objectives, with different price packages offered for the poor population, and different instruments used to target the assistance to the poor.

(d) Forum participants unanimously agreed that AEMI would deliver benefits by promoting better energy efficiency, improving energy access, enhancing economy, reliability and energy security, and achieving higher GDP. However, in order to reap these benefits, the AMS will have to address the challenges that stand in their way. More specifically, this needs to be done within the framework of AEC:

(i) Building market infrastructure, in order to capture efficiency gains from an integrated energy market. This requires reforming the existing regulatory and legal frameworks, and harmonizing standards;

(ii) Harmonizing energy prices and subsidies, in order to allow the integrated market to work. This is a challenge requiring the development of alternative pricing options, taking into account developing countries' perspectives and the need to address energy poverty;

(iii) Identifying infrastructure needs in order to allow energy flow between net energy importers and net energy exporters. This will also allow the enhancement of access to energy services and products;

(iv) Enhancing the ability to diversify sources of energy, in order to ensure security of supply. This will require increased technological capacity for the development and deployment of renewable energy sources, and for tapping into energy efficiency and its significant potential savings;

(v) Enhancing public knowledge and acceptability of AEMI, in order to ensure political will as well as sustain policies and actions across different political cycles. This requires providing information, raising awareness and transparency in all transactions and projects.

(e) In addition, Forum participants unanimously suggested additional studies that focus on:

(i) Quantifying AEMI benefits, in terms of energy savings and improved interconnections. This needs to recognize the limitations of quantitative methods in capturing environmental and social dimensions;

(ii) Identifying investment costs that are needed for expanding infrastructure;

(iii) Bringing out benefits and challenges in terms of capacity-building, education, exchange of knowledge and the participation of civil society;

(iv) Highlighting business opportunities within ASEAN, including additional investments for building infrastructure and for developing the new technology industry.

Session 3: The promise of AEMI within the AEC

20. AEMI Group members presented the analysis developed in the Discussion Paper. Accomplishments by the APAECs will serve as the platform for launching AEMI and expediting its implementation. In addition to carrying out connectivity projects and infrastructure development, the design of AEMI will require combining energy policies and institutional frameworks in support of its efficient functioning and its strategic objectives. These will include policies aimed at pooling efforts across AEC, beyond individual national entities, in order to leverage talents and resources, and capture their benefits beyond national borders. The Forum discussed some of these building blocks as well as the initial elements of an AEMI Blueprint as presented in the Discussion Paper.

21. Most participants acknowledged the relevance of AEMI building blocks, and expressed their views on the level of difficulty in their implementation. Some noted that AMS energy markets are at different stages of their development and have different structures and policies – covering the entire spectrum from the most liberalized markets to monopolistic structures. Several participants suggested that future refinement of an AEMI blueprint and roadmap should take into account such diversity by acknowledging distinct national challenges and the degree of preparedness to join AEMI, including the economic, social as well as political and cultural dimensions.

22. All participants agreed that political commitment and public acceptance are pre-conditions for a successful design of AEMI and its implementation. The elements of the blueprint should be agreed by all AMS Governments, even though some policies would need to be implemented at the ASEAN level while others would remain at the national level. One participant stated that the sequencing of implementation should also be agreed upon by policymakers throughout AMS. Regarding AEMI guiding principles, some participants argued that common decisions should be binding on all AMS and commitments fully honored, if they are to be effective in delivering AEMI's vision. Others also noted that allowing each AMS to join AEMI at its own pace would add flexibility to the approach, and open the door to a "progressive and incremental" approach that should be considered in this context.

Session 4: The way forward for AEMI within the AEC

23. AEMI Group members presented three papers: "Institutional and governance dimensions of AEMI"; "The pathway to AEMI" and the "The political economy of AEMI". On the institutional and governance dimensions, while some measures could be undertaken on an *ad hoc* and bilateral basis, sustained moves towards a regional energy market requires delegation of authority or "pooling of sovereignty" in an agency charged with its implementation. This is necessary to overcome the national obstacles and to create the required unifying regional perspective. A period of gradual integration could be introduced, marked by the progressive build-up of trust, liberalization of domestic energy markets, and harmonization of polices, regulations and standards.

24. From the political perspective, the obstacles to implementing AEMI include the long-standing prevalent notions of sovereignty and nationalism; the relatively weak capacity of some AMS to govern a sector as technically and economically complex as energy; and the diversity of the current development stages of energy markets across ASEAN. Efforts may be best directed at making progress on AEMI "incrementally", either by focusing on a limited number of activities that cover most or all ASEAN countries, or by building closer energy market integration among a sub-set of ASEAN countries that are able and willing to participate, before further expansion within ASEAN.

25. AEMI members reported that the experiences of other regional energy markets around the world (e.g., the European Union, MERCOSUR and NAFTA) indicates that steps towards integration are interrelated and could be given varying degrees of emphasis, depending on initial market structures. Some of the common integration building blocks that have emerged include binding agreements, physical infrastructure, standardized or harmonized rules of operation, and common governing or coordinating institutions. To date, concerted ASEAN collective action related to energy has generally been limited to activities where the political and economic costs to the individual Governments are either negligible or do not outweigh the short-term benefits. Nevertheless, given the energy challenges that need to be addressed, it will be necessary to develop a clear strategy and a step-wise path for achieving AEMI by 2030. It will also be important to identify the sequencing of these steps, on the grounds of their interdependency, the net benefits they can deliver and the ease of their implementation.

26. There was a sense among participants that the path to AEMI (including the blueprint and roadmap) should emerge from the combined perspectives of policymakers, the private sector and civil society in each country. Participants agreed with the suggestion that "national teams" could be set up to combine such perspectives and participate in the establishment of AEMI.

27. Some participants mentioned that before choosing a path for AEMI, it would be important to identify common milestones, goals and targets. All participants recognized that current institutional arrangements within ASEAN are not sufficient to deliver AEMI. Capacity is still lacking and clearer governance structures will need to be established for these institutions to deliver the AEMI vision. The majority of the participants agreed that if the choice for AEMI were one of "high collective action" with full integration, this would require the creation of an oversight body as well as the establishment of stronger national commitments and legally binding agreements (e.g., a binding treaty). They also agreed that it would be important to go beyond bilateral agreements if AMS were to reap the full AEMI benefits.

28. The overwhelming majority of participants stated that in order to develop AEMI further, it is imperative to have political support from ASEAN energy policymakers at the highest level. There was a general consensus for presenting the AEMI vision to the forthcoming SOME and, subsequently, to AMEM in September 2013, and to actively involve ASEAN specialized bodies in the development of AEMI.

AEMI Forum concluding statement

29. At the conclusion of the AEMI Forum on the second day, a short statement was drafted and circulated to participants for their review and approval. Further to the unanimous first-day statement, Forum participants unanimously agreed on the following statement:

    (a) The Forum has expressed strong support for the vision of ASEAN Energy Market Integration (AEMI), within the framework of AEC, aiming for deployment through 2030.

    (b) The Forum recommends that its main conclusions be presented to the SOME to be held in Bali on September 2013.

    (c) The Forum further recommends that SOME invites AMEM in September 2013 to further support AEMI, by tasking SOE and all Specialized Energy Bodies (namely, HAPUA, ASCOPE, AFOC, RE-SSN, EE&C-SSN, NEC-SSN, REPP-SSN), coordinated by the REPP-SSN and supported by the ASEAN Secretariat and ACE, to develop a blueprint and a roadmap for AEMI, with appropriate goals and steps for the short term (2015), medium term (2020) and long term (2030).

    (d) The Forum also recommends that, in order to deliver this task, the REPP-SSN commission studies, both at the national and ASEAN levels, with technical support from the AEMI Group in delivering these studies.

    (e) Finally, the Forum recommends that the REPP-SSN presents a progress report on AEMI to the SOME in June 2014.

ANNEX:
AEMI FORUM AGENDA

AGENDA

ASEAN ENERGY MARKET INTEGRATION (AEMI)

AEMI FORUM

August 27-28, 2013, Montien Hotel Bangkok

Forum held under Chatham House Rule

DAY 1, AUGUST 27, 2013

8:30-9:00 **Registration and Coffee**

9:00-9:10 **Opening Remarks**

Professor Pirom Kamolratanakul, M.D., President of Chulalongkorn University

9:10-9:20 **AEMI Initiative: Approach and Objectives**

Dr. Suthiphand Chirathivat, Executive Director, ASEAN Studies Center

9:20-9:30 Photo Group Session

SESSION 1: RATIONALE FOR AEMI

9:30-10:30 **ASEAN energy challenge and response**

Speakers: Dr. Leong Yow Peng, Director, Institute of Energy Policy and Research, Universiti Tenaga Nasional, Malaysia

Dr. Nawal Kamel, Faculty of Economics, Chulalongkorn University

Moderator: Dr.Thierry Lefevre, Director, Centre for Energy-Environment Resources Development, Thailand. *Session includes question period.*

10:30-11:00 Coffee Break

11:00-12:00 **Roundtable Discussion: What AEMI brings to the APAEC 2012-2015?**

Participants: Senior Officials of Energy; ASEAN Council on Petroleum, Heads of ASEAN Power Utilities/Authorities, ASEAN Forum on Coal; Renewable Energy Subsector Network, Energy Efficiency and Conservation Subsector Network, Regional Energy Policy and Planning Subsector Network, Civilian Nuclear Energy Subsector Network; ASEAN Centre for Energy; ASEAN Secretariat.

Moderators: Dr. Philip Andrews-Speed, Principal Fellow, Energy Studies Institute, National University of Singapore

Dr. Nawal Kamel, Faculty of Economics, Chulalongkorn University

12:00-12:30 **Conclusion: What AEMI brings to the APAEC 2012-2015?**

All participants

12:30-14:00 Lunch

SESSION 2: BENEFITS AND CHALLENGES

14:00-15:00 **Assessing AEMI benefits and national constraints**

Speakers: Dr. Tri Widodo, Head of Economics Department, Universitas Gadjah Mada, Indonesia

Mr. Jessie L. Todoc, Alternative Energy, International Copper Association Southeast Asia, the Philippines

Dr. Maxensius Tri Sambodo, Researcher, Indonesian Institute of Sciences Economic Research Center, Indonesia

Moderator: Dr. Srinivasa Madhur, Director of Research, Cambodia Development Resource Institute. *Session includes question period.*

15:00-16:00 **Roundtable Discussion: Options to capture AEMI Benefits and Address its challenges?**

Participants: Senior Officials of Energy; ASEAN Council on Petroleum, Heads of ASEAN Power Utilities/Authorities, ASEAN Forum on Coal; Renewable Energy Subsector Network, Energy Efficiency and Conservation Subsector Network, Regional Energy Policy and Planning Subsector Network, Civilian Nuclear Energy Subsector Network; ASEAN Centre for Energy; ASEAN Secretariat.

Moderators: Dr. Philip Andrews-Speed, Principal Fellow, Energy Studies Institute, National University of Singapore

Dr. Nawal Kamel, Faculty of Economics, Chulalongkorn University

16:00-16:30 Coffee Break

16:30-17:00 **Conclusion: Options to capture AEMI Benefits and Address its challenges?**

All participants

17:00-17:45 **AEMI Forum Initial Messages**

Dr. Chayodom Sabhasri, Dean, Faculty of Economics, Chulalongkorn University

Dr. Bundhit Euaarporn, Director, Energy Research Institute, Chulalongkorn University

18:00-21:00 Welcome Dinner

DAY 2, AUGUST 28, 2013

8:30-9:00 **Registration and coffee**

9:00-9:20 **Opening remarks**

Mr. Tran Dong Phuong, Director Finance, Industries and Infrastructure, ASEAN Secretariat

Dr. Hardiv Situmeang, Executive Director, ASEAN Centre for Energy

9:20-9:30 **Moving forward with the AEMI Forum**

Dr. Chayodom Sabhasri, Dean, Faculty of Economics, Chulalongkorn University

SESSION 3: THE PROMISE OF AEMI WITHIN THE AEC

9:30-10:30 **AEMI guiding principles and draft Blueprint**

Speakers: Dr. Chayodom Sabhasri, Dean, Faculty of Economics, Chulalongkorn University

Dr. Nawal Kamel, Faculty of Economics, Chulalongkorn University

Moderator: Dr. Thierry Lefevre, Director, Centre for Energy-Environment Resources Development, Thailand. *Session includes question period*.

10:30-11:00 Coffee Break

11:00-12:00 **Roundtable Discussion: What are the gaps in AEMI draft Blueprint?**

Participants: Senior Officials of Energy; ASEAN Council on Petroleum, Heads of ASEAN Power Utilities/Authorities, ASEAN Forum on Coal; Renewable Energy Subsector Network, Energy Efficiency and Conservation Subsector Network, Regional Energy Policy and Planning Subsector Network, Civilian Nuclear Energy Subsector Network; ASEAN Centre for Energy; ASEAN Secretariat.

Moderators: Dr. Philip Andrews-Speed, Principal Fellow, Energy Studies Institute, National University of Singapore

Dr. Nawal Kamel, Faculty of Economics, Chulalongkorn University

12:00-12:30 **Conclusion: What are the gaps in AEMI draft Blueprint?**

All Participants

12:30-14:00 Lunch

SESSION 4: THE WAY FORWARD FOR AEMI WITHIN THE AEC

14:00-15:00 **The pathway to AEMI**

Speakers: Dr. Hezri Adnan, Senior Fellow, Technology, Innovation, Environment, and Sustainability, Institute of Strategic and International Studies, Malaysia

Dr. Philip Andrews-Speed, Principal Fellow, Energy Studies Institute, National University of Singapore

Moderator: Dr. Srinivasa Madhur, Director of Research, Cambodia Development Resource Institute. *Session includes question period.*

15:00-16:00 **Roundtable Discussion: What options for AEMI pathway?**

Participants: Senior Officials of Energy; ASEAN Council on Petroleum, Heads of ASEAN Power Utilities/Authorities, ASEAN Forum on Coal; Renewable Energy Subsector Network, Energy Efficiency and Conservation Subsector Network, Regional Energy Policy and Planning Subsector Network, Civilian Nuclear Energy Subsector Network; ASEAN Centre for Energy; ASEAN Secretariat.

Moderators: Dr. Bundhit Euaarporn, Director, Energy Research Institute, Chulalongkorn University

Dr. Nawal Kamel, Faculty of Economics, Chulalongkorn University

16:00-16:30 Coffee Break

16:30-17:00 **Conclusion: What options for AEMI pathway?**

All Participants

17:00-17:15 **Next Steps for AEMI Blueprint and Roadmap**

Dr. Suthiphand Chirathivat, Executive Director, ASEAN Studies Center

17:15-17:30 **AEMI FORUM CONCLUSIONS**

A statement is circulated for review and agreement by all participants. The statement captures agreed conclusions from the Forum discussions and outlines next steps to further develop AEMI as an integral part of the ASEAN Economic Community.

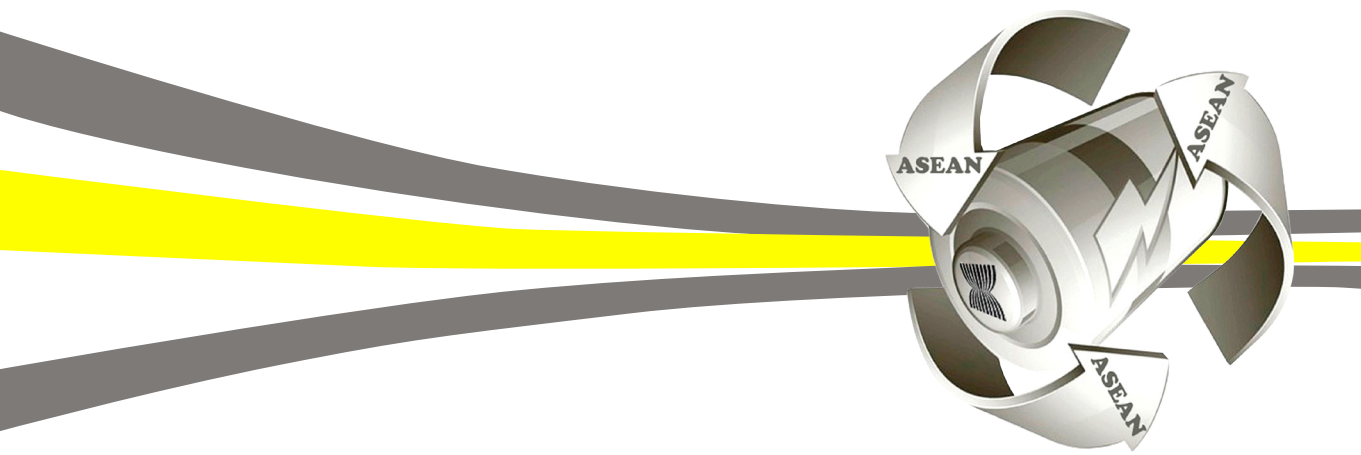
Professor Pirom Kamolratanakul, M.D., President of Chulalongkorn University

17:30-17:45 **Remarks by H.E. Pol. Lt. Gen. Dr. Wichianchot Sukchotrat, Vice Minister for Energy, Thailand**

17:45-18:00 Photo Group Session

18:00-21:00 Dinner

PART 2:
AEMI FORUM DISCUSSION PAPER



AEMI Forum Discussion paper[1]

Nawal Kamel[2]

I. Rationale for AEMI

A. ASEAN energy challenge[3]

1. Primary demand for energy in ASEAN is set to grow steadily at 4.4% per annum up to 2030 in the face of increased economic activities with a 5.2% growth per annum as well as population growth, greater electrification rates, and expansion of the transport sectors throughout the region.[4] The implication is practically a doubling of energy demand during that period, a significant increase in vulnerability in reliance on energy imports (particularly Middle East oil) and a doubling of ASEAN's contribution to global carbon emissions.[5] These developments are also set against a background in which notable segments of the population across ASEAN still lack access to modern and clean energy services, and are becoming increasingly vulnerable to climate change adversities.
2. Such prospects have raised serious concerns about the availability of conventional sources of energy to meet such a growing demand as well as about the implications for the environment in the region and beyond. There have been increasing calls for ASEAN to take urgent steps to address the situation, essentially through measures to curb and increase efficiency of energy demand, increase and diversify supply sources, and accelerate the transformation of energy markets (improve the energy investment climate and strengthen regional cooperation in sharing best practices).[6] Energy security and sustainability have therefore emerged at the top of the political and social agendas of ASEAN leaders.
3. More recently, the Asian Development Bank (ADB) featured a special chapter on Asia's energy challenges in its flagship annual report.[7] It asserts that one of Asia's biggest challenges is that its energy needs will expand in tandem with its growing economic influence, while its own energy endowment is not sufficient to sustain its growth prospects. It further argues that the region needs an ample supply of clean, affordable energy to continue its rapid growth in the coming decades.
4. The ADB report warns that in order to achieve energy security, developing Asia must actively contain its rising demand, aggressively explore new supply sources and technology, and

1 This chapter is the revised version of the Discussion Paper, which was prepared drawing on the AEMI papers and other related academic work. It was circulated to Forum participants to provide a synthesis of the research findings, and to serve as a guide for the discussions during the AEMI Forum. As such, it was structured along the lines of the AEMI Forum Agenda, with each section of this chapter corresponding to a session of the AEMI Forum.

2 Coordinator, AEMI Initiative, and Visiting Professor, Faculty of Economics, Chulalongkorn University, Thailand.

3 This section draws on the AEMI paper by Endang Jati Mat Sahid, Aishah Mohd Isa, Yow Peng Leong (lead) and Xunpeng Shi (2013), "Rationale for AEMI".

4 ACE, IEEJ and ESSPA (2011), *The 3rd ASEAN Energy Outlook*. ASEAN Centre for Energy; Institute of Energy Economics, Japan; National Teams of Energy Supply and Security Planning in the ASEAN Programme.

5 IEA (2012), *World Energy Outlook 2012,* International Energy Agency.

6 Numerous publications, notably by the Economic Research Institute for ASEAN and East Asia (ERIA); ASEAN Centre for Energy (ACE); International Energy Agency (IEA); Asian Development Bank (ADB); and World Bank Group (WBG).

7 ADB (2013), *ASIA Economic Outlook 2013*: *Asia's Energy Challenge*. Asian Development Bank.

progressively integrate regional energy markets and infrastructure. Expanding renewable energy sources will not be enough to meet such a future demand. Consequently, it concludes that Asia needs to invest in making conventional power cleaner and more efficient, and that it must aspire by 2030 to the degree of regional cooperation and integration in energy of the same type that currently prevails in Europe.

5. The ASEAN region has been experiencing rapid economic growth for the past few decades and is expected to expand further in the future; the regional economic growth projected for the next 25 years is encouraging and the Gross Domestic Product (GDP) per capita for ASEAN is projected to more than double from 2010 to 2030, reaching US$ 3,736 per capita (in 2000 US dollars). However, this economic growth will spur demand growth for energy, which is expected to more than double from 2010 to 2035. Energy demand for each ASEAN country (even Brunei Darussalam) is projected to continue increasing beyond 2030. For some countries, such as Indonesia and the Lao People's Democratic Republic, the increase is more than double the demand in the base year. The implications are energy production that is unable to meet the rapidly increasing demand, further widening the supply-demand gap.

6. The increasing energy gap for ASEAN countries can be attributed to two main factors, i.e., the rapidly increasing energy demand and the depleting energy reserves. There are also other factors that may further exacerbate the situation; for example, technically available renewable energy and hydropower potential may not be exploitable if the cost of harnessing this potential is too expensive, or the use of nuclear energy for electricity generation may not be pursued if perceived as a high risk to national safety and stability in the region.

7. Four potential mitigation measures for the energy gap are identified:

   (a) Efficient utilization of energy – enhancing energy efficiency (EE); reducing demand for personalized modes of transport and planned public transport schemes for the transportation sector; promotion of co-generation in industrial facilities; and tackling technology inefficiencies in the industry sector;

   (b) Reducing carbon content of energy – developing renewable energy; developing low carbon electricity; applying carbon capture and storage system at coal-based power plants; and increasing use of alternate fuels and cleaner sources of energy for the transport sector;

   (c) Diversifying sources of energy supply – intensifying hydro resources development; securing more gas from foreign sources; strengthening and expanding supply infrastructures to facilitate regional interconnection; and exploring and building capacity for the nuclear options; and

   (d) Expanding regional energy markets and supply infrastructure – a key measure needed to tackle the energy gap and security challenges. Energy resources in ASEAN are unevenly distributed; some countries are rich in fossil fuel resources, others have vast hydropower potential while some are resources-poor and have limited indigenous energy potential. This creates the core dynamics of a market, so long as the market infrastructure is established to allow for its efficient functioning.

B. ASEAN energy cooperation

8. As of 1997, ASEAN Heads of State embarked on energy cooperation with the declaration for ASEAN Vision 2020, which sought "to establish interconnecting arrangements for electricity, natural gas and water within ASEAN through the ASEAN Power Grid and the Trans-ASEAN Gas Pipeline and promote cooperation in energy efficiency and conservation, as well as development of new and renewable energy resources".

9. Since then, ASEAN leaders have adopted a number of initiatives to address these energy challenges, and have directed their Ministers of Energy to cooperate in delivering them.[8] The energy component of the ASEAN Economic Community Blueprint (2007) recognizes that the "secure and reliable supply of energy, including bio-fuel, is crucial to support and sustain economic and industrial activities".[9] It pledges to accelerate regional collaboration, specifically by taking action to:

   (a) Develop the interconnected oil and gas pipelines through the Trans-ASEAN Gas Pipeline (TAGP) and the ASEAN Power Grid (APG) projects;

   (b) Finalize the ASEAN Petroleum Security Agreement (APSA) to enhance oil and gas security;

   (c) Strengthen renewable energy development, such as bio-fuels, in view of the limited global reserves of fossil energy and the unstable world prices of fuel oil; and

   (d) Promote open trade, facilitation and cooperation in the renewable energy sector and related industries as well as investment in the infrastructure for renewable energy development.

10. Subsequently, in 2009, ASEAN Ministers reiterated their support for enhancing energy security, accessibility and sustainability, and agreed on 26 strategies and 91 actions towards these objectives through APAEC 2010-2015. This plan, the third in a series of action plans to cover the energy component of the ASEAN Economic Community Blueprint, serves as the blueprint for ASEAN cooperation in the field of energy, to ensure regional energy security while promoting efficient use and sharing of energy resources. More specifically, APAEC 2010-2015 directs ASEAN to enhance energy security and sustainability through accelerated implementation of seven components: (a) the APG; (b) the TAGP; (c) coal and clean coal technology; (d) renewable energy; (e) energy efficiency and conservation; (f) regional energy policy and planning, and (g) civilian nuclear energy.

11. It is interesting to note that the APAEC 2010-2015 document, while advocating the integration of energy networks (both pipelines and power grids), does not mention the introduction of trade/energy markets. The existing cross-border energy exchange thus far is limited to zero exchange or pre-established purchase agreements (bilateral).

12. In their latest meeting in 2012, ASEAN leaders strengthened the environmental dimension of their cooperation and pledged "to minimize any harm to the environment, ecosystem, nature and society aiming for reduction of global climate change".[10] They further pledged to ensure that ASEAN development would be "sustainable through, among others, mitigating greenhouse gas emissions by means of effective policies and measures, thus contributing to global climate change abatement."

13. Moreover, ASEAN Member States (AMS) recently ratified the agreement on the oil sharing scheme for emergency, i.e., the APSA, establishing the ASEAN Emergency Petroleum Sharing Scheme for crude oil and/or petroleum products in times or circumstances of both shortages and oversupply.[11] They also agreed on the Coordinated Emergency Response

8 ACE and KEEI (2013), *Development of the ASEAN Energy Sector,* ASEAN Centre for Energy and the Korea Energy Economics Institute; and Andrews-Speed, Philip (2012), *ASEAN The 45 Year Evolution of a Regional Institution,* University of Westminster, United Kingdom.

9 "ASEAN Economic Community Blueprint 2015", signed by ASEAN leaders in 2007, Articles 53-55.

10 ASEAN (2012), "ASEAN Green Connectivity", Joint Ministerial Statement, 30th ASEAN Ministers of Energy Meeting. Phnom Penh, Cambodia.

11 The ASEAN Petroleum Security Agreement (APSA) was signed in Manila in June 1986, and ratified recently by all ASEAN Member States (AMS). Implementation of the Coordinated Emergency Response Measures (CERM) was fully ratified by all AMS in March 2013.

Measures (CERM), under which all the AMS will endeavor to supply petroleum to another AMS in distress at an aggregate amount equal to 10% of that member's normal domestic requirement, on a voluntary and commercial basis.

14. APSA also includes voluntary oil stockpiling as one of the medium-term and long-term measures. The caveat is that oil stockpiling, whether individually or jointly by the AMS, is on a voluntary and commercial basis. Therefore, oil stockpiling is an option and not a stipulation to ensure supply security in times of emergency.[12] Moreover, across the AMS there are uneven oil stockpiles and capacities to storage oil. Unlike in the case of members of the International Energy Agency (IEA), effective coordination on the utilization of national oil stockpiles is absent.[13] Some argue that the AMS do not need such investment in oil stockpiles, and that such a capital intensive project is only affordable in developed countries. However, increasing ASEAN dependence on foreign oil makes AMS particularly vulnerable to energy supply disruptions.

C. Barriers to APAEC 2010-2015

15. The ASEAN Centre for Energy (ACE) and the Korea Energy Economics Institute (KEEI) recently carried out a joint review of the main components of APAEC 2010-2015 in order to identify the major challenges that ASEAN energy sector is facing in ensuring energy security and sustainable development.[14] The results of their research shed light on the major barriers to implementing the current cooperative approach. The review recognizes that realizing the objectives of ASEAN energy cooperation "do not merely require having the infrastructure available, but also having all the institutional, regulatory, legal, technical and economic aspects functional." It stresses the need to go beyond the current "piecemeal approach" based on "bilateral trade under pre-arranged power purchase and limited exchange", and towards the creation of "sub-regional integrated power grids and ultimately an integrated APG."

16. This joint APAEC review highlights the fact that actions under APAEC are undertaken essentially from a national perspective, and bilateral agreements are struck sporadically as piecemeal endeavors that do not add up to the cohesive, effective system needed to deliver secure, affordable and sustainable energy efficiently throughout the region. The overall conclusion is that the absence of policy and institutional dimensions constitute major barriers to the successful implementation of APAEC and greatly slow down its progress. Moreover, despite numerous resolutions and efforts for more than three decades, the APAEC review concedes that there is a lag in effectively delivering more cohesive ASEAN energy markets, and a sense that the political will for doing so is lacking.

17. Altogether, according to the ACE-KEEI review, APAEC 2010-2015 continues to face seven types of barriers that impede its ability to deliver its strategic goals on an efficient and timely basis. Overall, these barriers are: institutional and regulatory frameworks; tariffs, taxation and pricing; health, safety and the environment (HSE); financial availability; technology acquisition; security of energy supply; and political commitment. These are summarized in table 1, which also highlights the main recommendations for addressing them.

12 Youngho, Chang and Collin Koh (2009), "ASEAN Petroleum Security Act: Sealed or leaking?", *RSIS Commentaries*. S. Rajaratnam School of International Studies, Nanyang Technological University, Singapore; Suryadi, Beni (2012), "Hormuz and ASEAN: Are we ready?", *TheEnergyCollective.com*, available at http://theenergycollective.com/benisuryadi/81820/hormuz-and-asean-are-we-ready (accessed by 09 September 2013).

13 Every IEA member country has an obligation to stockpile 90 days of its net oil imports, which means if oil supply disruption happens, those countries will be able to continue their economic activities in normal practice for 90 days without any supply from outside.

14 ACE and KEEI (2013), *Development of ASEAN Energy Sector.* ASEAN Centre for Energy and Korea Energy Economics Institute.

18. The ASEAN Economic Community (AEC) provides for arrangements and agreements to transform ASEAN into a single market with a free flow of goods, services, investment and skilled labor, so that resources go into their most productive uses within ASEAN for the benefit of all. The objective of AEMI is to extend the scope of such provisions to the energy sector – that is, to allow the free flow of energy products, energy services and energy investments as well as energy skilled labor in the framework of the AEC, in order to achieve access to secure, affordable and sustainable energy sources within the AEC.[15] AEMI would thus build on the series of three APAECs, taking them a step further, from regional energy cooperation to regional energy integration.[16]

19. The AEC provides for the framework in which AEMI policies could be devised and implemented, with energy challenges elevated to an ASEAN level within the AEC. The argument is that the creation of the AEC opens up new approaches to addressing them, and increases their chances of success. This is because it offers a more effective approach than the current fragmented case-by-case solutions and Memoranda of Understanding (MoUs). More importantly, inherent to the creation of the AEC is the commitment to creating the market infrastructure for the free flow of products, services and investments. This approach would require that the same commitment be extended to the case of energy products, services and investment as well as skilled labor.

15 Consistent with a similar definition for Energy Market Integration (EMI) covering the East Asia Summit (EAS) countries, in ERIA (2010), *Energy Market integration in the East Asia Summit region: Review of Initiatives and Estimation of Benefits,* Economic Research Institute for ASEAN and East Asia.

16 For a full review of current ASEAN initiatives in the energy sector, please refer to ACE and KEEI (2013), *Development of ASEAN Energy Sector,* ASEAN Centre for Energy and Korea Energy Economics Institute.

Table 1. Barriers to APAEC

(1) Institutional and regulatory frameworks

(a) There is no specific ASEAN policy and institutional framework related to gas, power, RE or EE at the regional level. Instead, the approach is based on the signing of MoUs between the relevant AMS concerned, on a case-by-case basis, and relying on a long history of regional cooperation by resolving issues through ASEAN forums.

(b) APG and TAGP have MoUs, but the APG MoU has yet to develop a common ASEAN policy on power interconnection and trade. No MoUs have been signed on cooperating on RE and EE.

(c) The AMS have different technical standards, guidelines, regulations and procedures, which makes cross-border trade difficult to implement.

Recommendations:

(a) Establish a formal regional cooperation agreement for the planning, development and operation of ASEAN power grid and gas pipelines.

(b) Harmonize technical standards, guidelines, regulations, and common frameworks, in order to secure long-term investment and to alleviate associated barriers towards the realization of a fully-integrated power grid, and to make cross-border trade possible.

(c) Negotiate a multilateral arrangement or treaty at the ASEAN level to address the subject of transit passage rights in order to avoid future conflicts that could threaten the flow of gas and/or electricity. This would also facilitate the issuance of permits, licenses, consent or other forms of authorization for the passage of gas and electricity.

(d) Establish an ASEAN-level agreement to address policy, legal, regulatory and institutional frameworks for cross-border supply, transportation and distribution of gas and power of the proposed APG and TAGP networks. The newly-established ASEAN Energy Regulatory Network (AERN) is already assessing the regulatory frameworks for trade, investment and cross-border transmission of APG.

(2) Tariffs, taxation and pricing

(a) There are no harmonized common tariffs on energy trade. APG is planning to establish them, but it is not known whether this would relate to power purchase, energy exchange or other trade arrangements. Under the Greater Mekong Subregion (GMS) program, bilateral and case-by-case agreements are used.

(b) There is no harmonized taxation, which could distort competitiveness of resources and production and hamper cross-border trade. APG has not as yet addressed taxation issues. For TAGP, tax and duties on natural gas and pipelines are essential to commercial arrangements. Tax is set prior to the construction and operation of a pipeline, while tariff rates are a matter of commercial and contractual negotiation between parties.

Table 1. Barriers to APAEC *(continued)*

(c) Pricing of energy is treated differently across the AMS, which impedes the ability to structure cross-border projects, ensure their commercial viability and attract proper funding.

Recommendations:

(a) Agree on treaties for transnational pipelines to address taxation, import, export, transit passage or pipelines, product quality and technical infrastructure standards, settlement of cross-border disputes, contractual dispute resolution, and HSE quality standards.

(b) Harmonize tariffs, taxes and pricing of gas and electricity.

(3) Health, safety and the environment

(a) There are no HSE regulations at the regional level across AMS.

(b) There is no specific cooperation agreement or institutional arrangement to manage impacts on HSE for energy projects.

Recommendations:

(a) Devise safety measures and environmental requirements at the ASEAN level to govern the construction, operation, surveillance and maintenance of pipelines or power grid.

(b) Ensure reliability of operation, performance, and safety standards and procedures in generation and transmission of electricity interconnection.

(4) Financial availability

(a) More investment needs to be attracted to fund APG and TAGP, which are infrastructure projects that require large financial investments in their construction, operation and maintenance. Also needed is investment in gas exploration to reduce the region's reliance on crude oil.

(b) Securing funds for development and implementation of RE and EE technologies and their deployment is also difficult as they are perceived as high-risk projects.

Recommendations:

(a) Address the decisive factors in attracting investment, which are: (i) perceptions of each Government's long-term commitment; (ii) the existence of reliable and predictable policy and regulatory measures; and (iii) sound project economics.

(b) For RE and EE, devise systems for measuring, monitoring, verifying energy savings.

(5) Technology acquisition

(a) The capability to design, manufacture and deploy renewable and energy-efficiency technologies are weak in some AMS, with limited collaborative R&D.

Table 1. Barriers to APAEC *(continued)*

(b) Limited infrastructure also contributes to low levels of local manufacturing; consequently, most RE and EE equipment is imported from other countries.

(c) The AMS do not all have national standards for renewable energy or for efficient use of energy. Testing and certification labs in most AMS are inadequate, which leads to difficulties in enforcing technical standards and prevents local product development.

Recommendations:

(a) Agree on an ASEAN commitment to cooperate in technological innovation and acquisition.

(b) Devise ASEAN standards for renewable energy or for efficient use of energy.

(6) Security of energy supply

Recommendations:

(a) APG and TAGP need to ensure energy security through reliability of electricity and gas supplies for the AMS.

(b) RE and EE must be developed to enhance AMS energy security through greater diversification and enhanced utilization of energy sources.

(7) Political commitment

(a) Governments' firm commitments are strongly required to deliver APG and TAGP infrastructure projects according to Master Plans. Absence of firm commitments results in delays in project execution and difficulties in attracting investment. The regional power grid has been on the agenda of ASEAN for more than a decade now, and has not been progressing as timely as planned.

(b) Lack of firm commitment from Governments could also be the indirect cause of possible diverted budgetary resources and deterred foreign investment.

(c) The AMS have yet to agree on an approach to share investments needed for APG and TAGP projects, as these have not been specified in detail.

(d) There is a perception that trans-boundary gas pipeline could create dependency situations like those between the Russian Federation and Ukraine.

Recommendation:

The AMS Governments must demonstrate commitment to energy cooperation in order to encourage investment from private sector currently available in the region.

Sources: Author's analysis and compilation based on APAEC 2010-2015; and ACE and KEEI (2013), *Development of ASEAN energy sector: Power network interconnection, natural gas infrastructure and promotion of renewable energy and energy efficiency*, ASEAN Centre for Energy and Korea Energy Economics Institute.

D. Building on APAEC accomplishments

20. ASEAN energy cooperation has gone through a series of three APAECs and has successfully delivered notable successes towards this objective. However, after several decades of cooperation, the underlying approach characterized essentially by coordination on energy projects has reached its limit. It is facing several barriers that are impeding the successful delivery of its major projects in a timely fashion. The time has come to reconsider the fundamentals of the approach, and to capture the new opportunities made possible by the advent of the AEC. The successor of APAEC needs to move beyond coordination of joint efforts to integration of energy markets for greater cohesion and leverage.

21. AEMI will strive to deepen APAEC accomplishments by addressing the challenges it has faced, and broaden them through its set of expanded policies and frameworks across the AEC. To reach its full objectives, AEMI will be designed so as to introduce policies and create frameworks at the AEC level that will lift the barriers facing APAEC implementation, by elevating challenges beyond coordination on a case-by-case basis, into integration across ASEAN. The major tenor of the AEMI initiative is that while increased cooperation across ASEAN constitutes a positive development, elevating the approach to energy market integration would be more effective in addressing the looming energy challenge.[17]

22. AEMI will therefore deliver a successor to APAEC that will go from coordination to integration, from bilateral negotiations to ASEAN deliberations – effectively performing an "Aseanization" of approaches to addressing ASEAN challenges. Such approaches would lift the barriers and fill the gaps where they have been identified, thereby deepening APAEC accomplishments and broadening them within the AEC. Table 2 outlines the policies and framework that AEMI would adopt to address the challenges faced by APAEC, deepening its accomplishments by lifting the barriers on its way.

E. Energy market integration in East Asia

23. Since 2007, leaders of the East Asia Summit (EAS) and their Energy Ministers have embraced the ASEAN energy agenda, and have taken it a step further.[18] Going beyond the ASEAN cooperation model based on cooperation in delivering projects for joint connectivity, EAS has adopted a more efficient approach and an ambitious agenda to address the region's energy challenge. Those countries have pledged to establish an open and competitive energy market across the region, and further identified the creation of Energy Market Integration (EMI) as one of their major priorities. The vision for EMI encapsulates an energy policy agenda across EAS members to address all aspects of its implementation – including trade liberalization, investment environments, energy pricing reform, removal of trade and investment barriers, liberalization of the energy markets and the development of an energy infrastructure. It also introduces cohesion in the governance and regulatory environments across the EAS energy markets.

17 The case for energy market integration at the pan-Asian level was made in the feature chapter ADB (2013) "Asia's energy challenge" in *Asian Development Outlook 2013*, Asian Development Bank.

18 The East Asia Summit (EAS, 2005) countries include the 10 AMS plus the six ASEAN Dialogue Partners: Australia, China, India, Japan, the Republic of Korea and New Zealand.

Table 2. AEMI deepening accomplishments: Lifting APAEC barriers

AEMI Strategic Goal (Within the AEC)	AEMI actions (Policies and frameworks)
Create an efficient ASEAN energy market within the AEC, with a free flow of energy products, services and investment as well as skilled labor.	Creating the AEC requires lifting all tariff and non-tariff barriers to trading of goods, services and investment as well as harmonizing the legal, regulatory and institutional frameworks. Therefore, by including energy as part of the vision for the realization of the AEC it will be necessary to: ▪ Design institutional, legal and regulatory frameworks; ▪ Formulate proper trade and investment policies; ▪ Address energy pricing and subsidies across ASEAN; ▪ Harmonize tariff, taxation and pricing; ▪ Formulate HSE measures and environmental requirements. *Lifts three barriers identified under APAEC (as identified in table 1): Institutional and regulatory frameworks; Tariffs, taxation and pricing; HSE.*
Leverage energy investment	AEMI would create a consolidated energy market, with greater commercial viability and opportunities to attract investors, and leverage financing. This would secure long-term investment and alleviate associated barriers towards realization of large infrastructure projects. *Lifts barrier identified under APAEC (as identified in table 1): Financial availability.*
Expand technology acquisition and deployment	AEMI would forge ASEAN-level commitment to cooperate on technological innovation and acquisition; this is consistent with the AEC objectives for sustained growth and narrowing development gaps. It would also open up new business opportunities and quality jobs for skilled labor across ASEAN. AEMI would, within the AEC framework: ▪ Establish an ASEAN commitment to cooperate on technological innovation and acquisition; ▪ Devise ASEAN standards for renewable energy or for efficient use of energy. *Lifts barrier identified under APAEC (as identified in table 1): Technological acquisition.*

Table 2. AEMI deepening accomplishments: Lifting APAEC barriers (*continued*)

AEMI Strategic Goal (Within the AEC)	AEMI actions (Policies and frameworks)
Enhance energy security	Energy security is essential to the success of industrial development across the AEC, and represents a precondition for AEC ability to achieve and maintain sustainable growth. AEMI would provide the framework to address the issue of security of supply across ASEAN. The AEMI vision is to enhance energy security as it will allow for the efficient free-flow of energy from net exporters to net importers across the AEC, thereby securing energy sources for importers and extending resources and development opportunities to exporters. AEMI support for the creation of new technology and its deployment will increase energy security by helping to: (a) generate alternative sources of energy and their commercialization; (b) diversify energy sources; and (c) decrease dependence on foreign markets. AEMI could consider creation of own ASEAN emergency stocks of oil and gas reserves, together with effective coordination on the utilization of such energy stockpile. This could be construed as the next step for enhancing APSA within the AEC, as there are uneven oil stockpiles and uneven capacities to store oil across the AEC. *Lifts barrier under APAEC (as identified in table 1): Security of energy supply.*
Create political cohesion and commitment	Adoption of AEMI as an integral part of the AEC will generate a clear demonstration of commitment to supporting the development of an ASEAN energy sector, and will go a long way towards lifting the political uncertainties for investment. Such political support could unlock the energy to tackle sensitive issues such as the inclusion of a cost-sharing formula for investment in infrastructure projects across the AEC. Political support will also help alleviate concerns about the creation of interdependency through connectivity projects (notably gas pipelines and electric grids). These will be viewed in a broader perspective as the AEC, and within it AEMI, are about to generate several inter-linkages, and create interdependence and co-dependence at several levels, allowing for new ways to address these fears. *Lifts barrier under APAEC (as identified in table 1): Political commitment.*

Sources: Author's analysis drawing on ACE and KEEI (2013), *Development of ASEAN Energy Sector: Power network interconnection, natural gas infrastructure and promotion of renewable energy and energy efficiency*, ASEAN Centre for Energy and Korea Energy Economics Institute.

24. Work has started on EMI, fueled by an emerging consensus that a successful EMI would enhance energy security and environmental viability across the region and undoubtedly yield significant economic benefits for all involved.[19] Several actions have been taken in the direction of EMI and several more are being planned for the near future and beyond.[20] Nevertheless, analysts recognize now that the realization of EMI across the 16 EAS nations is a considerable undertaking that will likely take several decades to accomplish, and one that is probably best started at the sub-regional level.[21] AEMI would represent a gradual approach towards the full realization of EMI, starting with integration within ASEAN before its expansion to the six dialogue partners in EAS nations.

25. The question is whether ASEAN can afford to wait until EMI is established across the EAS area. Postponing such issues would run the risk of undermining ASEAN growth prospects, increasing energy costs for consumers and businesses, and weakening ASEAN competitiveness and quality of life. Given the lead time necessary to agree on a common course of action and to adjust energy systems, AMS need to start addressing this challenge as part of the creation of the AEC in 2015. This would also be the first necessary step towards building the broader and more ambitious EMI.

II. Benefits and challenges

A. Benefits[22]

26. Overall, AEMI holds the promise of enabling the AMS to share the least cost energy resources, with the best attainable environmental impact, in order to achieve greater regional economic integration and international competitiveness. It is expected to reduce the cost of electricity generation, facilitate regional investment on infrastructure projects (notably power development projects) and provide the possibility of adequate energy reserves. From an economic perspective, AEMI would make prices of energy products converge within the AEC, and become more stable, allowing firms to be more efficient and competitive.

27. Overall, at the macroeconomic level, higher welfare – measured in equivalent variation (EV) – and increases in GDP among member countries are also seen as the main economic benefits of AEMI. Econometric modeling indicates that welfare benefits will be realized by all AMS. Moreover, ASEAN could realize an overall increase in real GDP that could reach between 1% and 3% of real GDP. Specifically, real GDP would be 0.89% higher for Cambodia and 3.46% higher for Malaysia. Other economic benefits would be converging and stable prices, higher foreign direct investment in the region and more elastic demand that gives consumers more choices.

28. Apart from these strictly economic benefits, AEMI would bring environmental benefits and social benefits, including increased energy security, higher energy efficiency, lower energy system costs, higher level in energy diversification. By linking energy deficient countries to energy abundant countries in the region, AEMI would enhance the level of energy security, and boost development prospects across the AEC.

19 A number of policy investigations have been carried out and academic papers produced, notably commissioned by ERIA as part of the project on Energy Market Integration in the East Asia Summit Region (EMI), 2010-2012.

20 Sheng, Yu and Xunpeng Shi (2011), *Energy Market integration and Economic Convergence: Implications for East Asia*, Economic Research Institute for ASEAN and East Asia.

21 Andrews-Speed, Philip (2011), *Energy Market Integration in East Asia: A Regional Public Good Approach,* Economic Research Institute for ASEAN and East Asia.

22 This section is drawn from the conclusion of the AEMI paper by Chang, Youngho (lead), Tri Widodo, Nguyen Thi Mai Anh and Phouphet Kyophilavong (2013), "AEMI benefits".

29. AEMI would also reduce energy intensity across ASEAN and thus increase energy efficiency. The integrated energy market is expected to decrease energy system costs by 3% in the scenario of up to 20% of national energy demand is imported, and by 3.9% if up to 50% is imported. AEMI would enhance energy diversification and make AMS more resilient to exogenous energy shocks, in part due to a more varied fuel mix as well as higher availability of efficient and cleaner fuels. AEMI would raise energy development indicators by enabling access to new sources of energy producing lower amounts of carbon dioxide emissions and other pollutants. A simulation study of power trade between two countries shows that the power trade via the integrated energy market could decrease carbon dioxide emissions by 2% compared with a base case scenario with no such integration.

30. The various benefits arising from AEMI support the necessity for integrating energy markets in the region. These benefits could easily materialize under the AEC if energy products and services were to be freely flowing. In fact, AEMI is a necessary requirement towards the AEC. These findings recommend carrying out a holistic study that could verify and accurately quantify the totality of AEMI benefits at national AMS levels as well as at the broader consolidated AEC level.

B. Energy poverty[23]

31. Integration of energy markets would allow national Governments to address energy policy challenges more effectively and efficiently than they are able to do on their own. Challenges that would benefit from such a broader approach include: (a) enhancing security of energy supply and/or demand; (b) improving economic efficiency of the energy sector; (c) increasing social equity, particularly with regard to access to affordable energy; and (d) reducing emissions of pollutants. Energy security has been the first priority among these policies, and energy security itself rests on the three pillars of adequacy and reliability of physical energy supply, environmental sustainability and affordable access.

32. The strong connection between AEMI and energy poverty has been established both at the macro and the energy sector levels. At the macro level, energy market integration can contribute to national economic growth and development by facilitating the catching up by less developed economies with those more developed. However, this will not be possible without addressing the issue of energy poverty and increasing energy access. The lack of access to modern energy services is a serious hindrance to economic and social development, and must be overcome if the United Nations Millennium Development Goals (MDGs) are to be achieved and sustained.

33. AEMI cannot realize its vision without addressing the situation of more than 127 million people in ASEAN who lack access to electricity, and at least 228 million people without access to modern cooking fuels and technologies.[24] However, ASEAN recognizes the severity of the energy poverty situation in the region and is committed to closing the gap in energy access through energy cooperation, which to all intents and purposes is the precursor to energy market integration.

34. It is necessary to estimate the direct and indirect impacts of energy prices subsidy reform on the poor. Assessing the impacts of fossil-fuel subsidy reform is required convincingly making the case for reform and for designing policies to reduce the impact of higher fuel prices on the poor. It will then be necessary to design alternative methods to subsidize energy for the truly needy, at the same time as ensuring that those that can afford to are paying the full cost of the energy they use.

23 This section is drawn from the conclusion of the AEMI paper by Navarro, Adoracion, Maxensius Tri Sambodo and Jessie L. Todoc (lead) (2013), "AEMI and ASEAN energy poverty".

24 Based on the most recent IEA data.

35. It is also necessary to estimate the investment requirements for achieving universal energy access by 2030 across ASEAN, and investigating financing options for their realization. Such a task could be undertaken in cooperation with the IEA and the Organization for Economic Co-operation and Development. This undertaking should not be limited to estimating the investment requirements solely in United States dollar terms, but more importantly should include the technological requirements to support such investments as well as their potential sources of financing. Above all, such an undertaking should allow AEMI to address the challenge of energy access, as AEMI cannot be fully realized as long as some people in the region are without access to clean energy.

C. National constraints[25]

36. Energy prices vary considerably across ASEAN, due to various structures of energy consumption and different national policies. For example, the residential sector is the largest final consumer of energy in Indonesia and Viet Nam, whereas transportation is the largest in Brunei Darussalam, Malaysia, the Philippines, Singapore and Thailand. Such existing variations within the structure of energy prices and consumption indicate the need for flexibility in implementing AEMI, as a rigid implementation could create "winners" and "losers" across ASEAN, and increase the challenges for establishing the AEC.[26]

37. The implication is that energy policy across ASEAN should not be implemented across the board without country-specific considerations. Instead, it should demonstrate a significant amount of flexibility to allow for country differences, and to build on the substantial amount of complementarity across the AEC. Therefore the energy strategy should identify areas of complementarity that are of advantage to the ASEAN community.[27]

38. National constraints are divided into two main dimensions, i.e., policy and institutional challenges (notably energy pricing policy), and infrastructural constraints (as in the case of the APG and TAGP). In this regard, there are four main findings relevant to the adoption of AEMI and its implementation:

    (a) The exit strategy on energy subsidies has not been discussed in-depth at ASEAN Ministers of Energy Meetings (AMEM). As a result, most of ASEAN countries still provide energy subsidies of different degrees, although fossil fuel subsidies not only cause over-consumption of such fuels but also reduce the incentives for investment in energy efficiency and renewable energy;

    (b) There is still a high level of national resistance to conducting institutional reform of the energy market, due to political considerations;

    (c) The success of the APG requires each country to develop grid connections close to the border, harmonize technical standards, minimize environmental impact, and reduce transmissions and distribution loss; and

    (d) While investing in pipelines is an important component of the support for TAGP success, it is also important to prepare a trading hub, promote a competitive natural gas market and develop a national gas market infrastructure.

25 This section is from the conclusion of the AEMI paper by Sambodo, Maxensius Tri (lead), Adoracion Navarro and Tran Van Binh, (2013) "Addressing national constraints, energy pricing and subsidies in joining AEMI".

26 Ditya Agung Nurdianto and Budy Prasetyo Resosudarmo (2011), *Prospects and Challenges for an ASEAN Energy Integration Policy*, Australia National University, Canberra, Australia.

27 Ibid.

III. The promise of AEMI within the AEC

A. AEMI strategic objectives

39. The AEMI vision is to gradually build a regional energy market by 2030 that will allow a free flow of energy goods, services, investment and skilled labor within the AEC framework. AEMI would therefore be geared towards building a competitive, secure and sustainable energy market in the framework of the AEC. As such, it would create opportunities for more efficient sharing of energy resources, diversifying its sources, and securing energy availability for citizens and businesses throughout the AEC.

40. If properly structured, AEMI would have the potential to insulate net energy importers within the AEC from the uncertainties of international oil markets, while offering net energy exporters a readily available and efficient market for their energy products and services, together with investments to develop them. Moreover, AEMI would deliver a number of benefits as part of the AEC agenda, from the economic, social and environmental perspectives.

41. The development of AEMI is an imperative requirement for the success of the AEC, given the vital role that energy plays in sustaining economic growth and in securing the well-being of its people. The fundamental concept is predicated on a solid understanding that an integrated energy sector is essential to the well-being of all AMS, and represents a necessary condition for the sustainability of the ASEAN economic aspirations within the AEC. Indeed, the AEC will not be able to deliver an efficient economic integration in the absence of an underlying integration of its energy markets. In other words, the AEC cannot succeed without AEMI.

42. The experience of energy market integration around the world (notably in the European Union) illustrates the enormity of the challenge ahead. However, ASEAN has a far better chance today of making good progress, guided by its ASEAN way of doing business, the lessons from successes and failures from around the world, and, most importantly, the creation of the AEC, which will provide the proper framework for nurturing it and delivering its promises.

43. Moreover, AEMI would come in the context of a history of energy market cooperation within ASEAN, starting with the first energy agreement signed between Thailand and the Lao People's Democratic Republic in 1966, and evolving through all the initiatives that have been conducted since then.[28] It would be built on the experience of major energy infrastructure projects within ASEAN, notably in the GMS where the six countries involved are expected to be interconnected by 2020.[29] Finally, it would also be built on the ongoing and current initiatives within APAEC 2010-2015, and could be construed as its natural successor.

B. AEMI building blocks

44. In addition to carrying over connectivity projects and infrastructure development, the design of AEMI will require combining energy policies and institutional frameworks to be established within the AEC, in support of its efficient functioning and delivery of its

28 For a review of initiatives towards integrating the energy market in the EAS region refer to ERIA (2010), *Energy Market integration in the East Asia Summit Region: Review of Initiatives and Estimation of Benefits*, Economic Research Institute for ASEAN and East Asia.

29 The GMS includes Cambodia, the Lao People's Democratic Republic, Myanmar, Thailand and Viet Nam as well as two southern provinces of China.

aspirations. The core objectives of AEMI will be to identify such instruments through two distinct components:

(a) "Hardware" components (e.g., infrastructure, physical energy trading), including connectivity projects (such as APG and TAGP) and the deployment of new technology for energy efficiency and renewable energy; and

(b) "Software" components (e.g., policies, standards and regulations), including energy policies and required institutional frameworks. These include the regulatory, legal, governance and institutional frameworks for proper commercialization of products and services, efficient decision-making, and effectual implementation of resolutions and operations.

45. In designing its key components, AEMI will focus on energy policies and institutional frameworks that would gain from being elevated to the ASEAN level, or "Aseanized" within the AEC for greater cohesion, efficiency and leverage. These are the hardware and software components that represent a challenge to deal with at the bilateral or even multilateral level, and that are best addressed in a concerted manner within the AEC framework. They would constitute AEMI building blocks and would essentially capture AEMI value-added relative to the current piecemeal approach.

46. AEMI "software" will comprise a series of policies and frameworks that will allow AEMI to deliver its strategic objectives. These will include policies aimed at pooling efforts across AEC, beyond individual national entities, in order to leverage talents and resources, and capture their benefits beyond national borders. These would address the challenges difficult for any nation to accomplish alone, and which would be greatly facilitated by ASEAN joining forces and multiplying impacts.

47. Overall, AEMI "software" will be an integral part of the efficient functioning of the AEC, and will provide a more efficient way to address joint and common challenges. It will create value-added for ASEAN from effectively pooling resources and leveraging them through broader markets and larger capacity. In particular, such policies would contribute to:

(a) Producing a critical mass for commercialization and leveraging of innovation, products and services;

(b) Creating an environment more conducive to investment, with the larger market; and

(c) Creating a higher level of political commitment, embraced within the AEC, and therefore offer a more stable political commitment over an approach involving varied entities.

C. From APAEC to AEMI

48. Accomplishments by the APAECs will serve as the platform for launching AEMI and expediting its implementation. Building on such accomplishments, and capturing the new opportunities provided by the AEC, the approach would move from: (a) MoUs to policy agreements at the ASEAN level; (b) coordination and harmonization on a project basis to framework agreements on a broader basis within the AEC; (c) piecemeal disparate actions as agreed upon during forums to regional ASEAN energy policy formulation designed within an agreed framework; and (d) disparate decision-making entities into a cohesive institutional framework within the AEC.

49. Overall, AEMI would be a logical progression of APAEC and its natural successor in the context of the AEC. AEMI would elevate energy challenges to the AEC level, taking APAEC beyond piecemeal arrangements into fully integrated policies and frameworks across ASEAN. It would create the infrastructure for an ASEAN energy market within the AEC, thereby bringing cohesion to current projects and action, and establishing the institutional

frameworks to adopt and implement them. Such "Aseanization" of challenges would deepen APAEC accomplishments by lifting the barriers it is currently facing, and broadening them through opportunities made possible by the creation of the AEC.

50. For AEMI to address the APAEC barriers identified earlier and deepen its accomplishments, it will need to develop a set of policies and frameworks within the AEC that will focus on five major building blocks as identified above:
    (a) Create an efficient ASEAN energy market within the AEC;
    (b) Leverage energy investment;
    (c) Expand technology acquisition and deployment;
    (d) Enhance energy security;
    (e) Create political cohesion and commitment.

51. Furthermore, AEMI would also further expand its objectives beyond the current APAEC, by broadening its perspective and the scope of its action, leveraging the value-added from the integrated ASEAN energy market. As such, AEMI will focus on four additional building blocks:
    (a) Improve energy access and alleviate energy poverty;
    (b) Enhance human and institutional capacity;
    (c) Pool efforts to expand renewable energy and energy efficiency;
    (d) Improve energy conservation.

52. An overview of AEMI's building blocks (policies and frameworks) for deepening and broadening APAEC accomplishments is presented in table 3. Overall, identifying specific action and policy components for AEMI to deliver its mission will yield the initial elements of an AEMI Blueprint, as presented in table 4.

IV. The way forward for AEMI within the AEC

A. Guiding principles

53. AEMI would be developed as an integral component of the AEC. As such, it would be based on three principles, fundamental to the ASEAN Way:
    (a) Overall mutual benefits for the AMS and the AEC;
    (b) Mutual respect as well as commitment for integration within the AEC;
    (c) A step-by-step gradual approach, with long-term perspectives for deployment through 2030.

54. As a result, specific principles could guide any further discussion for the design and development of AEMI within the AEC. Consistent with the ASEAN Way, these include:
    (a) Leverage – AEMI would be designed around actions that have a comparative advantage to being elevated to the AEC level, relative to being treated at the national level;
    (b) Complementarity – AEMI would be based on the recognized synergies attained by the AMS joining forces to address common challenges. AEMI would include an ASEAN energy policy that would be complementary to national energy policies. Furthermore, AEMI would be consistent with the AEC objectives, given the cross-cutting nature of energy as a key input to economic activities;

(c) Flexibility – AEMI would lend itself to targeted and programmatic implementation of its constituent elements. This could be relevant, for example, in (i) the case of the creation of ASEAN strategic reserves and modalities associated with it, and (ii) the case of diversification of the energy mix and increase in the proportion of renewables in the production of energy.

Table 3. From APAEC to AEMI: Deepening and broadening accomplishments

AEMI (Integrated policies and frameworks)	APAEC (Coordinated programs and actions)
Deepening accomplishments	**Lifting barriers**
Create an efficient ASEAN energy market within the AEC, with a free flow of energy products, services, investment and skilled labor.	This lifts barriers identified under APAEC: - Institutional and Regulatory - Tariffs, taxation and pricing - HSE.
Leverage energy investment.	This lifts barrier identified under APAEC - Financial availability.
Expand technology acquisition and deployment.	This lifts barrier identified under APAEC - Technology acquisition.
Enhance energy security.	This lifts barrier identified under APAEC - Security of supply.
Create political cohesion and commitment.	This lifts barrier identified under APAEC - Political commitment.
Broadening accomplishments	**Capturing AEC opportunities[30]**
Improve energy access to a vast majority of ASEAN people and alleviate energy poverty.	
Enhance human and institutional capacity.	
Pool efforts to expand renewable energy (RE) and energy efficiency (EE) through a more broadly integrated ASEAN market.	
Improve energy conservation.	

Sources: Author's analysis and compilation drawing on APAEC 2010-2015, and ACE and KEEI (2013), *Development of ASEAN Energy Sector: Power network interconnection, natural gas infrastructure and promotion of renewable energy and energy efficiency*, ASEAN Centre for Energy and Korea Energy Economics Institute.

30 Building blocks not covered as such under APAEC 2010-2015.

Table 4. AEMI blueprint components for consideration

I. Create an efficient ASEAN energy market within the AEC

(a) Commit to the free flow of energy products (crude oil, petroleum products, natural gas and coal), services, investment as well as skilled labor within the AEC;

(b) Create the enabling framework to enhance the integration of energy markets, gain benefits from economies of scale and enhance the viable exploitation of renewable energy sources;

(c) Build market fundamentals, including: the design of the appropriate institutional, legal and regulatory frameworks; and formulation of proper trade and investment policies;

(d) Address energy pricing and subsidies across ASEAN, and harmonize tariffs, taxation and pricing;

(e) Optimize use of energy resources and transportation across the AEC (oil, natural gas and coal) to secure energy supplies at lower prices and improve the competitiveness of ASEAN industries;

(f) Design appropriate standards related to energy resources as well as the framework for their implementation and enforcement;

(g) Ensure the long-term sustainability of the electricity sector (power generation, transmission and distribution) through timely investments in infrastructure and appropriate technologies; increase the use of renewable energy; improve the legislative and regulatory framework; and increase cross-border trade of electricity, including that generated from renewable energy sources; and design programmed expansion of electricity generation, transmission, distribution and trade.

II. Leverage energy investment

(a) Undertake the necessary reforms to encourage and leverage greater investment in the energy sector in production, transformation and distribution of viable energy resources;

(b) Design an approach to exploring and establishing an institutional framework for leveraging financing mechanisms for the development of viable energy resources;

(c) Provide the proper investment climate for greater collaboration between the private and public sectors in the development of energy resources.

III. Expand technology acquisition and deployment

(a) Scale up new technology at the production and transmission levels (particularly for the grid) in order to generate clean energy technologies (particularly for coal);

(b) Create the critical mass for potential use of the Clean Development Mechanism (CDM) as part of the contribution to address environmental concerns;

(c) Increase technology transfer and information sharing.

Table 4. AEMI blueprint components for consideration *(continued)*

IV. Enhance energy security

(a) Ensure increased energy security through timely access to adequate, reliable and affordable supplies of energy by all AMS within the AEC;

(b) Develop sustainable and secure energy supplies through the diversification of energy sources, and investment in energy infrastructure and connectivity;

(c) Support the creation of new technology and its deployment in order to increase energy security, by helping to (i) generate alternative sources of energy and their commercialization, (ii) diversify energy sources, (ii) protect the environment, (iii) decrease dependence on foreign markets, and (iv) increase energy supply diversification and affordability;

(d) Create ASEAN emergency stocks of oil and gas reserves, together with effective coordination of the utilization of such energy stockpiles. This could be construed as the next step to enhancing APSA within the AEC, as there are currently uneven oil stockpiles and uneven capacities for oil storage across the AEC;

(e) Develop strategies to (i) ensure availability of energy supplies and products, (ii) a strategic response to any oil spill or natural disaster and (iii) sustainability of energy services during any crisis.

V. Create political cohesion and commitment

(a) Promote the adoption of AEMI as an integral part of the AEC in order to provide a clear demonstration of commitment to supporting the development of an ASEAN energy sector, as a way to lifting political uncertainties;

(b) Address concerns about cost-sharing formulae for investment in AEC infrastructure projects;

(c) Address concerns about the creation of interdependency through connectivity projects (e.g., notably gas pipelines and electric grids).

VI. Improve energy access and alleviate energy poverty

(a) Improve access to affordable energy by the poor and vulnerable populations;

(b) Extend energy access to the vast majority of ASEAN people in order to eradicate energy poverty.

VII. Enhance human and institutional capacity

(a) Build and strengthen human capacity, skills, and institutional capacity within the AEC;

(b) Encourage research and development, and increase public education and outreach;

(c) Enhance AEC cooperation in the compilation and sharing of energy information and data.

Table 4. AEMI blueprint components for consideration *(continued)*

VIII. Pool efforts to expand renewable energy and energy efficiency

(a) Pool efforts to create and deploy new energy efficiency (EE) and renewable energy (RE) technology; leverage potential for technological innovations; broaden the markets for their deployment; improve their commercialization through their larger-scale use;

(b) Leverage funding for EE and RE, relying on access to broader markets to commercialize EE and RE, and to provide the investment basis for supporting the creation and early-stage experimental deployment of RE and EE technologies (e.g., introduction of standardized smart electricity grids);

(c) Build on EE and RE targets to devise appropriate and cohesive product standards, and to create an ASEAN framework for monitoring their implementation and enforcement (AMS have agreed on regional targets of a 15% RE in power generation; and 8% reduction in energy intensity);

(d) Establish reliable and predictable RE and EE policies to enhance the potential for technological innovation; and establish a clear set of regulatory measures;

(e) Scale up small-scale energy generation from local to regional and, subsequently, cross-border large-scale use of renewable energy;

(f) Maintain ASEAN and national targets for emissions reduction, and for substitution of fossil fuels in electricity generation;

(g) Establish regional and national targets for the reduction of greenhouse gas emissions in the energy sector, and implement appropriate mitigation actions relevant to the energy sector.

IX. Improve energy conservation

(a) Promote energy savings efforts in all sectors; introduce consistent energy efficiency indicators and standards to monitor the use of energy; measure the impact of EE when used by national Governments for public transportation, buildings and public procurement contracts; and help national public authorities measure their energy efficiency gains relative to their objectives;

(b) Determine appropriate cohesive targets to produce higher energy savings, and to generate and deploy new energy-efficient technology; create systems for measuring, monitoring and verifying energy savings as well as calculating proper economic valuation;

(c) Promote fuel switching to cleaner energy sources and encourage greater efficiency of energy use in the transportation sector;

(d) Explore innovative market-based instruments to stimulate higher energy savings and enhance ability to generate promising new technologies.

(e) Establish and enforce labeling and standards for the import and production of electrical appliances and vehicles.

Sources: Author's analysis and compilation drawing on APAEC 2010-2015; ACE and KEEI (2013), *Development of ASEAN Energy Sector: Power network interconnection, natural gas infrastructure and promotion of renewable energy and energy efficiency*, ASEAN Centre for Energy and Korea Energy Economics Institute; and the Energy Policies and Blueprints in the North America Free Trade Agreement (NAFTA), the Caribbean Community (CARICOM) and the European Community.

B. Institutional and governance structures[31]

55. Effective governance is a key requirement for multi-lateral energy cooperation and for AEMI. This is because the objective of AEMI is to deliver not only direct economic efficiency gains but also a range of external benefits that have the character of regional public goods.

56. Energy market integration in the European Union and MERCOSUR reveal a number of lessons that are relevant to AEMI. Obstacles to integration arise principally from national differences and can persist for decades. These differences can be found in energy mix, energy balance, economic wealth, openness to investment, pricing and fiscal policies and energy policy priorities. Corporate or political actors may also seek to undermine integration if they see their interests threatened. These factors weaken the political will of national leaders to pursue energy market integration beyond rhetoric, except in cases where short-term economic gains are obvious.

57. While some measures (such bilateral energy transmission connections) can be undertaken on an *ad hoc* basis, sustained moves towards a regional energy market requires delegation of authority or pooling of sovereignty to an agency charged with implementation, in order to overcome the national obstacles. The period of gradual integration is marked by the progressive build-up of trust, liberalization of domestic energy markets, and harmonization of polices, regulations and standards.

58. The obstacles to implementing AEMI are numerous. First is the long-standing importance to AMS of sovereignty and nationalism, which easily translates into protectionism. Second, some AMS have a relatively weak capacity to govern a sector as technically and economically complex as energy. Third, there is a high degree of variability across ASEAN, much greater when compared with the European Union, even after its most the recent enlargement.

59. While formal supranational governance structures may be desirable in principle, arrangements that are less formal, and which lack binding commitments and enforceable sanctions, are more consistent with the nature of regionalism that prevails in ASEAN today. In these circumstances, it will prove difficult to move ahead with certain initiatives that involve substantial political and economic commitments from a large number of countries in the region. Instead, efforts may be best directed at making progress incrementally either by focusing on a limited number of activities that cover most or all ASEAN countries or by building closer energy market integration among a sub-set of ASEAN countries that are able and willing to participate.

60. In the longer term, it is essential to enhance the authority and capacity of ASEAN's energy leadership and administration, e.g., the ASEAN Secretariat, AMEM, Senior Officials Meeting on Energy (SOME) and ACE, if progress towards energy market integration is to be sustained. This will also necessarily involve the progressive delegation of authority or pooling of sovereignty. Without this step being taken, progress towards AEMI will be tightly constrained.

C. Deployment strategy[32]

61. Countries that choose to join a regional integrated energy market can enjoy regional public goods produced in the integration process. For the member countries these regional public goods create positive spill-over effects that are greater than what could be achieved if the

31 This section is from the conclusion of the AEMI paper by Andrews-Speed, Philip (lead) and Adnan Hezri (2013) "Institutional and governance dimensions of AEMI".

countries produce the goods on their own. Examples of regional public goods in regional integrated energy markets include knowledge-related services such as best practices in regulating the energy market, infrastructure such as the electricity transmission network, and security services such as an emergency energy reserve sharing system.

62. In the review of the experiences of selected regional energy markets around the world, broad elements or building blocks of integration emerged that have public goods characteristics, i.e., binding agreements, physical infrastructure, standardized or harmonized rules of operation, and governing or coordinating institutions. The decision to take advantage of the positive spill-over effects of, and mutual benefits from regional energy market integration can lead the AMS to taking steps to supply these regional public goods through AEMI.

63. The sequencing of steps towards energy market integration is not clear-cut, as shown by the experience of other regional energy markets; rather, the steps are interrelated and could be given varying emphasis depending on the regional market's environment and history. The highlight of the European Union experience is the integration of legal structures. The NAFTA experience highlighted free trade in energy. The emphasis in the MERCOSUR experience is from liberalization of investments that made infrastructure build-up possible. The highlight of the Central Asia experience is the operation of infrastructure interconnection. Finally, the highlight of the GMS experience is forging bilateral agreements.

64. In the case of AEMI, the practicable option is to expand the initiated GMS integration effort in scale and scope within ASEAN through "the ASEAN Way", which emphasizes building trust among AMS. Trust should be built by candidly disclosing mutual gains from, and shared costs and externalities in energy resource development, trading energy products, market adjustments and regulatory reforms.

65. There is also a need to accumulate shared databases on, and assessments of resource, trade, investment, market structures and regulations in order to reveal the elements that should be part of an AEMI regional accord. ASEAN leaders could then forge a regional accord for AEMI through 2030 with actionable targets and timetables, such as establishing or strengthening institutions for facilitating the integration efforts, removing border and behind-the-border barriers to energy trade and investments, harmonizing rules and standards, and building the physical infrastructure for regional energy trading.

66. The AMS are currently confronted by national constraints in varying intensities and these could have an impact on their motivation to join AEMI. One sticking point is the lack of independent regulators for the energy sector in some AMS. Thus, it is recommended that, at the minimum, AMS should have independent energy regulators, and pursue harmonization of rules and standards.

67. Finally, AMS should note that energy supply and demand imbalances that drive integration and create mutual gains from trade are never permanent. It is also possible that the ever-changing supply and demand outlook could lead to one or several AMS being either overconfident or insecure, both of which could result in less reliance on energy market integration, the pursuit of energy self-sufficiency domestically, or a greater inclination to look outwards from the region for trading and investments. However, AMS must recognize that the future will always be uncertain. Moreover, it is this same dynamic nature of supply and demand, both within and outside ASEAN, which should motivate the pursuit of energy security through an integrated energy market that has the flexibility to adjust to changing global conditions.

32 This section is from the conclusion of the AEMI paper by Navarro, Adoracion (lead) and Maxensius Tri Sambodo (2013), "The pathway to AEMI".

D. The political economy of AEMI[33]

68. Forty-six years of conscious effort by AMS to enhance regional security, promote economic development and build a sense of regional identity have met with a significant degree of success, despite encountering many obstacles. Despite this important achievement, ASEAN has fallen short of expectations in a number of ways. It has shown the ability to manage or diffuse disputes but not to resolve them. Its capacity for building institutions remains weak and the implementation of policy initiatives is generally slow, except at times of crisis. In particular, the reluctance of AMS to pool sovereignty or delegate authority has hampered the development of multilateral binding agreements and the formation of an authoritative supra-national agency. As a result, progress towards the achievement of specific integration programmes such as the AEC has been much slower than hoped for.

69. Energy market integration is a process through which a range of infrastructure and services relating to energy are provided across a region through collective action. The aims of such integration are not limited to enhancing economic efficiency but include the delivery of external benefits that have the nature of a regional public good. Collective action to deliver a regional public good requires a convergence of interests and a high degree of trust between different actors.

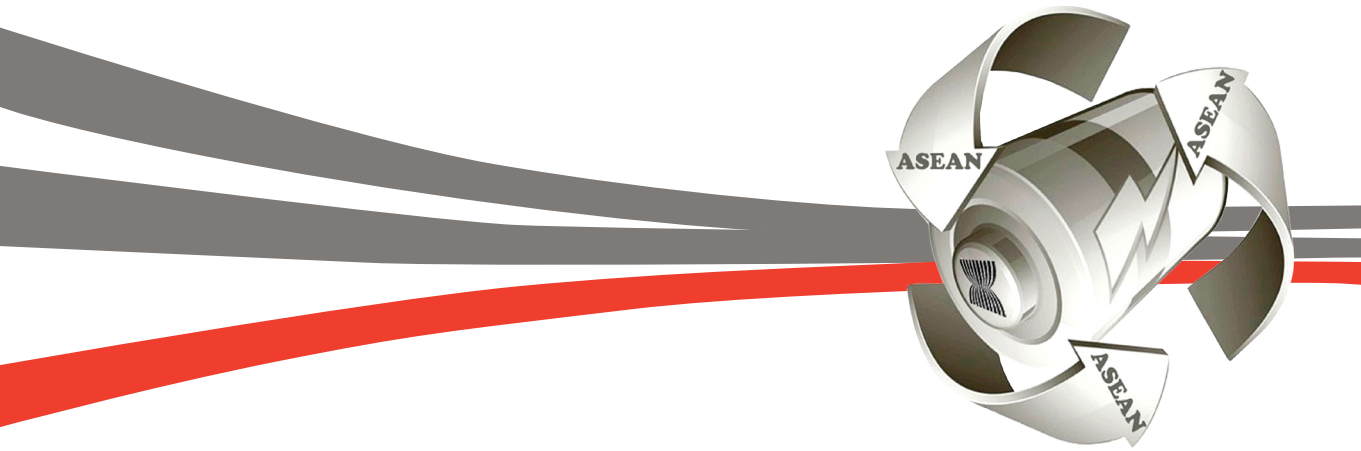
70. The general political and economic constraints to ASEAN integration are exacerbated by factors specific to the energy sector, such as the role of state-owned energy companies, energy subsidies and the treatment of energy as national security issue. To date, concerted collective action related to energy has generally been limited to activities where the costs to the individual Governments are either negligible or do not outweigh the short-term benefits. Such costs may be political or economic. Self-evidently, a supply of external funding can ease participation in certain circumstances. However, such funding will be restricted to public sources unless there are profits to be made. In the meantime, the preference of AMS appears to be for bilateral initiatives, either with other AMS or with States outside ASEAN.

71. Nevertheless, given the challenges that need to be addressed, it will be necessary to develop a clear strategy and a step-wise pathway to achieving AEMI by 2030. The AEMI initiative will need to identify the sequencing of these steps, on the grounds of their interdependency, the net benefits they can deliver and the ease of their implementation.[34] The challenge will be to: (a) formulate the set of policies required for its efficient functioning; (b) design the institutional frameworks needed for its sound governance; and (c) deliver the physical infrastructure necessary for its implementation. Action needs to be taken immediately in order to establish AEMI as an integral part of the AEC in 2015, although its full deployment would be delivered through 2030.

33 This section is from the conclusion of the AEMI paper by Andrews-Speed, Philip (lead) and Christopher Len (2013), "The political economy of AEMI".

34 Andrews-Speed, Philip (2011), *Energy Market Integration in East Asia: A Regional Public Goods Approach.* Economic Research Institute for ASEAN and East Asia.

PART 3:
AEMI PAPERS



I. Rationale for AEMI

Endang Jati Mat Sahid,[1] *Aishah Mohd Isa,*[2] *Yow Peng Leong* (lead)[3] and *Xunpeng Shi*[4]

Abstract

Primary energy demand in ASEAN is projected to almost double over the next 20 years. This implies further widening of the supply-demand gap, which may well lead to increasing reliance on energy imports and the doubling of ASEAN's contribution to global carbon emissions. To better understand the ASEAN energy challenges, this chapter first reviews the current national energy conditions (institutional framework and policies) and maps out energy resources and infrastructure across ASEAN. Four potential mitigation measures for the energy gap problem are identified: (a) efficient utilization of energy; (b) reduction of carbon content of energy; (c) diversification of sources of energy supply; and (d) regional interconnection of energy supply infrastructure and resources. The background review clearly demonstrates the uneven distribution of energy resources and demand centers in ASEAN and the fact that the existing infrastructure for both gas and power connectivity is not yet at sufficient levels to allow for the seamless flow of energy between countries. Trading of energy between countries, through the ASEAN Energy Market Integration (AEMI) mechanism, will be an even greater challenge, given the varied energy institutional setup across the ASEAN region. The second half of this chapter seeks to define AEMI and establish its core objectives. Five key building blocks for a successful AEMI are identified: (a) trade liberalization; (b) investment liberalization; (c) the development of regional energy infrastructure and institutions; (d) liberalization of domestic energy markets; and (e) energy pricing reform. Based on this comprehensive review of the ASEAN energy situation, it is clear that much work remains to be undertaken to move AEMI towards the next step to bringing the AEMI objectives to fruition.

A. Introduction

The ASEAN region has been experiencing buoyant economic growth for the past few decades and is expected to expand further into the future. GDP per capita for ASEAN is projected to more than double from 2010 to 2030, reaching US$ 3,736/person (in 2000 US dollars), indicating a general improvement in lifestyle and income for the member countries as well as strong population and economic growth rates. To meet this strong growth, primary energy demand in the region will also double over the same period to reach 956 Mtoe (million tons of oil equivalent) in 2030 (Institute of Energy Economics, Japan, 2013, p.160).

This thirst for energy will likely cause various energy security and environmental issues in the near future. It has been posited that integrating the ASEAN energy market may "lead to a less volatile, more flexible and resilient market through regional cooperation such as infrastructure connectivity, trade and investment arrangement, and the harmonization of regulatory and technological framework" (ERIA, 2011). To better understand the rationale behind creating an integrated ASEAN energy market, it is important to first understand the current energy situation in ASEAN countries, both as a whole and as individual nations.

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This chapter will present the rationale that is behind creating an integrated ASEAN energy market by first reviewing the existing national energy conditions across ASEAN and then defining the concept of the ASEAN Energy Market Integration (AEMI). This will serve as a common platform for identifying gaps and opportunities in developing and integrating ASEAN energy markets.

1. Scope of work

The scope of this chapter can be broadly categorized under two objectives:

(a) Mapping out the ASEAN Energy Challenge

- Map out current national energy market conditions across ASEAN, indicating the extent and nature of "energy balances" (gas, oil, coal, electricity and renewable energy) and identify where energy resources lie across ASEAN and where energy gaps are expected to be by 2030.
- Map out current physical infrastructure, indicating potential energy flows from energy surplus to energy deficit countries within ASEAN, given the current state of connectivity; and
- Provide an overview of ASEAN national energy market structures and policies.

(b) Defining AEMI

- Review definitions of energy market integration in the context of the European Union and East Asia (EMI) and provide a definition for AEMI, using terminology consistent with that of the ASEAN Secretariat.
- Establish the core objectives pursued by AEMI, notably to achieve open and competitive national energy markets across ASEAN, which are physically and institutionally integrated; and
- Identify AEMI hardware components (e.g., infrastructure, physical energy trading) as well as software ones (e.g., policies, standards and regulations) needed for AEMI to deliver its promise.

2. Methodology

This study encompasses four main areas:

(a) Reviewing the existing national energy conditions across ASEAN

The idea is to provide an overview of ASEAN energy demand and supply trends, national energy market structure and relevant energy policies by reviewing the available studies, outlooks and databases listed in table 1.

Table 1. Available energy databases and outlooks

Publication	Publication details	Outlook details	Scenarios
The 3rd ASEAN Energy Outlook	Published in February 2011 by ASEAN Centre for Energy and the Institute of Energy Economics, Japan	*Base Year:* 2007 *Projection Years:* 2008-2030 *Data:* Disaggregated energy data for all ASEAN countries	1. Business-as-usual 2. Alternative Policy Scenario: assumes energy savings targets are met for each country
The Asia/ World Energy Outlook 2012	Published in January 2013 by the Institute of Energy Economics, Japan	*Base Year:* 2010 *Projection Years:* 2011-2035 *Data:* Aggregated energy data for all ASEAN countries, disaggregated data available for Indonesia, Malaysia, Philippines, Thailand, Viet Nam and Singapore (6/10 ASEAN countries)	1. Reference Scenario 2. Technologically Advanced Scenario
APEC Energy Demand and Supply Outlook, Fifth Edition 2013	Published in February 2013 by Asia Pacific Energy Research Centre	*Base Year:* 2009 *Projection Years:* 2010-2035 *Data:* Disaggregated energy data available for Brunei Darussalam, Indonesia, Malaysia, Philippines, Thailand, Viet Nam and Singapore (7/10 ASEAN countries)	1. Business-as-usual Scenario 2. High Gas Scenario 3. Alternative Urban Planning Scenario 4. Virtual Clean Car Race
Asian Development Outlook 2013	Asian Development Bank	Only historical macroeconomic data	

A suitable database/projection has been chosen that can be used as a basic reference point for the whole AEMI study. So far, the best candidate is the Institute of Energy Economics, Japan Asia/World Energy Outlook, as this is the latest publication, covering all ASEAN countries and takes into account the latest energy developments and policies in their methodology (i.e., rapid economic growth in the region, Fukushima Nuclear Accident and latest renewable energy policies etc.).

(b) Reviewing the ASEAN resource availability and accessibility

As before, existing studies on potential energy resources (gas, coal, oil, electricity and renewable energy) and energy infrastructure (electricity grid and gas pipelines) are reviewed to provide an overview of ASEAN resource availability and accessibility. Some of

the information sources that have been identified are compiled as detailed below:

- World Energy Resources 2010
- BP Statistical Review of World Energy 2012
- US Geological Survey
- Clean Energy Info Portal
- Energy Information Agency, International Energy Database 2013

Information on the existing and future energy interconnections for the ASEAN region will be based on the ASEAN Centre for Energy 2013 publication, Development of ASEAN Energy Sector.

(c) Mapping out the ASEAN energy challenge

With a clear idea of how the geographical distribution of energy resources and demand lies across the region as well as the current state of connectivity, it would be possible to map out the potential energy flows within ASEAN from areas with energy surplus to areas with energy deficit. At the same time, using energy demand projections up to 2030, those areas where energy gaps will tend to occur can be identified. It would also be possible to determine whether the overall ASEAN energy gap can be sufficiently addressed by improving energy efficiency and technology alone, or whether further cooperative measures are required.

(d) Defining the AEMI

The definition of AEMI will be based on reviews of existing definitions of energy market integration – for example, under the European Union and East Asia (EMI) context the terminology is consistent with that of the ASEAN Secretariat. The major components of AEMI will likely be investment, trade, infrastructure, national market openness and energy pricing. A quick review of the current status of these five areas under AEMI will be done to identify the AEMI hardware components (e.g., infrastructure, physical energy trading) as well as software components (e.g., policies, standards and regulations) needed for AEMI to deliver its promise.

B. Energy demand and supply in ASEAN

1. Historical trends and outlook in energy demand and supply

The latest aggregated information available for ASEAN is the Institute of Energy Economics, Japan Asia/World Energy Outlook 2012 (available at http://eneken.ieej.or.jp/en/whatsnew/410.htm).

(a) Energy and economic indicators

In the past, energy demand in ASEAN was driven by strong GDP and population growth. While GDP and population growth is projected to gradually slowdown in future, with improving GDP per capita, a shift from rural to urban lifestyle, increasing automobile ownership, more industrialized economic structure etc., primary energy consumption per capita is expected to more than double from 0.77 toe per capita in 2010 to 1.63 toe per capita in 2035 (table 2).

Table 2. Energy and economic indicators

Energy and Economic Indicators								AAGR (%)
	1980	1990	2000	2010	2020	2030	2035	2010-2035
GDP ($2000 billion)	214	367	601	992	1643	2507	3043	4.6
Population (million)	348	430	504	571	628	671	689	0.8
CO_2 emissions (Mt)	205	358	705	1086	1706	2427	2864	4.0
GDP per capita ($2000)	615	855	1193	1738	2615	3736	4417	3.8
Primary energy consumption per capita (toe)	0.21	0.32	0.55	0.77	1.07	1.42	1.63	3.0
Primary energy consumption per GDP*1	338	380	465	443	408	381	369	-0.7
CO_2 emissions per GDP*2	956	974	1172	1094	1038	968	941	-0.6
CO_2 per primary energy consumption*3	2.83	2.57	2.52	2.47	2.55	2.54	2.55	0.1
Automobile ownership (million)	4.5	10	20	36	56	88	108	4.5
Automobile ownership*4	13	23	40	63	89	131	157	3.7

Source: Institute of Energy Economics, Japan, 2013.
Notes: *1 toe/$2000 million, *2 t/$2000 million, *3 t/toe and *4 vehicles per 1000 people.

(b) Primary energy consumption

Primary energy consumption mix will be dominated by oil at 34% share in 2035 (table 3), followed by coal and gas at a 28% share each. Renewable energy will experience the highest growth during the same period, driven by improving technology and strong policy support.

Table 3. Primary energy consumption

Primary energy consumption	Mtoe							Shares (%)			AAGR (%)
	1980	1990	2000	2010	2020	2030	2035	1990	2010	2035	2010-2035
Total*5	72	140	280	439	670	956	1124	100	100	100	3.8
Coal	3.6	12	32	84	161	257	319	8.9	19	28	5.5
Oil	58	88	153	197	265	339	379	63	45	34	2.6
Natural Gas	8.4	29	71	122	192	268	310	21	28	28	3.8
Nuclear	-	-	-	-	-	12	19	-	-	1.7	-
Hydro	0.8	2.3	4.1	6	12	18	20	1.7	1.4	1.8	4.9
Geothermal	1.8	6.6	18	25	33	51	60	4.8	5.6	5.3	3.6
Other Renewables	-	0.3	0.6	4.3	9.1	17	22	0.2	1.0	1.9	6.7

Source: Institute of Energy Economics, Japan, 2013.
Notes: *5 Trade of Electricity and heat are not shown.

(c) Final energy consumption

The industry sector will continue to be the largest energy consumer in the ASEAN region, as countries in the region continue to shift towards a more industrialized nation. Oil will continue to be the dominant fuel, although with a lower share (table 4).

Table 4. Final energy consumption

Final energy consumption	Mtoe							Shares (%)			AAGR (%)
	1980	1990	2000	2010	2020	2030	2035	1990	2010	2035	2010-2035
Total* [5]	51	91	182	297	439	610	710	100	100	100	3.5
By sector											
Industry	18	28	59	101	155	221	260	31	34	37	3.8
Transport	17	32	62	92	123	156	174	35	31	25	2.6
Buildings, etc.	13	19	41	56	94	145	177	21	19	25	4.7
Non-Energy Use	2.4	11	21	47	67	88	99	13	16	14	3.0
By energy											
Coal	2.1	6.1	14	36	65	95	113	6.7	12	16	4.7
Oil	41	67	125	179	230	296	333	79	60	47	2.5
Natural Gas	2.5	7.4	17	29	48	66	76	8.1	9.8	11	3.9
Electricity	4.7	11	28	52	93	147	181	12	17	26	5.1
Heat	-	-	-	-	-	-	-	-	-	-	-
Renewables	-	-	-	0.9	2.6	5.6	6.6	-	0.3	0.9	8.3

Source: Institute of Energy Economics, Japan, 2013.

Given that, by 2009, only five ASEAN countries had achieved access to electricity of above 95%,[5] the other ASEAN countries will likely continue to strive to provide better electricity access to their population in line with their individual Millennium Development Goals (MDGs) targets. At the same time, even in countries with good electricity access, electricity use will also probably continue to grow.

This growing electricity use can be mainly contributed to the improving economies and lifestyle in ASEAN countries, which entails the purchase of more electrical appliances for daily use such as space cooling/heating, cooking, cleaning and even entertainment. ASEAN countries are currently plagued by traffic congestion, and a popular solution for this problem is to build electricity-based transit systems. These factors contribute to the projection that electricity consumption will almost double its share, from 17% in 2010 to 26% of the total final energy consumption mix in 2030.

(d) Electricity

To meet the growing electricity demand, total electricity generated is expected to more than triple from 2010 to 2035. Most of the electricity will be generated from thermal energy, however, with a slightly decreasing share from 86% in 2010 to 83% in 2035 (table 5). It is encouraging to see that non-fossil fuel has become increasingly important in the ASEAN electricity mix, as these non-fossil fuels sources emit less carbon compared with fossil fuel combustion.

5 The World Bank Database, "Access to Electricity", defines this as the percentage of population with access to electricity, with the ASEAN countries that have achieved above 95% being Brunei Darussalam, Malaysia, Singapore, Thailand and Viet Nam.

Table 5. Electricity generation

Electricity generated	TWh							Shares (%)			AAGR (%)
	1980	1990	2000	2010	2020	2030	2035	1990	2010	2035	2010-2035
Total*[5]	62	154	370	674	1256	2007	2449	100	100	100	5.3
Coal	3.0	28	79	185	404	716	926	18	27	38	6.7
Oil	47	66	72	59	84	97	100	43	8.8	4.1	2.1
Natural Gas	0.7	26	154	335	580	856	1012	17	50	41	4.5
Nuclear	-	-	-	-	-	45	74	-	-	3.0	-
Hydro	9.8	27	47	70	137	212	235	18	10	9.6	5.0
Geothermal	2.1	6.6	16	19	38	59	69	4.3	2.9	2.8	5.2
Other Renewables, etc.	-	0.6	1.0	6.1	13	23	33	0.4	0.9	1.4	7.0

Source: Institute of Energy Economics, Japan, 2013.

(e) ASEAN outlook as a whole and the APAEC Initiative

The ASEAN economic growth projected for the next 25 years is encouraging; however, this economic growth will spur demand growth for energy to more than double from 2010 to 2035. This development may become unsustainable, as it will likely require increasing energy imports and producing more carbon emissions.

ASEAN leaders and policymakers have been fully aware of these implications, and the political will to jointly address these energy challenges was clearly expressed in the 1997 Summit Declaration, entitled the ASEAN Vision 2020, in which the ASEAN Heads of Governments agreed to "establish interconnecting arrangements for electricity, natural gas and water within ASEAN through the ASEAN Power Grid and the Trans-ASEAN Gas Pipeline, and promote cooperation in energy efficiency and conservation as well as development of new and renewable energy resources".

A series of medium-term action plans have been prepared to act as a blueprint for ASEAN cooperation in attaining the ASEAN 2020 Vision; the current action plan, the third in the series, is the 2010 ASEAN Plan of Actions for Energy Cooperation (APAEC 2010-2015). The program areas relevant to the AEMI concept are included in the next two sections.

(f) APAEC 2010-2015 – Program Area No. 1

ASEAN Power Grid

Paragraph 31: ASEAN recognizes the critical role of an efficient, reliable and resilient electricity infrastructure for stimulating regional economic growth and development. The continuing efforts of the ASEAN Member States in strengthening and/or restructuring their respective power market industry are oriented towards this direction. Currently, electricity is accessed by roughly 66% of the ASEAN peoples made available through grid power supply, stand-alone and distributed power generation systems. Electricity is produced through a mix of oil, gas, coal, hydro, geothermal and other renewable energy sources. Regional electricity production grew at an average yearly rate of 8% from 1990 to 2005 and is projected to grow at 6.1% annually from 2005 to 2030. Enhancing electricity trade across borders, through integrating the national power grids of the ASEAN Member States, is expected to provide benefits of meeting the rising electricity demand and improving access to energy services.

Paragraph 32: The ASEAN Power Grid (APG) is a flagship program mandated in 1997 by the ASEAN Heads of States/Governments under the ASEAN Vision 2020 towards ensuring regional energy security while promoting the efficient utilization and sharing of resources. To pursue the program, ASEAN adopts a strategy that encourages interconnections of 15 identified projects, first on cross-border bilateral terms, then gradually expand to sub-regional basis and, finally to a totally integrated Southeast Asian power grid system. Currently, the APG is in progress with four on-going interconnection projects and additional 11 projects are planned for interconnection through 2015. The investment requirement of the APG is estimated at USD 5.9 billion. A potential savings of about US$ 662 million in new investment and operating costs is estimated resulting from the proposed interconnection projects.

Paragraph 33: Objective – To facilitate and expedite the implementation of the ASEAN Interconnection Master Plan, and to further harmonize technical standards and operating procedures as well as regulatory and policy frameworks among the ASEAN Member States.

Strategic goals

- To achieve a long-term security, availability and reliability of energy supply, particularly in electric through regional energy cooperation in Trans-ASEAN Energy Network;
- To optimize the region's energy resources towards an integrated ASEAN Power Grid System; and
- To further harmonize all aspect of technical standard and operating procedure as well as regulatory frameworks among member country.

Highlights

- Implement 15 interconnection projects of which 4 are in operation, 3 under construction and 8 under preparation;
- Total investment including upgrading of existing interconnections is estimated to be US$ 5.9 billion; and
- Projects are open for private and public sector investment, supported by the ASEAN Infrastructure Financing Mechanism (AIFM) which will be formulated by the ASEAN Finance Ministers.

(g) APAEC 2010-2015 – Program Area No.2

Trans-ASEAN Gas Pipeline (TAGP)

Paragraph 34: The ASEAN Vision 2020 emphasizes the establishment of the interconnecting arrangements towards achieving a long-term security, availability and reliability of energy supply, particularly in oil and gas, through regional energy cooperation in Trans-ASEAN Energy Network comprising of the Trans-ASEAN Gas Pipeline (TAGP) and the ASEAN Power Grid (APG). TAGP aims to interconnect the gas pipeline infrastructure of ASEAN Member States and to enable gas to be transported across the borders of the Member States. APG, on the other hand, ensures that gas for power is also being optimized with other potential sources of energy.

Paragraph 35: The original TAGP aimed to develop a regional gas grid by 2020, by linking the existing and planned gas pipeline networks of the ASEAN Member States. The updated ASCOPE-TAGP Master Plan 2000 involves the construction of 4,500 kilometers of pipelines, mainly undersea, worth US$ 7 billion. Eight bilateral gas pipeline interconnection projects, with a total length of approximately 2,300 km, are currently operating. They are: (i) P. Malaysia to Singapore in 1991; (ii) Yadana, Myanmar to Ratchaburi, Thailand in 1999; (iii) Yetagun, Myanmar to Ratchaburi, Thailand in 2000; (iv) West Natuna, Indonesia to Singapore in 2001;

(v) West Natuna, Indonesia to Duyong, Malaysia in 2001; (vi) South Sumatra, Indonesia to Singapore in 2003; (vii) Malaysia-Thailand Joint Development Area to Malaysia via Songkhla in 2004; and (viii) Malaysia-Singapore in 2006. These interconnections form part of the backbone of energy security and sustainability of supply objectives of ASEAN to be accelerated by 2015 and serve as a key driver of growth to the various energy consuming sectors of the ASEAN economies.

Paragraph 36: Over the years, natural gas demand has increased tremendously while new gas finds are not imminent to meet this new regional demand growing yearly at about 7-8%. ASEAN consumes approximately 10 billion cubic feet per day (BCFD) of natural gas. ASCOPE has reflected in its updating of the TAGP 2000 Study and Roadmap the latest gas supply and demand situation in the region. Findings indicated that there is a widening supply gap from 2017 rising to more than 12,000 MMSCFD by 2025. ASCOPE E&P BDC has been tasked with studying how best to further increase the gas supply. Many options are considered for addressing the future shortfall of gas such as exploring new discoveries in the region, or by increasing imports of LNG gas. Coalbed methane (CBM) is also identified as possible additional supply source. However, the East Natuna gas field of Indonesia remains the main source of energy in ASEAN for the future and its commercialization is the key to addressing the supply gap. The said gas field has about 70% CO_2 and reserves of 45 trillion cubic feet (excluding CO_2), with a gas price that is affordable and competitive with alternative fuels such as coal or fuel oil. ASEAN Member States are also building LNG re-gasification terminals to supplement their energy needs. Moreover, ASCOPE and HAPUA are strategizing actions to strike a supply-demand balance for gas to be used in the TAGP and APG in view of the growing regional gas demand.

Paragraph 37: Objective – To facilitate the implementation and realization of the TAGP Infrastructure Project, to ensure greater security of gas supply.

Strategic goals

- To achieve long-term security, availability and reliability of energy supply, particularly in oil and gas, through regional energy cooperation in the Trans-ASEAN Energy Network;
- To work on managing high CO_2 gas fields;
- To commercialize the East Natuna Gas Field to fulfill current demand and address a future supply gap;
- To further explore and secure additional gas supplies from non-conventional sources, i.e. Coalbed methane (CBM);
- To expedite the pipeline construction under the TAGP Updated Master Plan 2008, once the East Natuna supply is available;
- To leverage existing bilateral pipeline interconnections for future gas mobility within the region.

Highlights

- To promote and increase cleaner coal use and trade for regional energy security;
- To strongly encourage the use of clean coal technologies through regional cooperation.

(h) Barriers to APAEC 2010-2015

The ASEAN Centre for Energy (ACE) and the Korea Energy Economics Institute (KEEI) recently carried out a joint review of the main components of APAEC 2010-2015 in order to identify the major challenges that ASEAN energy sector is facing in ensuring energy security

and sustainable development.[6] The results of their research shed light on the major barriers to implementing the current cooperative approach. The review recognizes that realizing the objectives of ASEAN energy cooperation "do not merely require having infrastructure available, but also having all the institutional, regulatory, legal, technical, and economic aspects functional". It stresses the need to go beyond the current "piecemeal approach" based on "bilateral trade under pre-arranged power purchase and limited exchange", and towards the creation of "sub-regional integrated power grids and ultimately integrated APG."
The APAEC review highlights the facts that actions under APAEC are undertaken essentially from a national perspective, and bilateral agreements are struck sporadically as piecemeal endeavours that do not add up to the cohesive, effective system needed to deliver secure, affordable and sustainable energy throughout the region. The overall conclusion is that the absence of policy and institutional dimensions constitute major barriers to the successful implementation of APAEC and greatly slow down its progress. Moreover, despite numerous resolutions and efforts for more than three decades, the APAEC review concedes that there is difficulty in effectively delivering more cohesive ASEAN energy markets, and a sense that the political will for doing so is lacking.

The forthcoming ASEAN Economic Community (AEC) provides for arrangements and agreements to transform ASEAN into a single market with a free flow of goods, services, investment and skilled labor, so that resources go into their most productive uses within ASEAN for the benefit of all. The objective of AEMI is to extend the scope of such provisions to the energy sector – that is, to allow the free flow of energy products, services and investment in the framework of AEC, in order to achieve access to secure, affordable and sustainable energy sources within AEC.[7] AEMI would thus build on the series of the three APAECs, taking them a step further, from regional energy cooperation into regional energy integration.[8]

It is interesting to note that the APAEC 2010-2015 document, while advocating for the integration of energy networks (both pipelines and power grids), does not mention the introduction of a trade/energy market. The existing cross-border energy exchanges thus far are limited to zero exchange or pre-established purchase agreement (bilateral) (ACE, 2013).

The establishment of a regional market will require political willingness and compromise among the Governments. A truly competitive market needs suitable market structures, an adequate guarantee of supply, common transmission networks with adequate access and pricing rules, and a minimum level of harmonization among member markets involved (Pérez-Arriaga, 2010). For ASEAN, this will likely require further negotiations and legislation at the top-level that goes beyond bilateral agreements and network integration.

The next section on institutional framework, energy industry structure and relevant energy policies looks at some of the criteria based on existing national conditions for each of the ASEAN member economies.

2. Institutional framework, energy market structure and relevant energy policies

Table 6 contains an overall view of the energy institutional profile for each ASEAN country. Three categories are covered: the institutional framework (i.e. who regulates the energy

6 *Development of ASEAN Energy Sector*, ASEAN Centre for Energy, Korea Energy Economics Institute, 2013.
7 Consistent with a similar definition for EMI, covering the EAS countries, in *Energy Market Integration in the East Asia Summit Region: Review of Initiatives and Estimation of Benefits*, ERIA, 2010.
8 For a full review of current ASEAN initiatives in the energy sector, refer to Development of ASEAN Energy Sector, ASEAN Centre for Energy and Korea Energy Economics Institute, 2013.

sector?), the energy industry structure (i.e. who provides the energy services) and relevant energy policies (i.e. which laws and policies governs the energy sector). This table focuses more on information related to gas and electricity as these are the commodities covered under the AEMI project (TAGP and AGP).

The information is collected from various sources; Clean Energy Info Portal (http://www.reegle.info/index.php); APEC Energy Demand and Supply Outlook 5th Edition (http://aperc.ieej.or.jp); and documentation/websites of the individual countries.

Table 6. Regulatory conditions in each ASEAN economy

Country	Institutional framework	Energy industry structure	Relevant energy policies
Brunei Darussalam	The energy sector is overseen by the Energy Department under the Prime Minister Office (EDPMO) Regulated energy prices	Fully overseen by the Government Electricity is provided by the Department of Electrical Services (DES) and Berakas Power Management Company (BPMC) O&G sector major players: Brunei Shell Petroleum, Total E&P Offshore	- Oil Conservation Policy (1981) - Brunei Natural Gas Policy (Production and Utilization) (2000) - Five-year National Development Plans
Cambodia	Overseen by the Ministry of Industry, Mines and Energy (MIME) and its three departments: 1. Department of Energy Development 2. Department of Technique 3. Hydropower Department Electricity is regulated by Electricity Authority of Cambodia (EAC). Cambodia National Petroleum Authority (CNPA) regulates the petroleum sector.	Electricity provided by Electricity du Cambodge (EdC) (government-owned power utility) and IPPs. Private sector participation through IPP power purchase agreements.	- Power Sector Strategy 1999-2016 - Rural Electrification by Renewable Energy Policy (2006) - Renewable Electricity Action Plan (REAP) 2002-2012 - National Strategic Development Plan (NSDP) of Cambodia (2009)

Table 6. Regulatory conditions in each ASEAN economy *(continued)*

Country	Institutional framework	Energy industry structure	Relevant energy policies
Indonesia	Overseen by the National Energy Council (DEN). Ministry for Energy and Mineral Resources (MEMR) regulates the energy sector, along with its sub-agencies: - Directorate General of Oil and Gas - Directorate General of Mineral and Coal - Directorate General of Electricity - Directorate General of New Energy, Renewable and Energy Conservation Regulated energy prices.	O&G industry currently undergoing regulatory changes. E&P based on production sharing contracts with Pertamina (government-owned). Major IOCs operating in Indonesia are Chevron, Total, Conoco Philips, Exxon and BP. Downstream gas pipelines are operated by the state-owned gas distribution utility Perusahaan Gas Negara (PGN). Initial restructuring of the electricity took place in 1994. The Perusahaan Elektrik Negara (PLN) is the government-owned electricity utility that is the sole buyer and seller of electricity in the power market. The utility shares its generation business with IPPs and cooperatives. At the transmission and distribution level, certain assets have been decentralized (i.e. the Java-Bali Electricity Transmission Unit).	- National Energy Policy (2006) - Oil and Gas Law (Law No 21/2001) - Electricity Law (Law No 30/2009)

Table 6. Regulatory conditions in each ASEAN economy *(continued)*

Country	Institutional framework	Energy industry structure	Relevant energy policies
Lao People's Democratic Republic	Overseen by Ministry of Energy and Mines (MEM). Relevant departments under MEM are: - Department of Energy Promotion and Development (DEPD) - Department of Electricity (DOE) - Department of Geology and Mines	Electricity provided by state-owned, vertically-integrated utility Electricité du Laos (EdL).	- Electricity Law (1997) - National Policy on the Environmental and Social Sustainability of the Hydropower Sector (2005)
Malaysia	The key ministries and agencies for Malaysia's energy sector are: - Energy Unit of the Economic Planning Unit (EPU) of the Prime Minister's Department - Ministry of Energy, Green Technology and Water (KeTTHA) - Energy Commission (ST) Regulated energy prices.	Petronas holds exclusive ownership rights for O&G exploration and production. Other companies must operate through production sharing contracts (PSC). The electricity industry has been partially deregulated with participation by IPPs. The main government-linked electricity utilities are Tenaga National Berhad (TNB), Sabah Electricity Berhad (SESB) and Sarawak Energy Berhad (SEB).	- National Energy Policy (1979) - National Depletion Policy (1980) - Economic Transformation Program (2010)

Table 6. Regulatory conditions in each ASEAN economy *(continued)*

Country	Institutional framework	Energy industry structure	Relevant energy policies
Myanmar[9]	The Ministry of Energy (MOE) is the focal point for overall energy policy and coordination and O&G regulation. Other ministries involved in energy sector are: - Ministry of Electric Power - Ministry of Mines (MOM) for coal - Ministry of Agriculture and Irrigation (MOAI) for biofuels and micro-hydro (for irrigation purposes) - Ministry of Science and Technology (MOST) for renewable energy - Ministry of Environmental Conservation and Forestry (MOECAF) - Ministry of Industry (MOI) for energy efficiency	State-owned enterprises related to O&G sector: - Myanma Oil and Gas Enterprise (MOGE): E&P and transportation of O&G. - Myanma Petroleum Products Enterprise (MPPE): Operates refineries, fertilizer plants, LPG plants and methanol plant. - Myanma Petrochemical Enterprise (MPE): Operates the Marketing and Distribution of petroleum products.	- Myanmar Electricity Law (1984) - Electricity Rules (1985) - The Petroleum Act (1934) - Petroleum Rules of 1937 (as amended in 1946) - National Environment Policy (1994) - Myanmar Energy Policy

9 ADB, Myanmar Energy Sector Initial Assessment, available at www.adb.org/sites/default/files/myanmar-energy-sector-assessment.pdf.

Table 6. Regulatory conditions in each ASEAN economy *(continued)*

Country	Institutional framework	Energy industry structure	Relevant energy policies
Philippines	The energy sector is overseen by the Department of Energy (DOE). The department has oversight of five government-owned and controlled corporations: - National Power Corporation (NPC) - National Electrification Administration (NEA) - Philippine National Oil Company (PNOC) - Philippine Electricity Marketing Corporation (PEMC) - Power Sector Assets and Liabilities Management Corporation (PSALM) Oil pricing is deregulated, and electricity pricing is set by the Energy Regulatory Commission (ERC). The ERC also regulates the electricity sector.	O&G E&P activities are undertaken by private entities through service contracts with DOE, which is contracted through the annual Philippine Energy Contracting Round (PECR) Mechanism. The Wholesale Electricity Spot Market (WESM) was established in Luzon and Visayas. Other parts of the power market are serviced by the state-owned National Power Corporation (NPC) that generates its own electricity and buys from IPPs. Electricity distribution is serviced by a mixture of private utilities and electricity cooperatives.	- Philippine Energy Plan (2004-2013) - Electricity power Industry Reform Act (2001)

Table 6. Regulatory conditions in each ASEAN economy *(continued)*

Country	Institutional framework	Energy industry structure	Relevant energy policies
Singapore	The electricity and gas industries are regulated by the Energy Market Authority (EMA).	Open electricity and gas markets. Domestic gas pipeline network is owned and operated by PowerGas Ltd. Generations companies compete in the National Electricity Markets of Singapore (NEMS) to sell electricity to the grid network operated by EMA.	- Energy for Growth: National Energy Policy Report (2007) - Gas Network Code (2008)
Thailand	The energy sector is overseen by the Ministry of Energy. Government agencies responsible for energy include the: - Office of the Minister - Office of the Permanent Secretary - Department of Alternative Energy Development and Efficiency (DEDE) - Department of Energy Business - Department of Mineral Fuels - Energy Policy and Planning Office (EPPO) - Electricity Generating Authority of Thailand (EGAT) - Energy Regulatory Commission - Nuclear Power Program Development Office	The three major state enterprises in the O&G sector are: - Petroleum Authority of Thailand (PTT) - PTT Exploration and Production Co. Ltd (PTTEP) - Bangchak Petroleum Public Co. Ltd (Bangchak). Electricity is generated by the Electricity Generating Authority of Thailand (EGAT) and IPPs, Small Power Producers (SPP) and Very Small Power Producers (VSPP). EGAT also owns the whole transmission system but electricity distribution and retailing is conducted by the Metropolitan Electricity Authority (MEA) and Provincial Electricity Authority (PEA).	- Power Development Plan (2012 Update) - Energy Business Act (2007)

Table 6. Regulatory conditions in each ASEAN economy *(continued)*

Country	Institutional framework	Energy industry structure	Relevant energy policies
Viet Nam	The Ministry of Industry and Trade (MOIT) is responsible for the state management of all energy industries. Inside MOIT, the General Directorate of Energy administers the Viet Nam Electric Power Group (EVN), the Viet Nam National Coal and Mineral Industries Group (Vinacomin) and the Viet Nam Oil and Gas Group (PetroVietnam, or PVN). The power market is regulated by the Electricity Regulatory Authority of Viet Nam (ERAV) Regulated energy prices.	Upstream O&G production is carried out by PVN and private companies that have Product Sharing Contracts (PSC) with PVN. Downstream functions are carried out by PVN. Electricity is supplied by state-owned Electricité du Vietnam (EVN) and other companies that operate based on Build-Operate-Transfer and IPP schemes. The state maintains a monopoly on the transmission operations.	- National Energy Development Strategy (2007) - Electricity Law (2005)

National Regulations and ASEAN Energy Market Integration

Table 6 clearly demonstrates the varied regulatory conditions throughout the ASEAN region. For electricity, the only country with a competitive market is Singapore. Some countries, such as Malaysia and Thailand, have a deregulated supply side, but with no power purchase pool. The Philippines has power pools in certain parts of the electricity network while other countries such as Brunei Darussalam and the Lao People's Democratic Republic (Lao PDR) are served by state-owned utilities. For natural gas markets, the majority of the ASEAN countries operate based on the Product Sharing Contract mechanism while access to the gas transmission pipeline is usually owned and regulated by state-owned companies. Furthermore, the prevalence of national electricity utilities and price control mechanisms (i.e., subsidies) in several ASEAN countries will most likely become a challenge to AEMI development in the near future, as certain ASEAN countries may choose to protect their national interests rather than pursuing regional objectives.

Obviously, there is still much to be done in terms of harmonizing energy institutions across ASEAN before AEMI can become a realistic option. Some of the key actions include:

- Harmonizing of technical, legal, regulatory and commercial frameworks;
- Adopting more trade-compatible industry structures (liberalization of energy markets);
- Developing integrated transmission networks with transparent access for market players (both for gas pipelines and for power grids, and including technical access and common access tariffs);
- Creating new regional level institutions (made up of national operators) that oversee the co-operation framework, administer disputes, organize regional planning framework etc.;
- Removing trade and investment barriers (rationalization of inefficient energy subsidies and creating a secure investment environment).

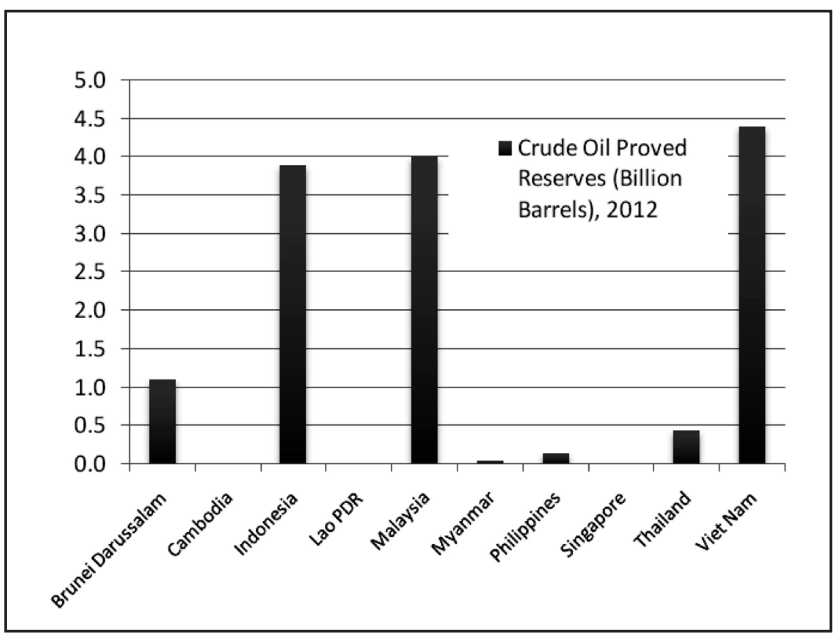
C. Mapping the ASEAN energy challenge

1. Energy resources in ASEAN countries

(a) Current availability

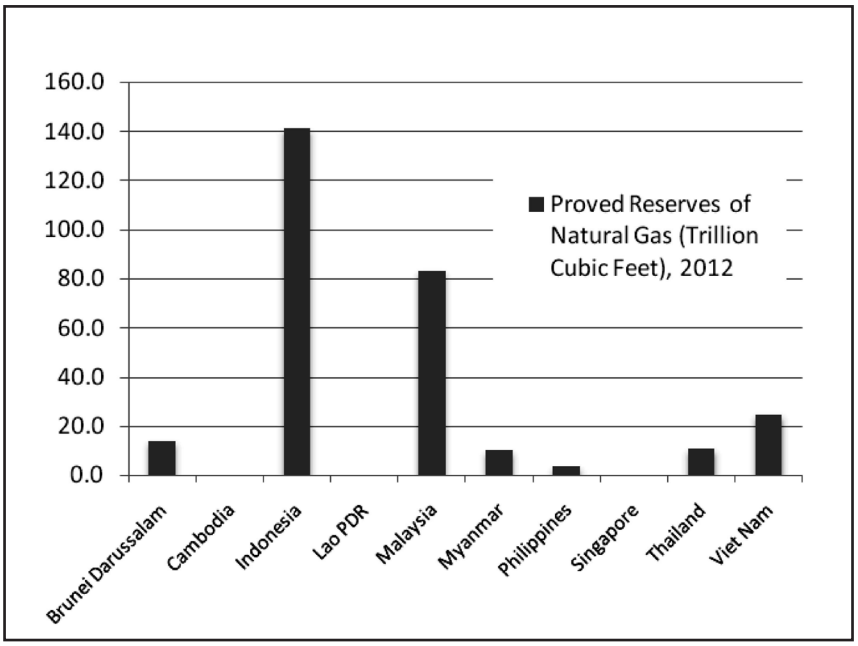
The ASEAN region as a whole is blessed with an abundance of fossil fuel resources, i.e., oil, natural gas and coal. Oil and natural gas are largely concentrated in four countries – Indonesia, Malaysia, Viet Nam and Brunei Darussalam. As for coal, Indonesia has the biggest recoverable coal in the ASEAN region at 6,718 million tons followed by Thailand (1,505 million tons). It is estimated that the 10 member countries of ASEAN have 14 billion barrels of oil reserves, 286.6 trillion cubic feet of natural gas reserves and 9,408.4 billion tons of coal reserves. Figures 1, 2 and 3 show the available reserves in ASEAN by countries.

Figure 1. Crude oil proved reserves by country, 2012 (billion barrels)



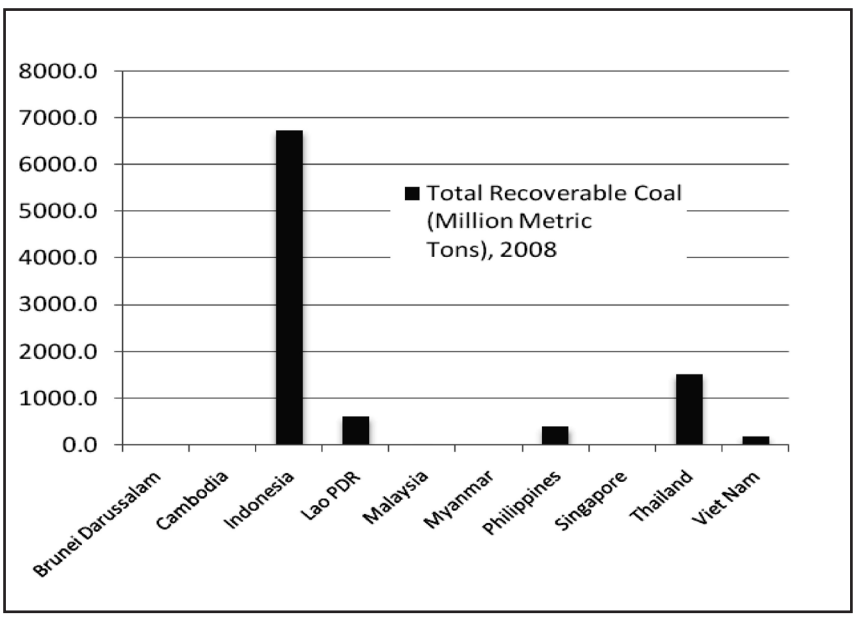
Source: EIA, 2013.

Figure 2. Proved reserves of natural gas by country, 2012 (trillion cubic feet)



Source: EIA, 2013.

Figure 3. Total recoverable coal by country, 2008 (million metric tons)



Source: EIA, 2013.

The ASEAN countries are also capable of harnessing their own indigenous renewable energy resources to produce electricity; however, the type and amount of renewable energy available varies from country to country. Table 7 shows the renewable energy potential for hydropower and geothermal, which illustrates the varied distribution of energy resources in ASEAN. Unfortunately, a common source for solar energy potential is not available; however, based on

a brief literature survey, it is clear that the region is highly suitable for solar photovoltaics but not solar thermal, and therefore there is much potential for solar PV installations in ASEAN countries, even for resource-poor Singapore.

Table 7. Renewable energy potential

	Technical hydropower potential (TWh/year)	Geothermal potential
Brunei Darussalam	N/A	-
Cambodia	34	-
Indonesia	402	27.67 GW_e
Lao PDR	63	-
Malaysia	123	-
Myanmar	139	-
Philippines	20	4340 MW_e
Singapore	-	-
Thailand	16	N/A
Viet Nam	123	340 MW_e

Source: WEC, 2010.

(b) ASEAN energy dependence outlook

The Asia Pacific Energy Research Centre (APERC, 2013) has projected coal, oil, gas and electricity production for seven of the 10 ASEAN member countries. The expected total primary energy production and electricity production for these seven countries are shown in table 8. For detailed data on production by types of fuel, refer to the tables provided by APERC at their website, http://aperc.ieej.or.jp.

Table 8. Total primary energy production and electricity production

	Primary energy production (Mtoe)			Electricity production (TWh)		
	2009	2020	2030	2009	2020	2030
Brunei Darussalam	18.8	17.1	13.8	3.6	3.7	3.9
Indonesia	355.7	409.7	505.7	159.8	285.9	478.5
Malaysia	90.0	96.3	93.4	108.1	145.6	190.9
Philippines	24.3	29.1	28.9	67.1	103.8	154.7
Singapore	0	0.1	0.1	44.3	50.8	52.9
Thailand	61.7	70.3	80.9	152.8	196.7	269.7
Viet Nam	78.9	100.1	116.1	92.2	173.8	313.9

Source: APERC, 2013.
Note: Statistics for Cambodia, the Lao PDR and Myanmar are not readily available.

APERC has also projected the final consumption for the seven countries; however, for the

sake of completeness, table 9 includes the total final energy demand and total primary energy consumption for Cambodia, the Lao PDR and Myanmar produced by the ASEAN Center for Energy in 2011. Note that the base year for these countries is 2007, not 2009.

Table 9. Total final energy demand and total primary energy consumption

	Total final energy demand (Mtoe)			Total primary energy consumption (Mtoe)		
	2007/2009	2020	2030	2007/2009	2020	2030
Brunei Darussalam	0.9	1.6	1.6	3.1	3.1	3.1
Cambodia*	4.6	7.7	10.9	5.2	9.3	13.2
Indonesia	145.9	192.2	260.7	202.0	259.2	428.9
Lao PDR*	2.0	3.7	6.0	2.2	6.2	8.7
Malaysia	39.8	51.4	68.9	66.8	83.0	101.9
Myanmar*	14.0	21.6	32.6	15.7	23.8	35.2
Philippines	23.1	29.8	41.1	38.8	52.1	70.1
Singapore	14.1	18.2	21.0	18.5	27.2	29.8
Thailand	75.8	102.4	133.0	103.3	141.2	201.9
Viet Nam	55.6	80.8	116.5	64.0	99.8	153.9

Sources: ACE, 2011; APERC, 2013.
Note: *Statistics for Cambodia, Lao PDR and Myanmar are from ACE (2011) and the base year is 2007.

Based on available data, the energy self-sufficiency for seven out of the 10 ASEAN countries can be calculated and tabulated as shown in table 10. It can be seen that only two of the seven countries analyzed will remain energy independent by 2030, but even for these two countries, the self-sufficiency ratio is steadily declining.

Table 10. Energy self-sufficiency for ASEAN countries

	Energy self-sufficiency		
	2010	2020	2030
Brunei Darussalam	6.1	5.5	4.5
Indonesia	1.8	1.6	1.2
Malaysia	1.3	1.2	0.9
Philippines	0.6	0.6	0.4
Singapore	0.0	0.0	0.0
Thailand	0.6	0.5	0.4
Viet Nam	1.2	1.0	0.8

Source: Authors' calculation based on tables 8 and 9.
Note: Statistics for Cambodia, the Lao PDR and Myanmar are not readily available.

(c) The looming ASEAN energy gap

Energy resources in ASEAN are unevenly distributed, as can be seen from figures 1, 2 and 3 as well as table 7, with some countries rich in fossil fuel resources, others with vast hydropower potential while others are resources-poor and have limited indigenous energy potential.

However, analysing the consumption and self-sufficiency projections for the ASEAN economies reveals a worrying trend. Energy demand for each ASEAN country (even Brunei Darussalam) is projected to continue to increase up to, and likely beyond 2030. For some countries, e.g., Indonesia and the Lao PDR, the projected increase is more than double the demand at the base year. What this may mean is that energy production may be not enough to meet the rapidly increasing demand, i.e., the supply-demand gap will keep increasing over the outlook horizon in 20 years. In fact, based on table 10, by 2030 it appears likely that only Brunei Darussalam and Indonesia will remain self-sufficient.

The looming energy gap for ASEAN countries can be attributed to three main reasons: (a) the rapidly increasing energy demand; (b) over-dependency on fossil fuels to meet demand; and (c) depleting energy reserves. There are also other factors that may further exaggerate the situation; for example, technically available hydropower potential may not be exploitable if the cost of harnessing this potential is too expensive; or using nuclear energy for electricity generation may not be pursued if perceived as a risk to national stability.

2. Energy trade in ASEAN countries

(a) Current energy trade in ASEAN countries

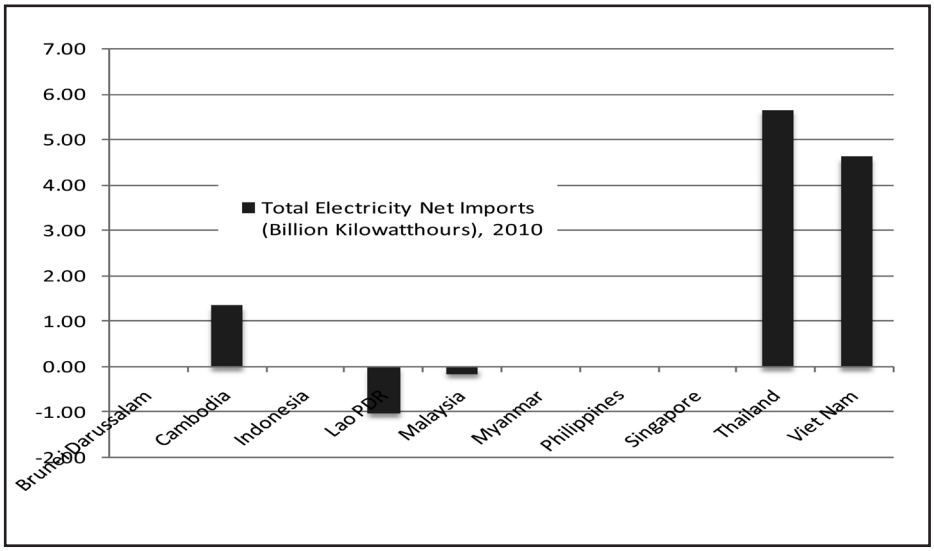
Trade is the import or export of commodities to or from a country. To maintain consistency, in this report the net import for each commodity is shown for each country where net import is the difference between energy import and export quantity for a particular country. A country with a negative net import is a country in a positive net export position (i.e., an exporting country). This indicator is important in determining the possibility of securing energy supply within the region through existing and future energy infrastructure interconnection.

Four commodities are covered in this report – electricity, natural gas, coal and oil. It should be noted that electricity and natural gas can be traded between ASEAN member economies via either the APG (electricity) or the TAGP (natural gas) while coal and oil are transported via more conventional means (road, rail or shipping).

(b) Electricity trade

The electricity net import position for all the ASEAN member countries are shown in figure 4. The Lao PDR and Malaysia were net exporters of electricity at 1.02 billion KWh and 0.151 billion KWh, respectively, in 2010. On the other hand, Thailand and Viet Nam both had high electricity net import values at 5.672 billion KWh and 4.635 billion KWh, respectively, in 2010. Cambodia was also a net importer of electricity at 1.357 billion KWh in 2010.

Figure 4. Net electricity imports by ASEAN countries, 2010 (billion kilowatt hours)

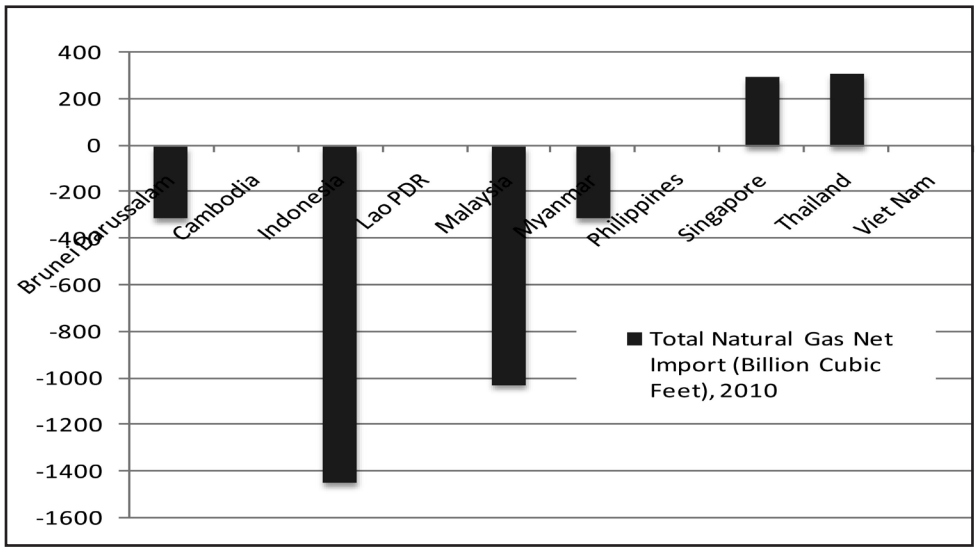


Source: EIA, 2013.

(c) Natural gas trade

In 2010, four of the 10 ASEAN member countries (Brunei Darussalam Indonesia, Malaysia and Myanmar) were natural gas net exporters. Indonesia had the biggest net exporter value at 1,444.38 billion cubic feet, followed by Malaysia (1,025.90 billion cubic feet), Brunei Darussalam (311.83 billion cubic feet) and Myanmar (311.13 billion cubic feet). Singapore and Thailand were net importers of natural gas in 2010, at 311.13 billion cubic feet and 296.65 billion cubic feet, respectively.

Figure 5. Natural gas net imports in ASEAN countries, 2010 (billion cubic feet)

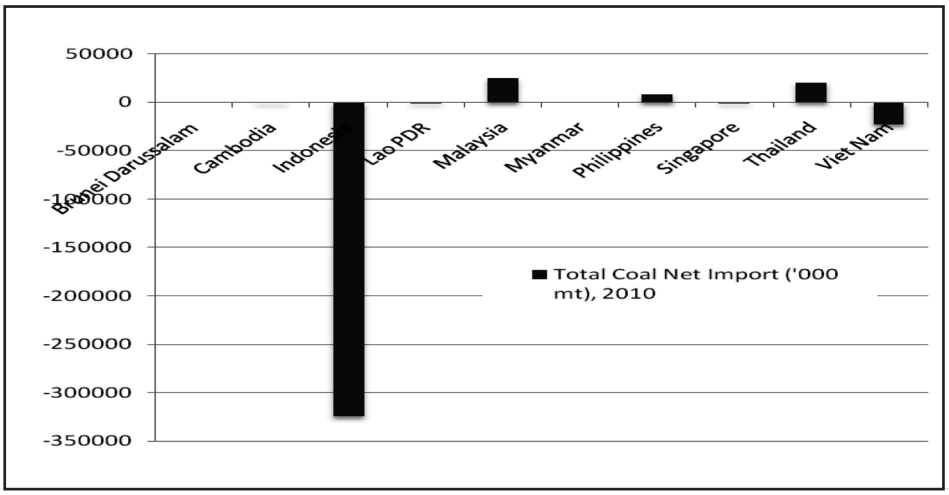


Source: EIA, 2013.

(d) Coal trade

Indonesia is the largest net exporter of coal in the ASEAN region, amounting to about 324,606 thousand metric tons in 2010. Viet Nam and the Lao PDR were also net exporters of coal in 2010, albeit at much lower values of about 22,689 thousand metric tons and 460 thousand metric tons, respectively. On the other hand, five of the 10 ASEAN member countries were net importers of coal in 2010 (Cambodia, Malaysia, the Philippines, Singapore and Thailand), mainly to fuel their power generation sector and for application in the industry sector. Figure 6 depicts the net coal imports in the ASEAN region.

Figure 6. Coal, net imports in the ASEAN region, 2010 ('000 metric tons)

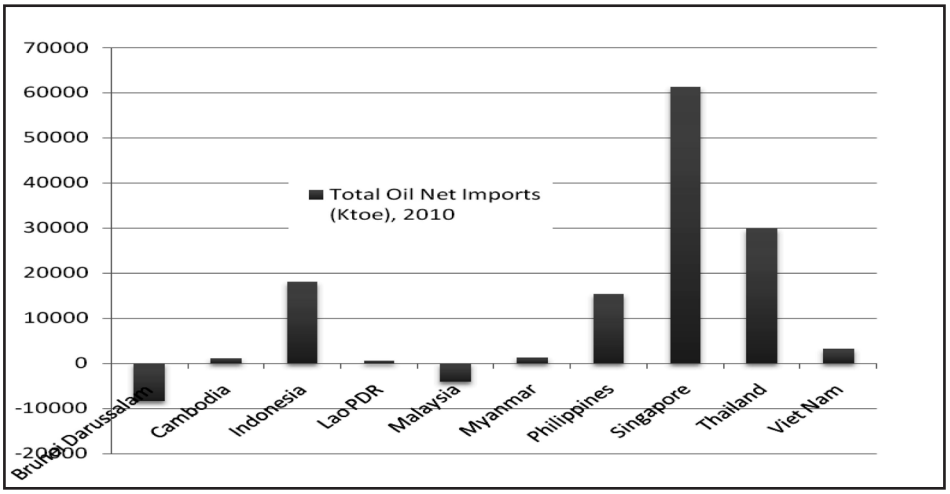


Source: EIA, 2013.

(e) Oil trade

Figure 7 shows that most of the ASEAN countries were net oil importers in 2010; only Malaysia and Brunei Darussalam were net oil exporters. Oil is essential for the transportation sector.

Figure 7. Net oil imports in the ASEAN region, 2010 (Ktoe)



Sources: EIA, 2013; and Pornkeratiwat, 2013.

(f) Energy sources: Import/export outlook

APERC (2013) has projected the imports/exports of coal, oil, gas and electricity for seven of the 10 ASEAN member countries. Tables 11 and 12 show the projected net import values for coal, oil, gas and electricity up to 2030. It is projected that Indonesia will remain a major coal net exporter in 2030 while Malaysia, the Philippines, Singapore, Thailand and Viet Nam will remain net importers of coal. As for oil resources, all ASEAN member countries are expected to become oil net importers by 2030, with the exception of Brunei Darussalam, which will remain an oil net exporter throughout the projection period (2010 to 2030).

Table 11. Coal and oil net imports

	Net coal imports (Mtoe)			Net oil imports (Mtoe)		
	2010	2020	2030	2010	2020	2030
Brunei Darussalam	0.00	0.00	0.00	-7.54	-6.66	-5.09
Indonesia	-141.56	-195.86	-278.68	19.28	53.63	98.74
Malaysia	9.37	14.05	11.99	-7.70	11.45	25.16
Philippines	2.87	7.74	18.59	13.72	17.10	25.14
Singapore	0.12	0.63	0.49	56.80	72.15	85.13
Thailand	10.02	14.95	17.56	34.50	49.32	69.74
Viet Nam	-7.70	-4.03	7.45	-2.96	6.48	23.09

Source: APERC, 2013.
Note: Projections for Cambodia, the Lao PDR and Myanmar are not readily available.

Through 2030, Brunei Darussalam and Malaysia are expected to remain net exporters of natural gas. On the other hand, Indonesia and Viet Nam are expected to become net importers of gas by 2030, changing their status from net exporters of gas in 2020. Singapore and Thailand will likely remain natural gas importers throughout the projection period. Thailand and Viet Nam are projected to maintain their status as net importers of electricity through the projection period. Malaysia, on the other hand, will become a net exporter of electricity, albeit at a very low value.

Table 12. Gas and electricity net imports

	Net gas imports (Mtoe)			**Net electricity imports (Mtoe)**		
	2010	**2020**	**2030**	**2010**	**2020**	**2030**
Brunei Darussalam	-7.99	-7.14	-5.58	0.00	0.00	0.00
Indonesia	-27.06	-6.54	36.15	0.00	0.00	0.00
Malaysia	-21.81	-35.94	-32.16	-0.01	-0.02	-0.02
Philippines	0.00	0.00	0.00	0.00	0.00	0.00
Singapore	7.82	8.91	9.50	0.00	0.00	0.00
Thailand	4.16	11.17	19.34	0.49	2.63	3.85
Viet Nam	0.22	-1.71	9.34	0.48	0.69	0.69

Source: APERC, 2013.
Note: Statistics for Cambodia, the Lao PDR and Myanmar are not readily available.

3. Meeting the energy gap challenge

This analysis of the historical trends and outlook of energy demand and supply shows that energy supply security concerns are threefold: (a) rapidly increasing energy demand; (b) over-dependency on fossil fuel resources to meet demand; and (c) increasing dependence on energy imports due to depleting domestic resources.

These three factors will lead to an increasing energy gap between demand and supply of energy for the 10 countries in the ASEAN region. It is possible for ASEAN member economies to take advantage of the physical proximities of demand and supply centers in order to secure the energy supply, particularly gas (via pipelines) and electricity (via power grids).

(a) Potential mitigation measures for the energy gaps

The strategic options for achieving sustainable energy development could also act as potential mitigation measures for the energy gaps. These measures can be segregated into the following four main segments:

(i) Efficient utilization of energy

By enhancing energy efficiency (EE) in the residential and commercial sector; reducing demand for personalized modes of transport and a planned public transport scheme for the transportation sector; and promoting co-generation in industrial facilities and tackling technology inefficiency in the industry sector.

(ii) Reducing carbon content of energy

By developing renewable energy; development of low-carbon electricity such as nuclear power plants; the application of carbon capture and storage systems at coal-based power plants; and increasing the use of alternate fuels and cleaner sources of energy for the transport sector.

(iii) Diversifying sources of energy supply

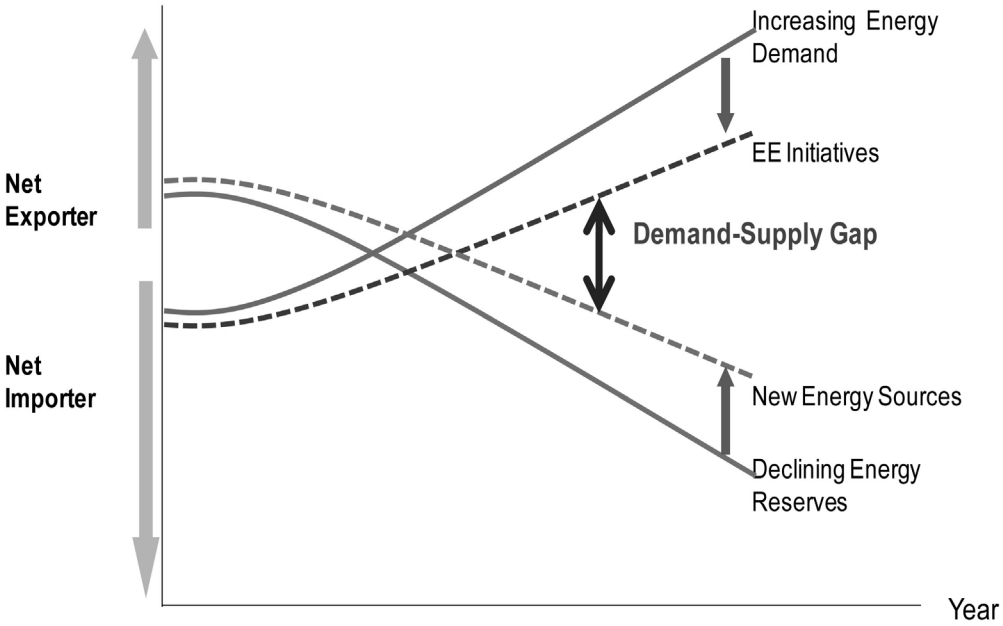
By intensifying hydro resources development; securing more gas from foreign sources; strengthening and expanding supply infrastructures to facilitate regional interconnection; and exploring and building capacity for the nuclear options (Endang Jati and others, 2013).

(iv) Regional interconnection of energy supply infrastructure and resources

The three measures to mitigate the energy gaps could be combined as depicted in figure 8. Energy efficiency measures will reduce the growth of energy demand, while declining energy reserves could be tackled by introducing new types of energy sources and by diversifying the location of the sources of energy supply.

Expanding the energy supply infrastructure and resources to facilitate regional interconnection is one of the key measures for diversifying the energy supply. In order to reduce the greenhouse emissions from the energy sector, measures to reduce carbon content of energy could be introduced concurrently with other measures.

Figure 8. Measures to mitigate energy gaps

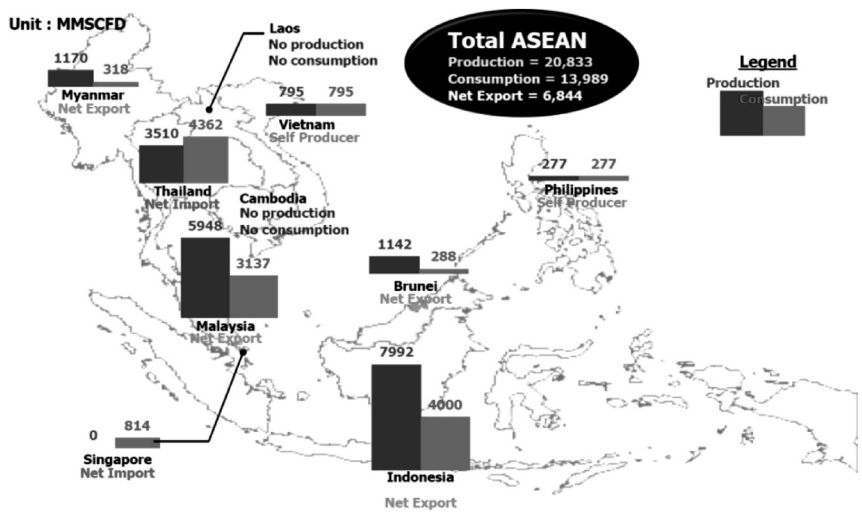


Note: Adapted from Malaysia Energy Planning Unit, 2012.

4. Mapping potential energy flows from energy surplus to energy deficit countries

As of 2013, two energy interconnection infrastructures exist in the ASEAN region, i.e., the TAGP to transport natural gas, and the APG to transport electricity. Currently, there is enough supply of natural gas within the region to meet regional demand; as a group, the ASEAN region is a net exporter of natural gas at 6,844 MMSCFD.

Figure 9. Natural gas production and consumption in the ASEAN region



Note: Adapted from Pornkeratiwat, 2013.

(a) Current state of ASEAN connectivity

(i) ASEAN Power Grid[10]

The Heads of State/Government of the ASEAN member countries called for the establishment of electricity interconnecting arrangements within the region through the APG under the ASEAN Vision 2020 adopted by the Second ASEAN Informal Summit in Kuala Lumpur on 15 December 1997.

The APG is an effective way for ASEAN member economies to essentially pool electricity by interconnecting the various independent power systems through transmission networks between neighboring countries. Technically, this will improve the overall network reliability and stability of the interconnected power grids. From an economic point of view, expansion of power grids will allow investment economies-of-scale in power supply instead of individual power systems building independent facilities, and these interconnections would enable ASEAN member countries that export electricity to earn revenue from the sales. At the same time, large interconnected system would offer more opportunities for environmentally favourable energy resources for power generation to be developed than the isolated and smaller ones (APERC, 2000).

The underlying concepts for the development of the APG are to:

(a) Maximize the use of resources in the region to achieve best benefits for ASEAN;
(b) Encourage the development of large-scale power production in commercial scale;
(c) Promote cooperation in the generation and use of power in ASEAN.

At the same time, the main objectives of establishing the APG are to:

(a) Promote a more efficient, economical and secure operation as well as to foster harmonious development of the national electricity network in the ASEAN countries by establishing or achieving a region-wide interconnection linking the member countries' national networks;
(b) Optimize or maximize the use of energy resources in the region by sharing the benefits;
(c) Reduce the financial burden from generation capacity expansion;
(d) Share experiences amongst member countries;
(e) Establish close power cooperation within the region.

The existing linkages of the APG, as of 2013, are listed in table 13 while figure 10 shows the same interconnections on the ASEAN map. Table 14 is a status report of current and future APG interconnection projects.

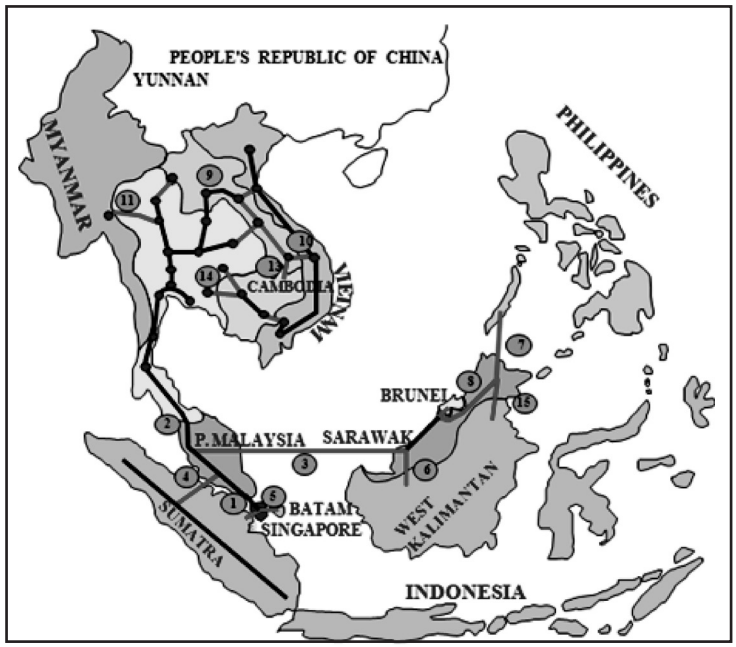
10 This section was adapted from ACE (2013).

Table 13. Existing linkages of the APG

No.	Interconnected Projects	System	Capacity (MW)	Type	SCOD
1	Thailand-Peninsular Malaysia				
	· Sadao-Chuping	HVAC	80	EE	1980
	· Khlong Ngae-Gurun	HVDC	300	EE	2002
2	Thailand-Lao PDR				
	· Nakhon Phanom-Thakhek-Theun Hinboun	HVAC	214	PP: La→Th	1998
	· Ubon Ratchathani 2-Houay Ho	HVAC	126	PP: La→Th	1999
	· Roi Et 2-Nam Theun 2	HVAC	946	PP: La→Th	2010
	· Udon Thani 3-Na Bong-Nam Ngun 2	HVAC	597	PP: La→Th	2011
	· Sakhon Nakhon 2-Thakek-Theun Hinboun (Expansion)	HVAC	220	PP: La→Th	2012
3	Peninsular Malaysia-Singapore				
	· Pentong-Woodlands	HVAC	450	EE	1985
4	Viet Nam-Cambodia				
	· Chau Doc-Takeo-Phnom Penh	HVAC	200	PP: Vn→KH	2009
5	Thailand-Cambodia				
	· Aranyaprathet-Banteay Meanchey	HVAC	100	PP: Th→Kh	2007
		Total	**3,483**		
SCOD stands for Scheduled Commercial Operating Date					

Source: ACE, 2013, table 2.5.

Figure 10. Map of the APG



Source: ACE, 2013, figure 2.2.

Table 14. Status of the APG projects

No.	Interconnection Projects	Revised Earliest COD
1	Peninsular Malaysia-Singapore (New)	2018
2	Thailand-P.Malaysia:	
	· Sadao-Bukit Keteri	Existing
	· Khlong Ngae-Gurun	Existing
	· Su Ngai Kolok-Rantau Panjang	2015
	· Khlong Ngae-Gurun (2nd phase, 300 MW)	2016
3	Sarawak-Peninsular Malaysia	2015-2021
4	Peninsular Malaysia-Sumatra	2017
5	Batam-Singapore	2015-2017
6	Sarawak-West Kalimantan	2015
7	Philippines-Sabah	2020
8	Sarawak-Sabah-Brunei:	
	· Sarawak-Sabah	2020
	· Sabah-Brunei	Not Selected
	· Sarawak-Brunei	2016-2017
9	Thailand-Lao PDR	
	· Roi Et 2-Nam Theun 2	Existing
	· Sakon Nakhon 2-Thakhek-Then Hinboun (Exp.)	2012
	· Mae Moh 3-Nan-Hong Sa	2015
	· Udon Thani 3-Nabong (converted to 500KV)	2017
	· 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-Viet Nam	2011-2016
11	Thailand-Myanmar	2016-2025
12	Viet Nam-Cambodia (New)	2016
13	Lao PDR-Cambodia	2015
14	Thailand-Cambodia (New)	2015-2017
15	East Sabah-East Kalimantan	Feasibility Study
16	Singapore-Sumatra	2020

Source: ACE, 2013, table 2.4.

(ii) Trans-ASEAN Gas Pipeline

The Trans-ASEAN Gas Pipeline (TAGP) project was endorsed by the seventeenth ASEAN Ministers on Energy Meeting (AMEM) in July 1999. The responsibility for implementing the project was entrusted to the ASEAN Council on Petroleum (ASCOPE), in collaboration with national focal points and relevant institutions. During the twentieth AMEM on 5 July 2002 in Bali, Indonesia, the Ministers signed the ASEAN Memorandum of Understanding on the TAGP project, which sets out the cooperative framework for greater public-private partnership

and collaboration in the TAGP implementation (ACE, 2013).

The objectives of TAGP are to:

(a) Provide energy supply security, which is essential for industrial development;
(b) Strengthen cross-border economic and political ties;
(c) Enable the members to share least-cost gas resources, which have an environmental impact advantage compared to other energy resources.

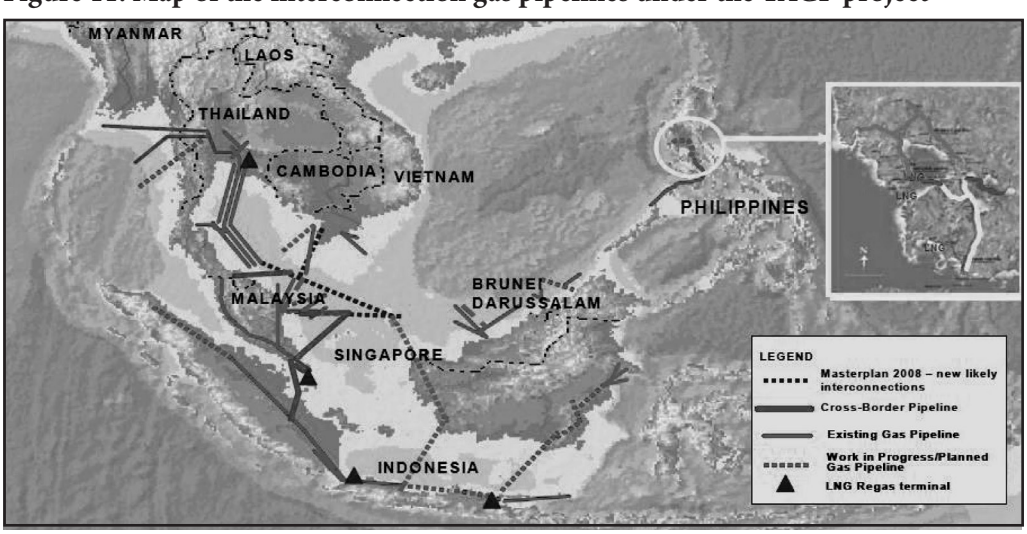
Currently there are 11 cross-border gas pipeline interconnection projects in operation; the total length of the gas pipeline is approximately 3,019 km. The twelfth cross-border gas pipeline, a 150-km new pipeline connection from Myanmar to Thailand, will come into operation in 2013 (figure 11). The gas infrastructure serves as a key driver of growth to the various energy-consuming sectors in the ASEAN economies. The list of existing pipelines is listed in table 15.

Table 15. Existing gas pipeline interconnections

No.	Interconnection	Completion year	Length (km)
1	P. Malaysia-Singapore	1991	5
2	Yadana, Myanmar to Ratchaburi, Thailand	2000	470
3	Yetagun, Myanmar to Ratchaburi, Thailand	2000	340
4	West Natuna, Indonesia to Singapore	2001	660
5	West Natuna, Indonesia to Duyong, Malaysia	2001	100
6	CAA-Malaysia	2002	270
7	South Sumatra, Indonesia to Singapore	2003	470
8	CAA-Viet Nam	2007	330
9	Malaysia - Joint Development Area (JDA)	2009	100
10	Singapore to Malaysia	2006	4
11	Thailand - Joint Development Area (JDA)	2009	100
12	*M9-Thailand*	*2013*	*250*

Sources: ACE, 2013; and ACE, 2010.

Figure 11. Map of the interconnection gas pipelines under the TAGP project



Source: ACE, 2013, figure 3.2.

(b) Expanded state of connectivity

(i) ASEAN Power Grid

The updated status of the APG projects is listed in table 16. These are ongoing projects with tariffs or Memorandums of Understanding already signed.

Table 16. Updates on APG status

No.	Interconnection Projects	System	Capacity (MW)	Type	SCOD
1	Thailand-Peninsular Malaysia				
	· Su Ngai Kolok-Rantau Panjang	HVAC	100	EE	2015
2	Peninsular Malaysia-Sumatra				
	· Malaka-Pekan Baru (Selected by AIMS-II, Priority Project)	HVDC	600	EE	2018
3	Sarawak-West Kalimantan				
	· PPA signed in September 2012, Priority Project	HVAC	230	PP: Sw→WK (5 years) then convert to EE	2014
4	Sarawak-Sabah-Brunei				
	· Sarawak-Brunei (Committed in AIMS II)	HVAC	2x100	EE	2012 2016
5	Thailand-Lao PDR				
	· Mae Moh 3-Nan 2-Hong Sa	HVAC	1473	PP: La→Th	2015
	· Udon Thani 3-Na Bong-Nam Ngiep 1	HVAC	269	PP: La→Th	2018
	· Ubon Ratchathani 3-Pakse-Xe Pian Xe Namnoy	HVAC	390	PP: La→Th	2018
6	Lao PDR-Viet Nam				
	· Ban Hat San-Pleiku	HVAC	1,000	PP: La→Vn	2015
	· Nam Mo-Ban Ve	HVAC	TBC	PP: La→Vn	TBC
	· Xekaman 1-Thankhmy	HVAC	488	PP: La→Vn	2013
	· Stung Treng-Chau Doc	HVAC	207	PP: La→Vn	2014
	· Luang Prabang-Nho Quan	HVAC	1,410	PP: La→Vn	2015
7	Lao PDR-Cambodia				
	· Ban Hat-Stung Treng (G2G Agreement)	HVAC	300	PP: La→Kh	2016
		Total	**6,467**		
SCOD stands for Scheduled Commercial Operating Date					

Source: ACE, 2013, table 2.6.

(ii) Trans-ASEAN Gas Pipeline

The East Natuna gas resource in Indonesia is expected to be the main source of gas for the ASEAN region in the future. The ability to exploit this gas resource is a key to addressing the supply gap (ACE, 2013). A proposed cross-border natural gas pipeline from East Natuna is listed in table 17.

Table 17. Proposed cross-border natural gas pipelines from East Natuna

No.	Cross-Border Pipeline	Length (km)	Note	Status
1	East Natuna, Indonesia-JDA-Erawan, Thailand	1500	Commencement date will be approximately 7 years from East Natuna gas supply sanction. Approximate volume to make each pipeline viable is 1 BSCF/day (i.e. 36"- 42" diameter of pipeline)	Subject to Supply Commercial viability
2	East Natuna, Indonesia-Kerteh, Malaysia	600		
3	East Natuna, Indonesia-Java, Indonesia	1400		
4	East Natuna, Indonesia-Viet Nam	900		
5	East Natuna, Indonesia-Brunei Darussalam-Sabah, Malaysia-Palawan, Philippines	Regional assumptions on East Natuna Gas field have changed since the 2000 Original TAGP Master Plan. High demand and limited gas supply with high CO_2 content has increased cost of development of this pipeline.		

Source: ACE, 2013, table 3.2.

(c) AEMI and the ASEAN connectivity

The existing ASEAN connectivity for both gas pipelines and power networks are not yet at sufficient levels to allow for the seamless adoption of AEMI. However, this may not be a negative point. As discussed above, the current cross-border interchanges for power in ASEAN are based on bilateral agreements, since market integration was not a priority when APEAC was first formulated. Therefore, if ASEAN countries decide to make AEMI a priority in the future, upcoming interconnections can be designed with the view of market integration.

D. Integrated ASEAN energy market

Energy market integration (EMI) has been pursued in ASEAN and East Asia (EAS) for decades. However, no explicit definition of EMI has been established. What the vision and goals of EMI would be, and how it should proceed in East Asia has not been clear at all (Shi and Kimura, 2010; Kimura and Shi, 2011). To define the possible scenarios of EMI, it is worthwhile reviewing the development of EMI globally.

The European Union is one example often cited as a model for economic integration, including EMI. However, the European Union still needs to do further work in order to realize all the competitive benefits to which it aspires (Bannister and others, 2008). The European Union

has been working on EMI between its member countries for many years, both for electricity and pipeline gas. Although the longer-term goal of buyers and sellers operating competitively across national borders and without constraints has not been achieved, there has been some success, such as cross-broader energy flow (Bannister and others, 2008). The unachieved goal of competition may be partly due to doubt in Germany and France that an ownership unbundling, i.e., forcing large electricity-generating firms (monopolies and incumbent groups) to cede control over their distribution networks, is necessary for a better functioning energy market with better prices, greater supply security and environmental sustainability (Euractiv, 2007); and partly due to overlooking or politically debating of important technical and regulatory challenges that lead to confusion about the best way to proceed with the liberalization drive (Bannister and others, 2008). In summary, ownership unbundling, technical and regulatory challenges are still present while energy trade flows have occurred.

At the East Asia regional level, attempts to define EMI have started in 2010, with the launch of the ERIA study for the EAS Summit and its energy ministers. A conceptual framework was gradually developed for the study on EMI in East Asia, which effectively identified the major components of EMI in the whole EAS as: (a) trade liberalization; (b) investment liberalization; (c) the development of regional energy infrastructure and institutions; (d) liberalization of domestic energy markets; and (e) energy pricing reform, in particular, removal of fossil fuel subsidies (Shi and Kimura, 2010; and Kimura and Shi, 2011). The first four elements were agreed on and pricing, although sensitive, was noted explicitly by the fifth EAS Energy Ministers Meetings (ASEAN, 2011).

Kimura and Shi (2011) argued that these five issues were important elements of EMI and were interrelated. Well-functioning and transparent national energy markets are essential to developing an open, competitive, and more integrated EAS regional energy market. In order to increase energy market efficiency, it is necessary to remove impediments and distortions that prevent the efficient functioning of the market. This should include, but not be limited to, trade and investment liberalization and the reduction or removal of barriers, such as price restrictions, subsidies and monopolies. A region-wide movement of energy products requires both physical infrastructure and institutions to be in place. This framework was also followed by the later ERIA studies on EMI, including Shi and Kimura (2011), and Wu and others (2012).

The brief overview of the European Union and the EAS efforts on EMI finds that there is no single or authoritative definition of EMI. The definition of EMI depends completely on each regional bloc's background, including political willingness and regulatory framework. In ASEAN, the EAS EMI framework proposed by ERIA should also be applicable due to the close relationship between ASEAN and EAS. Trade and investment liberalization has been achieved, or at least attempted, in the ASEAN Free Trade Area (AFTA) and AEC. ASEAN regional infrastructure has long been attempted with the APG and TAGP as the two flagship programs. Institutional apart from the infrastructure, such as Gas Swap Principle, has also been formulated recently (Shi and Malik, 2012).

The other two elements, domestic market liberalization and energy pricing reform, however, have rarely been mentioned in ASEAN. Fuel subsidies have a great presence in many ASEAN countries, such as Brunei Darussalam, Indonesia and Malaysia. Energy subsidies have become deep-rooted in ASEAN social and political structures, starting from the time of colonization, because Western forces used cheaper energy as an instrument to reduce protests from the local people over extraction of natural resources (Kojima and Bhattacharya, 2011).

Plans or actions for liberalizing energy prices and removing subsidies for fossil energy have been implemented in many countries, such as Indonesia and Malaysia. However, little advancement has been demonstrated in these two countries towards reducing the subsidy. Fuel subsidies are

still heavy in Brunei Darussalam, Indonesia and Malaysia. With such subsidy policies in place, countries have to close their boundaries. In order to prevent leakage of subsidies to others, limitations on purchasing fuels and preventive smuggling measures are often enforced at the borders of Singapore-Malaysia, Thailand-Malaysia and Cambodia-Viet Nam. In an integrated energy market, the national Government would have difficulties, if not finding it impossible, to control or manipulate fuel prices. The open market will bring fuels from cheaper to more expensive markets.

Similarly, for AEMI to be successful, it needs an open competitive national energy market as part of an integrated market. However, many ASEAN energy countries still have dominant national players, with electricity market as a distinguished example (Kimura and Shi, 2011).

EMI in ASEAN is more promising than the EAS, and it is possible to have a clear vision of ASEAN EMI in the near-future. The situation in ASEAN is slightly better than that in East Asia, as ASEAN has an institutional goal of establishing the AEC, which provides for an overall architecture for EMI. The ASEAN energy section has a close relationship with all the four pillars under the AEC. As a commodity group and production input, energy is a necessary part of the single market and production base. Pursuing a competitive regional market requires an open and competitive energy sector, in line with the national economy in general. Energy is also important to equitable economic development by providing an electricity service to more than 100 million people who have no access to electricity in ASEAN, in line with the aims of United Nations Conference on Sustainable Development (Rio+20). However, the AFTA, and AEC by 2015, is not a custom union as that in the European Union. Each Member State still has its own national tariff scheme, which, however, has to be limited to zero-5 per cent in the majority of cases. The segmental arrangements and the need for a clear vision make AEMI more challenging in moving towards an ASEAN energy market.

Given the above understanding, a proposed vision for AEMI is:

- By the end of 2015 when the AEC is expected to be established, ASEAN energy markets are likely to be a group of institutionally and physically connected, but not fully opened competitive national markets.

- After 2015, given the condition that the AEC is seriously moving forward and ASEAN is overcoming its challenges to become an integrated glomeration, ASEAN energy market will emerge at first as a more harmonized, more open and competitive regional market with some national restrictions on investments and import of electricity. However, electricity may be traded among member countries. The trading of electricity, if it happens, will likely be stimulated by the development of hydroelectricity in the Greater Mekong Subregion.

- Another challenging step is to achieve fully liberalized and competitive national energy markets by 2030. Beyond 2030, we may see a regional energy market, which although does not have identical national energy markets, can allow free flow of energy goods, investment and services. Economically feasible electricity trading can be realized without any institutional constraints. The success of AEMI requires higher levels of political trust and commitment among ASEAN member countries. The ASEAN member countries can change from a national energy security paradigm to an ASEAN regional energy paradigm.

E. Conclusion

This chapter has touched upon two important issues related to the rationale for AEMI, i.e., mapping out the ASEAN energy challenges and defining ASEAN energy market integration.

The ASEAN region has been experiencing rapid economic growth for the past few decades and is expected to expand further in the future; the regional economic growth projected for the next 25 years is encouraging and the GDP per capita for ASEAN is projected to more than double from 2010 to 2030, reaching US$ 3,736 per capita (in 2000 US dollars). However, this economic growth will spur demand growth for energy, which is expected to more than double from 2010 to 2035. Energy demand for each ASEAN country (even Brunei Darussalam) is projected to continue to increase beyond 2030. For some countries, like Indonesia and the Lao PDR, the increase is more than double the demand at the base year. The implications are energy production that is unable to meet the rapidly increasing demand, further widening the supply-demand gap over the outlook horizon in 20 years.

The increasing energy gap for ASEAN countries can be attributed to two main factors, i.e., rapidly increasing energy demand and depleting energy reserves. There are also other factors that may further exaggerate the situation; for example, technically available renewable energy and hydropower potential may not be exploitable if the cost of harnessing this potential is too expensive, or using nuclear energy for electricity generation may not be pursued if perceived as high risk to national safety and stability in the region.

This chapter has identified four potential mitigation measures for the energy gap: (a) efficient utilization of energy – enhancing energy efficiency (EE); reducing demand for personalized modes of transport and a planned public transport scheme for the transportation sector; and promoting co-generation in industrial facilities and tackling technology inefficiencies in the industry sector; (b) reducing carbon content of energy – developing renewable energy, development of low carbon electricity such as nuclear power plants, application of carbon capture and storage systems at coal-based power plants; and increasing the use of alternate fuels and cleaner sources of energy for the transport sector; (c) diversifying sources of energy supply – intensifying hydro resources development; securing more gas from foreign sources; strengthening and expanding supply infrastructures to facilitate regional interconnection; and exploring and building capacity for the nuclear options; and (d) regional interconnection of energy supply infrastructure and resources.

Energy resources in ASEAN are unevenly distributed; some countries are rich in fossil fuel resources, others have vast hydropower potential while some are resources-poor and have limited indigenous energy potential. Expanding the energy supply infrastructure and resources to facilitate regional interconnection are some of the key measures for tackling the issue of the energy gap and security. However, at this point, the existing ASEAN connectivity for both gas pipelines and power networks is not yet at sufficient levels to allow for the seamless flow of energy between countries. Trading of energy between countries, through the AEMI mechanism, will be an even greater challenge given the varied energy institutional setup across the ASEAN region. This will require cooperation at the highest level of government as well as with leaders of the energy supply industries.

Recognizing the importance of a regional interconnection of energy supply infrastructure and resources, efficient utilization of energy and reduction carbon content of energy, ASEAN leaders and policymakers jointly expressed in the 1997 Summit Declaration the "ASEAN Vision 2020", in which the ASEAN Heads of Governments agreed to "establish interconnecting arrangements for electricity, natural gas and water within ASEAN through the ASEAN Power Grid and the Trans-ASEAN Gas Pipeline, and promote cooperation in energy efficiency and conservation as

well as development of new and renewable energy resources". A series of medium-term action plans have been prepared as a blueprint for ASEAN cooperation in attaining the ASEAN 2020 Vision. The current action plan, the third in the series, is the 2010 ASEAN Plan of Actions for Energy Cooperation (APAEC 2010-2015).

It is interesting to note that the APAEC 2010-2015 document, while advocating the integration of energy networks (both pipelines and power grids), makes no mention to the introduction of trade/energy markets. The existing cross-border energy exchange thus far is limited to zero exchange or pre-established purchase agreements (bilateral) (ACE, 2013).

Therefore, in moving towards achieving AEMI, a proposed vision for AEMI is:

(a) By the end of 2015, when the AEC is expected to be established, ASEAN energy markets are likely to be a group of institutionally and physically connected, but not fully opened competitive national markets;

(b) After 2015, given the condition that the AEC is seriously moving forward and ASEAN is overcoming its challenges to becoming an integrated glomeration, an ASEAN energy market will emerge at first as a more harmonized, more open and competitive regional market with some national restrictions on investments and imports of electricity. However, electricity may be traded among member countries. The trading of electricity, if it happens, will likely be stimulated by the development of hydroelectricity in the Greater Mekong Subregion;

(c) Another challenging step is to achieve fully liberalized and competitive national energy markets by 2030. Beyond 2030, we may see a regional energy market, which, although does not have identical national energy markets, can allow free flow of energy goods, investment and services. Economically feasible electricity trade can be realized without any institutional constraints. The success of AEMI requires higher levels of political trust and commitment among ASEAN member countries. The ASEAN member countries can change from a national energy security paradigm to an ASEAN regional energy paradigm.

From the outset, the purpose of this chapter is to provide a background review of the current energy challenge and how best to link it to AEMI core objectives. Although this chapter provides a comprehensive review of the energy challenges as well as some ongoing initiatives that foster collaborative work at the ASEAN level through the nascent physical and institutional integration, much work needs to be undertaken to move AEMI towards the next step to bringing AEMI objectives to fruition. The context of a successful AEMI would be a necessary condition for the success of the AEC, which would enhance energy security and environmental viability across the region and undoubtedly yield significant economic benefits to all involved, from the economic, societal and environmental perspectives. The core areas for further research are: (a) to enhance the knowledge base in the individual ASEAN countries with regard to their challenges in tackling the energy gap; (b) to understand the national perspectives and action plans for moving towards an integrated energy market in terms of new interventions required in relation to policy and infrastructure developmental needs; (c) the level of acceptance and preparedness in liberalizing the energy market, both at the national and the ASEAN level; (d) how best to institutionalize the interconnections and energy trading from a bilateral to an open market system; and (e) the need to further enhance the understanding and development of AEMI definitions, objectives, and the hardware and software needed for the integration to materialize the vision towards building a blueprint for AEMI.

References

ACE (2010). *APAEC 2010-2015, ASEAN Plan of Action for Energy Coopreration 2010-2015*. ASEAN Centre for Energy, Jakarta. Available at http://aseanenergy.org/index.php/about/apaec.

—— (2011). *The Third ASEAN Energy Outlook*. ASEAN Centre for Energy, Jakarta. Available at http://aseanenergy.org/index.php/publication/2012/06/14/3rd-asean-energy-outlook.

—— (2013). *Development of ASEAN Energy Sector: Power Network Interconnection, Natural Gas Infrastructure and Promotion of Energy Efficiency*. ASEAN Centre for Energy, Jakarta.

APERC (2013). *APEC Energy Demand and Supply Outlook, 5th Edition*. Asia Pacific Energy Research Centre, Tokyo. Available at http://aperc.ieej.or.jp/publications/reports/outlook.php.

——— (2000). *Power Interconnection in the APEC Region.* Asia Pacific Energy Research Centre, Tokyo. Available at http://aperc.ieej.or.jp/file/2010/9/26/Power_Interconnection_in_the_APEC_Region_2000.pdf.

ASEAN (2011). *Joint Ministerial Statement of the Fifth East Asian Summit Energy Ministers Meeting.* Available at http://www.asean.org/news/item/joint-ministerial-statement-of-the-fifth-east-asian-summit-energy-ministers-meeting-jerudong-brunei-darussalam-20-september-2011-2 (accessed 26 September 2011).

Bannister, H., G. McDonell, S. Thorncraft, X. Hu, B. Whitelock and C. Malik (2008). *Energy Market Integration in the East Asia Summit Region*. ASEAN Secretariat, Jakarta.

Euractiv (2007). "Commission wields big stick on EU energy sector", report on the findings of European Union Competition Commissioner, Neelie Kroes, published 17 February 2006, updated 29 June 2007.

EIA (2013). *International Energy Database 2013*. US Energy Information Agency, Washington, D.C. Available at www.eia.gov

Endang Jati M. S., C. S. Chew and Y. P. Leong (2013). *Enhancing energy security in Malaysia: The challenges towards sustainable environment*, paper presented at the Fourth International Conference of Energy and Environment, 5th & 6th March 2013 at Universiti Tenaga Nasional, Malaysia

EPU (2012). *The new energy policy*, paper presented at the National Energy Security Conference, 28 February 2012 at Sime Darby Convention Centre, Kuala Lumpur, Malaysia. Economic Planning Unit, Kuala Lumpur.

ERIA (2011). *Energy Market Integration in East Asia: Theories, Electricity Sector and Subsidies*. Economic Research Institute for ASEAN and East Asia, Jakarta. Available at http://www.eria.org/RPR-2011-17.pdf.

——— (2010). *Energy Market Integration in the East Asia Summit region: Review of Initiatives and Estimation of Benefits*. Economic Research Institute for ASEAN and East Asia, Jakarta.

Institute of Energy Economics, Japan (2013). *Asia/World Energy Outlook 2012.* Available at http://eneken.ieej.or.jp/data/4686.pdf.

Kimura, F. and X. Shi (2011). *Energy Market Integration in East Asia: Deepening Understanding and Moving Forward*. Economic Research Institute for ASEAN and East Asia, Jakarta. Available at http://www.eria.org/publications/research_project_reports/deepen-understanding-and-move-forward-energy-market-integration-in-east-asia.html.

Kojima, S. and A. Bhattacharya (2011). "Pricing Reform and Enhanced Investment in the Energy Sector: A Way Towards East Asian Economic Development". In: F. Kimura and X. Shi (eds.), *Deepen Understanding and Move Forward: Energy Market Integration in East Asia*. Economic Research Institute for ASEAN and East Asia, Jakarta: Indonesia.

Pérez-Arriaga, I. J. (2010). "Regional electricity markets" (lecture notes). Available at http://ocw.mit.edu/courses/engineering-systems-division/esd-934-engineering-economics-and-regulation-of-the-electric-power-sector-spring-2010/lecture-notes/MITESD_934S10_lec_22.pdf.

Pornkeratiwat (2013). "Briefing on the Trans-ASEAN Gas Pipeline plan", 14 March 2013.

Shi, X and F. Kimura (2010). *Energy Market Integration in the East Asia Summit Region: Review of Initiatives and Estimation of Benefits*. Economic Research Institute for ASEAN and East Asia, Jakarta.

Shi, X and C. Malik (2012). *Mid-Term Review of AEC Blueprint on the Energy Sector*. Economic Research Institute for ASEAN and East Asia, Jakarta.

WEC (2010). *2010 Survey of Energy Resources*. World Energy Council, United Kingdom. Available at http://www.worldenergy.org/documents/ser_2010_report_1.pdf

Wu, Y., X. Shi and F. Kimura (eds) (2012). *Energy Market Integration in East Asia: Theories, Electricity Sector and Subsidies*. Economic Research Institute for ASEAN and East Asia, Jakarta.

Websites for energy resources availability by country

World Energy Resources (2010) (http://www.worldenergy.org/publications/2010/survey-of-energy-resources-2010).

BP Statistical Review of World Energy (2012) (http://www.bp.com/en/global/corporate/about-bp/statistical-review-of-world-energy-2013.html).

United States Geological Survey (http://minerals.usgs.gov/minerals/pubs/country/).

Clean Energy Info Portal (www.reegle.info).

Energy Information Agency (2013), International Energy Database (http://www.eia.gov/countries/).

II. AEMI benefits

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Abstract

Market integration, ranging from the economy to energy and the environment, has shown it has provided huge benefits for integrated markets. This chapter, which suggests that the ASEAN Energy Market Integration (AEMI) will reap a similar benefit in the energy market, revisits the theoretical background of market integration, reviews the experiences of energy market integration in other areas of the world – i.e., the European Union as well as West African countries – and draws lessons from these experiences for AEMI. In addition, it identifies the benefits that would accrue to AEMI. The identified economic benefits are increases in gross domestic product (GDP), the convergence and stabilization of energy prices, and more foreign direct investment (FDI) in the integrated energy market. The identified energy benefits are enhanced energy security, higher energy efficiency, lower energy system costs and higher energy development indicators. There would also be environmental benefits such as lower CO_2 emissions.

Keywords: Equitable growth; environmental quality; energy security; energy poverty; social welfare; and energy development indicators (EDI).

A. Introduction

The Association of Southeast Asian Nations (ASEAN) will achieve an even higher level of economic integration through the forthcoming ASEAN Economic Community (AEC) in 2015. In the AEC, there will be free movements of factors (i.e., skilled labor and capital) that are extremely useful for creating efficient economic activities in production, distribution and consumption. These factors will move from "less efficient" countries to "more efficient" countries. All economic activities require energy products. Therefore, smooth-functioning economic integration obviously requires energy market integration. An integrated energy market is considered to provide more benefits than costs to the participants of the market. ASEAN, and more specifically the Greater Mekong Subregion (GMS), have a strong potential for economic development and cooperation together with greater possibilities for harnessing energy resources, but major barriers exist to the realization of such potential and possibilities (Bhattacharya and Kojima, 2010; Chang and Yao, 2012; Lidula and others, 2007; Yu, 2003). The European Union's integrated energy market has proved that the benefits from an integrated energy market are greater than the costs of creating such a market (Barroso, 2006; *The Economist*, 2007; Leonard, 2005), although there is still room for improvements (Kroes, 2007). A study by Gnansounou and others (2007) examined strategies for regionally integrating electricity supply in West Africa and found that an integrated strategy would bring benefits such as reduced capital expenditures, lower electricity supply costs and enhanced system reliability.

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Noticing the creation of a few successful integrated energy markets elsewhere, similar attempts to create an integrated energy market in the ASEAN region have started. It is suggested that the ASEAN members should increase their efforts towards regional cooperation in the area of sharing best practices in the development and utilization of energy and energy efficiency (IEEJ, 2011). In their flagship report, the Asian Development Bank (ADB, 2013) emphasized the need for a secure energy supply to ensure a robust economic growth in the region. Therefore, it recommended the establishment of a region-wide market for energy, including equipment, together with specific recommendations for strengthening the energy sector, i.e., reducing energy demand, replacing energy subsidies with efficient policies, investing in new technologies and putting the use of renewable energy first (ADB, 2013).

A public good approach indicates that economic growth and a number of positive externalities are the possible benefits of an integrated energy market (Andrews-Speed, 2011). The accrued benefits of an integrated energy market are diverse and subtle. Some benefits are direct and tangible while others are indirect and intangible. The benefits of an integrated energy market would be greater than the costs of integrating energy markets across the region.

This chapter examines the possible benefits to be gained from an ASEAN Energy Market Integration (AEMI). It consists of three main parts. First, it revisits the rationale of integration by reviewing the theories of integration with regard to economic, market and energy perspectives. Second, it reviews a few existing integrated energy market cases such as the European Union and West Africa, and examines what benefits have been brought into the integrated energy market. Third, it assesses the potential benefits of the AEMI, ranging from the economic and environmental to the energy and other benefits, possibly by simulation of a computable general equilibrium or non-linear model.

B. Theoretical overview of integration

1. Economic integration

Theoretically, there are five successive stages of economic integration based on the degree of openness, i.e., a Free Trade Area (FTA), Customs Union (CU), Common Market (CM), Economic Union, and Complete Economic Integration (CEI) (Balassa, 1961; McCarthy, 2006). In an FTA, tariffs (and other quantitative restrictions) are abolished by the participating countries. However, each country still maintains its own tariffs against the non-members. In a CU, apart from the introduction of free movement of commodities within the union, common external tariffs in trade with non-member countries are set up. In a CM, not only trade restrictions but also restrictions on factor movements are abolished. In the European Union, the member countries combine the suppression of restrictions on commodities and factor movements with some degree of harmonization of national economic policies, in order to remove discrimination due to disparities in those policies. In CEI, unification of monetary, fiscal, social and counter-cyclical policies are observed; it also requires the setting-up of a supra-national authority whose decisions are binding on the member States.

The only one *de jure* economic integration in East Asia is the ASEAN Free Trade Area (AFTA). In 2015, ASEAN will establish the AEC, which appears to have the similar characteristics to those of a CM. The flow of production factors (capital and labor), trade diversion and trade creation may not be optimized in the AEC due to the absence of common external tariffs. However, ASEAN members have their own way of integrating their economies – the "ASEAN way". So the Governments of ASEAN members are obviously eager to realize the AEC on schedule in

2015. As a regional economic integration, the AEC has four main characteristics: (a) a single market and production; (b) a highly competitive economic region; (c) equitable development; and (d) full integration in the global economy. The AEC also has to consider AEMI in order to support well-functioning distribution, consumption and production within the community. The internal ASEAN energy market, through AEMI, will become a powerful instrument for supporting the AEC and for increasing competition not only within the AEC but also in the global market. In addition, it will help AEMI to become a source of large macroeconomic benefits. However, the benefits of AEMI will be significantly greater if the removal of the remaining cross-border barriers in energy products is achieved. More specifically, AEMI will become a means for generating a more dynamic, innovative and competitive economy in the global market.

2. Market integration

(a) Condition

Market integration will be achieved if prices among different markets follow similar patterns over a long period. Prices often move proportionally to each other; when this movement is very clear among different markets, those markets are integrated. If AEMI is established, there will be co-movements of energy product prices in ASEAN countries.

(b) Characteristics

There is a conflict between the technical efficiency and the agency efficiency in the strategy "to buy from market" ("arm's length" market transaction – market integration) and "to produce domestically" (vertical integration) (Besanko and others, 2010). Similarly, in an international energy market, a country can choose "to buy" (market integration) or "to produce domestically" in order to fulfill domestic energy demand. The benefits of market integration are that: (a) market energy firms (countries) can achieve economies of scale; and (b) market energy firms (countries) will be efficient and innovative.

3. Energy market integration

(a) Comparative Advantage of ASEAN Countries

To examine the pattern of comparative advantages of energy products, a modified measure of Revealed Symmetric Comparative Advantage (RSCA) is applied in the empirical analysis. The $RSCA_{ij}$ index ranges from -1 to +1 (or $-1 \leq RSCA_{ij} \leq 1$). $RSCA_{ij}$ that are greater than zero imply that country *i* has a comparative advantage in good *j*. In contrast, $RSCA_{ij}$ that are less than zero imply that country *i* has a comparative disadvantage in product *j*. The Trade Balance Index (TBI) is employed to analyze whether a country has specialization in exporting (as a net-exporter) or in import (as a net-importer) for a specific group of products – Standard International Trade Classification (SITC). Values of the index range from -1 to +1. At the extreme, the TBI equals -1 if a country only imports; in contrast, the TBI equals +1 if a country only exports. By using the RSCA and TBI indexes, the "products mapping" is constructed. Products (SITC) can be categorized into four groups, A, B, C and D, as shown in table 1.

Table 1. Product mapping

Revealed Symmetric Comparative Advantage Index (RSCA)		
RSCA<0	**Group B:** Have Comparative Advantage No Export-Specialization (net-importer) (RSCA > 0 and TBI <0)	**Group A:** Have Comparative Advantage Have Export-Specialization (net-exporter) (RSCA > 0 and TBI >0)
RSCA>0	**Group D:** No Comparative Advantage No Export-Specialization (net-importer) (RSCA < 0 and TBI <0)	**Group C:** No Comparative Advantage Have Export-Specialization (net-exporter) (RSCA < 0 and TBI >0)
	TBI <0 Trade Balance Index (TBI)	TBI>0

In the SITC system, the energy products covered are: (a) SITC 322, coal, lignite and peat; (b) SITC 323, briquettes, coke and semi-coke; lignite or peat; and retort carbon; (c) SITC 333, crude petroleum and oils obtained from bituminous minerals; (d) SITC 334, petroleum products, refined; (e) SITC 335, residual petroleum products, n.e.s. and related materials; (f) SITC 341, gas, natural and manufactured; and (g) SITC 351, electric current. Table 2 shows the product mapping of the energy products of ASEAN and individual ASEAN countries. ASEAN has a high comparative advantage for energy products (category A), i.e., SITC 322, coal, lignite and peat; SITC 335, residual petroleum products, n.e.s. and related material; and SITC 341, gas, natural and manufactured, refined. However, SITC 334, petroleum products, refined, is in category B.

ASEAN, as whole, has a high comparative advantage (category A) in primary energy products (SITC 322, coal, lignite and peat; SITC 335, residual petroleum products, n.e.s. and related materials; and SITC 341, gas, natural and manufactured). Primary energy products are transformed in energy conversion processes to secondary energy products, for example, electrical energy, refined fuels, synthetic fuels (hydrogen fuels). This is beneficial for AEMI; ASEAN has a comparative advantage in primary energy products as inputs to secondary products. AEMI will automatically lead to the ASEAN members specializing in either primary or secondary energy products, depending on their comparative and competitive advantages. Comparative advantage focuses more on the endowment factor, so countries such as Indonesia, Malaysia and Thailand could develop primary energy products. Competitive advantage focuses on dynamic rivalry, new entrants, substitutes and complements as well as supply and demand of the energy industries. Therefore, Singapore and the Philippines might develop secondary energy products. Each ASEAN member could develop its own energy products based on that country's comparative and competitive advantages. In short, AEMI will create greater efficiency in both primary and secondary energy industries in ASEAN through:

(a) Liberalization of intra-industry trade and inter-industry trade in energy products;

(b) Resource reallocation from "less efficient" countries to "more efficient" countries;

(c) Trade creation and trade diversion in energy products;

(d) Efficient exploration for sources of primary energy products, which is good for society and the environment;

(e) Healthier competition in primary and secondary products;

(f) Reductions in costs as well as prices of secondary energy products, making it possible for societies to afford the energy products;

(g) Enhancement of economies of scale and the scope of energy industries;

(h) Support for broad economic efficiency and competitiveness, since all economic activities require energy as an input.

Table 2. Product mapping of energy products in ASEAN, 2005

No	SITC	Commodity Description	ASEAN	Singapore	Indonesia	Malaysia	Thailand	Philippines
72	322	Coal, lignite and peat	A	D	A	D	D	D
73	323	Briquettes; coke and semi-coke; lignite or peat; retort carbon	D	D	D	D	D	D
74	333	Crude petroleum and oils obtained from bituminous minerals	D	D	A	A	D	D
75	334	Petroleum products, refined	B	A	D	D	C	D
76	335	Residual petroleum products, n.e.s., and related materials	A	A	A	D	A	D
77	341	Gas, natural and manufactured	A	C	A	A	D	D
78	351	Electric current	D	D	D	C	D	D

Sources: United Nations Comtrade Database; authors' calculation.

(b) Price equalization in energy market integration

Since the domestic energy markets in the ASEAN members are distorted, energy prices do not reflect efficient competitive market prices. With subsidies, domestic energy prices have been set below efficient market level. The energy product prices vary among the ASEAN members. This chapter uses the variation coefficient (VC) to find the discrepancy in energy product prices. The smaller the VC, the less variation there is in energy product prices among the ASEAN members. In contrast, the higher the VC, the more variation there is in energy product prices among the ASEAN countries.

By looking at the trend in the VC, it can be observed whether energy product prices become more equal (less variation) or less equal (more variation) in ASEAN. To make the VC trend smooth, this study uses Moving Average 2. Figure 1 shows the trend in the VC of energy product prices (MA[2]) in ASEAN for 1980-2012. All energy products, except coal, lignite and peat, and briquettes, coke and semi coke, lignite or peat, and retort carbon, show a positive trend in the VC. This implies that those energy product prices are becoming more varied among the

ASEAN members. Price differences in energy products show inefficiency among the ASEAN members that may be due to the energy supply side (for example, the type and market price of the primary energy products or fuels used, domestic market competition, the existence of substitute energy products, government subsidies, government and industry regulation) and energy demand side (for example, local weather patterns). The difference in energy prices not only occurs among countries but also among areas within the region. For example, electricity prices might differ between countries and might even vary within a single area or distribution network of the same country. In Indonesia, electricity rates typically vary for residential, commercial and industrial customers. Prices for any single class of electricity customer can also vary by time-of-day or by the capacity or nature of the supply circuit. The price also varies depending on the source of the electricity. For example, in 2002, in the United States the cost of electricity from different sources were: coal, 1-4 cents; gas, 2.3-5.0 cents; oil, 6-8 cents; wind power, 5-7 cents; nuclear, 6-7 cents; and solar power, 25-50 cents (EIA, 2010). AEMI will create price equalization in energy products in the ASEAN through:

(a) Liberalization in primary energy products (input of secondary energy products);

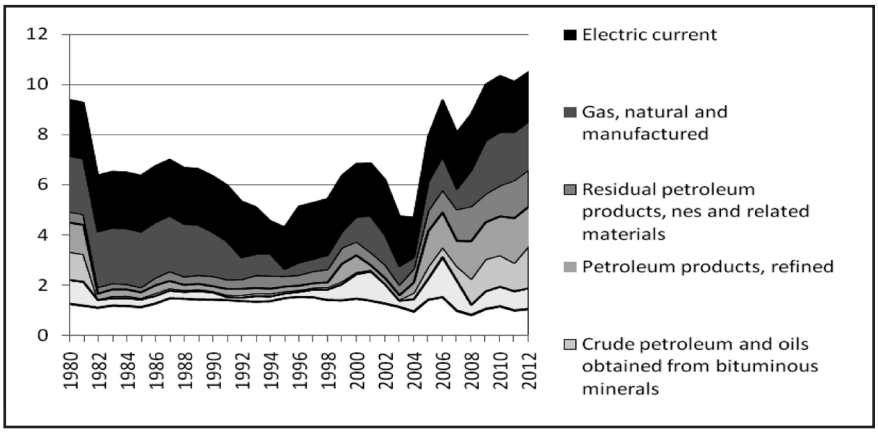
(b) Coordination, cooperation and harmonization in energy policy;

(c) Joint production and marketing of energy supply to achieve economy-of-scale and scope;

(d) Efficiency in energy supply;

(e) An efficient cross-country distribution network for energy.

Figure 1. Trend in variation coefficient of energy product prices in ASEAN, (MA[2])



Source: United Nations Comtrade Database; authors' calculation.

The more energy product prices vary, the larger the differences in efficiency among the ASEAN members due to distorted domestic energy product markets. Theoretically, AEMI may be able to provide more efficient energy product prices through the reallocation of resources from less efficient energy product providers to more efficient ones. Thus, equal energy product prices could be achieved in the ASEAN region.

AEMI will lead to energy prices decreasing before they become equalized. First, in the existing distorted energy markets, due to subsidies and other government interventions, AEMI would bring efficiency; therefore the prices of energy would decrease in all countries. Second, if the overall energy market would have been in the efficient situation, AEMI would equalize the market price. In such a situation, energy prices may increase in certain countries but decrease in the others.

The Equivalent Variation (EV) and Compensation Variation (CV) represent the impact of AEMI. The EV can be defined as the United States dollar amount that the country would be indifferent to accepting the changes in energy prices and income (wealth) or not accepting. The CV measures the net revenue of the planner who must compensate the country for food prices and income changes, bringing the country back to its welfare (utility level). (EV and CV are positive if the prices and income changes make the country better off). Theoretically, the impacts are divided into (a) two direct impacts (solely due to decrease of certain energy prices) and (b) an indirect impact (through the other price channels, using cross-price elasticity). Table 3 shows the simulation of the direct welfare impacts of a 10 per cent energy price decrease (in United Sates dollars) due to AEMI and in percentage of current gross domestic product (GDP). For example, a 10 per cent decrease in the price of coal, lignite and peat will result in an increase in welfare in Malaysia by US$ 98,496,773 (or 0.003 per cent of Malaysian GDP). The simulation shows that AEMI will have a direct positive impact on the ASEAN countries' welfare. It also shows that SITC 333, crude petroleum and oils obtained from bituminous minerals, and SITC 334, petroleum products, refined, will record highest direct impact (in percentage of GDP).

Table 3. Direct welfare impact of 10 per cent decrease in price of energy product (US$/year)

Measurement	Indonesia	Malaysia	Philippines	Thailand	Singapore	Viet Nam	Cambodia
1. SITC 322 – Coal, lignite and peat							
Compensating variation	6,705,006 (0.001%)	98,496,773 (0.003%)	29,953,588 (0.012%)	89,787,029 (0.025%)	202,257 (0.0001%)	6,358,473 (0.004%)	47,080 (0.003%)
Equivalent variation	6,705,263 (0.001%)	98,552,373 (0.003%)	29,956,53 (0.012%)9	89,824,488 (0.025%)	202,257 (0.0001%)	6,358,971 (0.004%)	47,084 (0.003%)
2. SITC 323 – Briquettes; coke and semi-coke; lignite or peat; retort carbon							
Compensating variation	98,267,719 (0.011%)	3,497,646 (0.001%)	4,567,822 (0.002%)	7,485,555 (0.002%)	487,568 (0.0002%)	61,950,815 (0.044%)	678,023 (0.0047%)
Equivalent variation	98,322,573 (0.011%)	3,497,705 (0.001%)	4,567,891 (0.002%)	7,485,741 (0.002%)	487,569 (0.0002%)	61,998,271 (0.044%)	678,771 (0.0047%)
3. SITC 333 – Crude petroleum and oils obtained from bituminous minerals							
Compensating variation	1,550,388,031 (0.177%)	569,996,242 (0.19%)	6,927,166,346 (2.8%)	3,209,329,439 (0.88%)	1,795,384,058 (0.65%)	396,640,198 (0.28%)	4,591,455 (0.031%)
Equivalent variation	1,562,210,554 (0.177%)	571,594,700 (0.19%)	6,994,925,228 (2.8%)	3,249,254,210 (0.89%)	1,805,228,972 (0.65%)	398,582,154 (0.28%)	4,625,978 (0.032%)
4. SITC 334 – Petroleum products, refined							
Compensating variation	2,162,680,142 (0.25%)	859,060,953 (0.28%)	4,400,758,679 (1.76%)	502,131,560 (0.13%)	3,994,854,118 (1.44%)	447,429,536 (0.31%)	57,351,017 (0.4%)
Equivalent variation	2,188,285,691 (0.25%)	862,807,056 (0.28%)	4,465,385,702 (1.78%)	503,107,087 (0.13%)	4,039,967,095 (1.46%)	449,916,785 (0.31%)	57,803,778 (0.4%)
5. SITC 335 – Residual petroleum products, n.e.s. and related materials							
Compensating variation	63,081,078 (0.007%)	37,925,192 (0.01%)	27,731,527 (0.011%)	67,183,535 (0.018%)	73,642,259 (0.027%)	329,385,095 (0.23%)	198,064 (0.014%)
Equivalent variation	63,101,603 (0.007%)	37,932,690 (0.01%)	27,734,054 (0.011%)	67,203,788 (0.018%)	73,656,715 (0.027%)	330,716,398 (0.23%)	198,126 (0.014%)

Table 3. Direct welfare impact of 10 per cent decrease in price of energy product (US$/year) *(continued)*

Measurement	Indonesia	Malaysia	Philippines	Thailand	Singapore	Viet Nam	Cambodia
6. SITC 341 – Gas, natural and manufactured							
Compensating variation	74,988,583 (0.009%)	55,426,227 (0.02%)	226,926,003 (0.091%)	293,368,430 (0.08%)	13,093,167 (0.0047%)	12,318,071 (0.009%)	18,221 (0.0001%)
Equivalent variation	75,020,835 (0.009%)	55,443,876 (0.02%)	227,066,675 (0.091%)	293,768,899 (0.08%)	13,093,687 (0.0047%)	12,319,946 (0.009%)	18,222 (0.0001%)
7. SITC 351 – Electric current							
Compensating variation	240,197 (0.0003%)	1,256,344 (0.0004%)	414 (0.0000002%)	24,998,463 (0.007%)	637 (0.0000002%)	19,435,685 (0.014%)	1,676 (0.00001%)
Equivalent variation	240,197 (0.0003%)	1,256,351 (0.0004%)	414 (0.0000002%)	25,000,686 (0.007%)	637 (0.0000002%)	19,440,353 (0.014%)	1,676 (0.00001%)

Sources: UN Comtrade and ASEAN Secretariat, 2013.
Note: Figures in parentheses are the percentage of GDP in current prices.

C. Lessons learnt from other integrated energy markets

Efforts to create integrated energy markets have been made in other regions of the world. A notable case is the experience of energy market integration in the European Union while a less notable, but very promising case, is the integration of the electricity market in West Africa. This section reviews how energy market integration has been established in the European Union and among West African countries, and draws lessons for AEMI.

1. Europe an Union

(a) Overview

Europe, which heavily depends on oil and gas from external sources, has been engaged since the early 1990s in a debate on building an integrated and competitive energy market. The European Union has agreed to share the responsibility to develop a strategic policy for changing current trends. A truly competitive single European electricity and gas market will improve the security of supply as well as boost efficiency and competitiveness. The approach by the European Union in terms of restructuring energy markets has a broader perspective, which includes not only economic concerns but also strategic/political goals.

(b) Lessons learnt

The liberalization and integration of European energy markets is a process of discovery, involving continuous interactions between the market players and the regulatory authorities. One of the key lessons comes from the historical experience, which suggests that to reach a more competitive and efficient market structure, the following stages of energy reform should be completed: (a) the privatization of publicly-owned electricity assets; (b) the opening of the market to competition; (c) the extension of vertical unbundling of transmission and distribution from generation and retailing; and (d) the introduction of an independent regulator (Pollitt, 2009).

Second, it is imperative to balance regulatory governance between national regulatory agencies and one that is European Union-wide. Although national regulatory agencies have been empowered in the European Union, the governance of European energy regulation is still characterized by multi-authority structures at the national level. This structure has been criticized because the lack of a European Union-wide energy regulatory authority has resulted in market integration in Europe being driven mainly by informal regulatory networks among the network operators, standardization authorities and national regulators (Meeus and Belmans, 2008). The European Union experience suggests that member States should create a common energy regulator and try to increase the regulatory impact through enhancing cooperation among national regulators. Apart from such cooperative efforts, each member State must guarantee that its national regulatory authority exercises its powers "impartially and transparently".

Third, designing energy policies and implementing such policies should not be hindered by a slow decision process. The new energy policy was expected to overcome barriers as well as develop a secure supply and increase efficiency. However, the slow decision process of the European Union has resulted in significant difficulties in reaching the aimed-for structure in the foreseeable future. As technical barriers are inherent characteristics of energy sources, and politics and economics are associated with energy sources, the decision process is intertwined with government interventions, environmental issues and energy security.

Fourth, there should be an agreement on the future structure of an integrated energy market. The future structure of the European energy market is still not clearly defined and European policy makers have largely followed a trial and error approach in order to break through these barriers and find an appropriate way to establish the rules and regulations in order to govern energy markets (De Jong and Hakvoort, 2008).

Fifth, it is critical to the success of the regional initiatives to adapt future challenges (European Commission, 2010). The first challenge in the European Union is to match the bottom-up approach of the regional initiatives and the more top-down approach of the third package, particularly in relation to drawing up of framework guidelines and network codes. The second challenge is the risk of divergence if different regions implement different solutions to tackle similar issues. In addition, some important technical and political challenges may slow down, pause or reshape the structure of markets (Domanico, 2007; Pollitt, 2009).

Sixth, it is necessary to reflect non-market considerations in the integrated energy market. Once the security of supply enters the policy framework (Haase, 2008), regulations are less likely to follow competitive market models. With an expected increase in future geopolitical uncertainties, together with a greater import dependency on fewer supplies, energy supply security is likely to move up on the political agenda and needs to balance its position vis-à-vis carbon reduction objectives. Therefore, AEMI should advocate free-market compatible solutions to greater energy-related environmental and supply security problems to avoid industrial competitiveness concerns cooling down the market enthusiasm of energy policy stakeholders.

2. West Africa

(a) Overview

The majority of West African countries have suffered from electricity shortages for several decades, which constitute a serious handicap for their socio-economic development. The situation has worsened during the past few years due to several reasons: (a) the obsolescence

of the electricity generation and transmission infrastructures; (b) unfavorable hydrological conditions; and (c) difficulties in attracting the investment needed for construction of new facilities in order to satisfy the increasing energy demand. After identifying the causes of electricity shortages, the Economic Community of West African States (ECOWAS) has established a joint power project to assist in integrating their national power system into a unified regional energy market. The West African Gas Pipeline (WAGP) project and the West Africa Power Pool (WAPP) project have been established with the goal of cooperatively providing the indispensable building blocks of a sustainable energy infrastructure network in ECOWAS. The two systems will help create regional energy trade and cross-border exchange between national utilities.

WAPP is an emerging partnership between the Governments of ECOWAS member States who collectively have resolved to put in place a regional power pooling mechanism as the preferred means of achieving their long-term vision – a unified regional electricity market where electricity supply costs are lowered and energy security improved in order to contribute towards further regional energy integration. The ECOWAS member States are in the process of ratifying the ECOWAS Energy Protocol to provide a legal and regulatory framework for all regional energy integration initiatives, including the WAPP and WAGP projects. WAPP is also a partnership between the ECOWAS member States and donors (including the World Bank), financing partners (including the Kuwait Fund for Arab Economic Development), the European Investment Bank, African Development Bank (AfDB), Bank for West Africa (BOAD) and, possibly, the European Union. Bilateral donors include the Agence Francaise de Development (AFD) and the United States Agency for International Development (USAID).

The WAGP project is a cooperative effort of the four participating States (Benin, Ghana, Nigeria and Togo), the producers, sponsors, transporters, foundation customers, and the providers of political risk guarantees. The four participating States have established, by treaty, the WAPP Authority to, inter alia: (a) monitor compliance by West African Gas Pipeline Company (WAPCo) with its obligations; (b) approve the pipeline design and construction plan; (c) negotiate and agree with WAPCo on the licenses and access code; (d) negotiate and agree with a third-party operator of the pipeline system; (e) negotiate and agree on any expansion plans; (f) act on behalf of the four States' respective tax authorities; (g) negotiate and agree with WAPCo on changes in tariff methodology; and (h) use its best efforts to ensure that each State complies with the International Project Agreement (IPA) and applicable enabling legislation. The WAGP Authority does not set tariffs, as these are regulated by contract.

(b) Lessons learnt

A report by the World Bank Group identified two most pertinent lessons from the design of the West Africa Power Pool Adaptable Program Lending (WAPP APL). First, the key to successful expansion of multi-country, regional electricity trade is to initially establish an appropriate (simple, flexible and robust) institutional structure consisting of the main national power utilities. Over time, with growing economies and increases in electricity demand in a regional context, the scope and evolution of multi-country, regional electricity trade expands as trading partners build confidence in working together (Moural, 2006).

Second, in order to maintain a balance in the operations of the power transmission system when changing from a national into a multi-country, a regional operations regime is required to implement the WAPP Cooperation Agreement for the 330kV Coastal Transmission Backbone. It is preferable to promote greater independence for national transmission system operators to coordinate and cooperate with each other across borders.

There are other lessons to be learnt. First, in order to facilitate compliance with safeguard procedures across the ECOWAS region in the long term, a process of harmonization of

environmental and social rules and regulations is being put in place. The ultimate goal of this effort is to minimize the burden that environmental rules and procedures create across the region. The tools to achieve this will be the adoption of general safeguard framework documents.

Second, in the long term, the key to achieving sustainability of regional energy integration initiatives, such as WAPP and WAGP, lies in the establishment and strengthening of the emerging power utility-led institutional framework – the WAPP institutional framework (WAPP Secretariat and Information Coordination Center, and the network of WAPP Operational Coordination Centers to be set up in Cote d'Ivoire, Ghana, Nigeria and Senegal).

Third, a power pool can be defined as "an arrangement between two or more interconnected electric systems that plan and operate their power supply and transmission in the most reliable and economical manner, given their joint load requirements". Thus, when utilities form a group to consider their joint generation resources and needs, and agree to plan and operate their system to improve reliability and economy, they are pooling. Indeed, due to the difficulties of harmonizing demand and supply, the forecasting and maneuvering of a pooled electric power system necessitates careful synchronization of transmission; an accurate system design is also required. The effect of this pooling system is that energy security will no longer be merely the concern of a single State as it will have been elevated to a regional level.

Fourth, in a practical sense, the mechanism can be described as follows. The control areas are the smallest units of an interconnected power system. In a power pool, these units are responsible for coordinating the planning and operation of the generation facilities and transmission networks in their areas. They can be established by either a single utility or two or more utilities that are tied together by sufficient transmission and contractual arrangements. All the utilities within a control area operate and control their combined resources to meet their loads as if they were one system. Because most systems are interconnected with neighboring utilities, each control area must assure that its load matches its own supply resources plus power exports or imports to/from other control areas.

Fifth, with regard to the contractual arrangements required for power to be possible in ECOWAS, the Treaty and Energy Protocol provides a strong legal basis for regional interconnection (Abdoul, 2012).

D. Assessing the benefits

The theoretical investigation of integration shows that energy market integration brings high levels of various benefits. Such benefits have been assessed quantitatively and qualitatively. This subsection presents the benefits that AEMI will potentially bring in terms of economic, energy and environmental points of views.

1. Economic benefits

It is believed that AEMI will bring extensive economic benefits such as increases in real GDP and foreign direct investment. It will also help prices to converge and stabilize, and make greater elastic demand possible, so that the economies can respond to external shocks more swiftly and, hence, cause less harm.

This study conducted a simulation analysis, based on the Global Trade Analysis Project (GTAP) model, to show that the removal of energy commodity trade barriers under AEMI and

ensuing investments in the energy sector will bring economic benefits.[5] The potential benefits accruing from AEMI have been calculated by equivalent variation (EV) and real GDP.[6] The overall impacts of AEMI on the ASEAN economy are shown in table 4. It is clear that the effects of AEMI, through tariff cuts and subsidies as well as increasing investments, are substantial. The EV values vary but real GDP figures show that the possible benefits accrue would be more than three percentage points.

Table 4. Impacts on macroeconomic variables: EV and the increase in real GDP

	EV (million USD)	Real GDP (percent)
Vietnam	2645.24	3.13
Thailand	5499.87	2.41
Singapore	1695.41	2.14
Philippine	1955.47	2.19
Malaysia	6352.9	3.46
Laos	58.66	1.08
Indonesia	8856.67	1.9
Cambodia	314.96	0.81
Other Southeast Asia	968.1	4.57

Source: authors' GTAP model results.

The impacts of AEMI shown in table 4 support the view that it will have positive impacts on some energy sectors in some ASEAN countries. The simulation results show that Indonesia will potentially gain the highest benefits from tariff cuts and subsidies as well as increasing investment in energy, as it has the highest EV, i.e., US$ 8,856. The next highest benefits will be gained by Malaysia and Thailand. Output will potentially increase in all ASEAN countries due to AEMI, as indicated by increases in real GDP. In terms of increases of real GDP, Malaysia will potentially experience the highest increase (3.46 per cent). It is followed closely by Viet Nam and Thailand. The impacts of AEMI on welfare and output are heterogeneous across the ASEAN members due to the characteristics of protection of the energy sector as well as consumption and production patterns in each ASEAN member.

Apart from evaluating the economic benefits of AEMI through EV, the attempt to quantify the possible benefits from energy market integration shows that there would be more foreign direct investment, which, in turn, would increase the GDP of the host countries. It also suggests that there would be an increase in overall welfare in the integrated natural gas market (Kimura and Shi, 2011).

5 For the applied studies on using GTAP and the interpretations of results, see: Adams, 2005; Brockmeier; 1996; Hanslow, 2000; and Hertel, 1997.

6 The EV in this section is different to that of section B. In section B, the EV is calculated based on microeconomic modeling of welfare and the imports of energy products. The EV in this section is calculated based on macroeconomic modeling, i.e., the Global Trade Analysis Project (GTAP) model.

The resulting possible benefits are price convergence and an increase in GDP (ERIA, 2010).[7] A lower income disparity and catching up in economic development by poorer countries are suggested as possible benefits of an integrated energy market. A study employing the energy trade index and energy market competition index shows that there would be economic convergence and narrower development gaps among members of the integrated energy market (Sheng and Shi, 2011). A study with an economic convergence analysis shows that the higher the level of energy market integration, the lower the income disparity and equitable growth will be (Sheng and Shi, 2013).

Integrated energy markets help in curbing demand for energy and induce greater supply of energy from cleaner sources (ADB, 2013). An integrated energy market will provide consumers with more choices and alternatives, so that the demand becomes more elastic and consumers can spread the pressure from energy demand (Sheng and others, 2013).

2. Energy benefits

The major benefits of expanded cooperation in the energy sector by AEMI include integrated regional planning and coordination (allowing identification of cost-effective energy projects), and mitigation measures for addressing climate change (public policy actions not only at the national level, but also at the regional level). Furthermore, regional cooperation in energy markets will enable the use of best practices in energy efficiency, renewable energy technologies and clean coal technologies. Sharing resources across borders will also enable the ASEAN members to increase regional energy security, reduce power costs, attract investment by creating greater market scale to interest potential investors, optimize natural resources and develop a common infrastructure (Situmeang, 2013).

ASEAN has been successful in eliminating common threats to the region's energy security. Energy infrastructure, including regional or sub-regional interconnection, which allows for reliable energy supplies at reasonable cost within ASEAN, is important to production efficiency and reliability as well as energy security in the region (ASEAN, 2013; Kimura, 2012; Mulqueeny, 2011). Energy security is the one of the benefits accruing from an integrated energy market (Koyama and Kutani, 2012). There are also compelling long-term economic, environmental and energy security benefits from establishing large-scale and dynamic electricity markets for the ASEAN members (Boethius, 2012).

In ASEAN, energy sustainability is based on three core dimensions – energy security, social equity and environmental impact mitigation. The current ASEAN Plan of Action (2010-2015) places greater emphasis on accelerating the implementation of action plans in order to further enhance energy sustainability for the region with due consideration being given to health, safety and the environment, clean coal technology and renewable energy, among others. Considering such sustainability, the ASEAN Energy Policy is thus formulated as follows (Jude, 2012):

(a) Energy security starts with using less energy far more efficiently to do the same tasks;

(b) Obtain energy from sources that are not vulnerable and obtain energy from sources that increase use of renewable (solar, wind and biomass) energy;

(c) Share energy resources between countries such as the development of sustainable hydropower projects in one country and exporting such power to another where demand is high;

7 In section B, the welfare impacts of price convergence (equalization) due to AEMI have been simulated by using CV and EV microeconomic modeling.

(d) Increase cross-border power trading. Take advantage of differences in peak demand. (Grids will need to be strengthened);

(e) Increase use of domestic energy resources such as natural gas, hydropower and clean coal technologies;

(f) Increase use of alternative energy resources (biofuels/wind/solar/biomass);

(g) Subsidies.

With regard to ensuring greater regional energy security, the ASEAN Memorandum of Understanding on the Trans-ASEAN Gas Pipeline (TAGP) in 2004, for example, concerns the provision of a broad framework for the ASEAN members to cooperate in the realization of the TAGP project (Ramli and Abdullah, 2009).

The energy intensity of primary energy consumption in the ASEAN for 1990 to 2005 improved from 695 TOE/US$ million to 627 TOE/US$ million; it is projected to continue decreasing up to 2030 to 500 TOE/US$ million (Base case) and 452 TOE/US$ million (High case), due to fuel mix improvements (where natural gas replaces fuel oil as the dominant feedstock for power generation) and energy efficiency improvements as a result of regional energy market integration (Hung, 2009).

Energy efficiency has become widely recognized as one of the most cost-effective ways of enhancing energy security, addressing climate change and promoting competitiveness in industry in ASEAN. Thanks to the integration in energy markets, Berger (2011) showed that by 2020, the ASEAN countries could achieve efficiency gains of between 12 per cent and 30 per cent, a projection that would translate into power savings ranging between119 TWh and 297 TWh, or US$ 15 billion and US$ 43 billion, respectively. Moreover, according to EIAS (2013), integrating power transmission among Asian countries would save considerable amounts of money through substituting hydropower for fossil fuels as well as reduce CO_2 emissions by 14 million tonnes per year by 2020.

An integrated electricity market could extend access to electricity and relieve peak demand. The integrated electricity market would result in more renewable energy being harnessed and lower the total cost of meeting the demand for energy (Wu and others, 2012).

There have been strong movements towards bilateral energy development and increasing trade among the ASEAN members. Cooperation in developing hydropower and ensuing bilateral power trade between the Lao People's Democratic Republic and Thailand could bring various benefits – lower energy system costs, better environmental quality, greater energy diversification and significant export revenues (Watcharejyothin and Shrestha, 2009).

Small-scale power distribution systems in many ASEAN members, incorporating modern technology, can be cost-effective, scalable and financeable (Taw, 2013). Through energy market integration, reduced expenditure on energy imports would significantly have long-term economic benefits for each ASEAN member as well as the region as a whole. By considering three scenarios (no trade, 20 per cent trade and 50 per cent trade in energy) for developing optimal power generation capacity and their impacts on energy market integration in ASEAN (table 5), Chang and Li (2013) found the level of benefit of integration resulting from the reduction in expenditure on the energy. Specifically under the scenarios of partial trade (20% and 50% capacity), the present value of cost savings would be 20.9 billion USD (3.0 per cent), and 29.0 billion (3.9 per cent), respectively. Thus, even with partial integration (cross-border power trading), substantial cost reduction could be realized (table 5).

Table 5. Key findings from different scenarios in the electricity trade

Scenario	Total cost savings	Development of additional capacity (top four in turn)
No trade	n.a.	Gas, coal, hydro and geothermal
20 per cent of demand met by trade	3 per cent (US$ 20.9 billion)	Gas, coal, hydro and geothermal
50 per cent of demand met by trade	3.9 per cent (US$ 29 billion)	Gas, coal, hydro and geothermal

Source: Chang and Li, 2012.

The energy market integration projects in ASEAN have significant security implications for the participating countries through diversity and affordability. In other words, efficient energy market integration will operate uninterrupted by oil price volatility, with the capability to diversify the regional resources. Among the ASEAN members, even though less developed countries may be at a disadvantage, integration will enable them to become more diversified by sharing new technologies (Hamid and others, 2011). Through energy integration, the diversification of the regional energy mix, for example, a shift from coal and oil to biomass and nuclear power will contribute to improvement in the regional energy security as well as carbon intensity (Malik, 2011).

An integrated energy market would make access to modern energy supply easier and produce fewer amounts of pollutants. The Energy Development Indicator (EDI) can be used to examine the status of access to modern energy among various countries (IEA, 2012).

3. Environmental benefits

In parallel with the increase in energy consumption, CO_2 emissions are a critical issue globally with regard to energy sustainability. The potential benefits of CO_2 emissions reduction through regional dynamic energy markets with energy grids are emerging as one of the most effective means of enhancing energy security and reducing the emissions of greenhouse gases by facilitating the increased use of diversified energies. The integration of the energy market could yield substantial positive gains for the East Asian region as a whole in terms of GDP growth and CO_2 emissions reduction (ERIA, 2010). Similarly, through energy market integration, a 10 per cent reduction of subsidies for energy commodities would slightly reduce the CO_2 emissions of the East Asian region as a whole by 0.23 per cent. Among others, in the countries associated with larger energy subsidies, such as Indonesia and Malaysia, CO_2 emissions reduction effects would be greater (Wu, 2012).

In the ASEAN members, according to the estimation provided by Hung (2009), the 4 per cent annual growth in primary energy consumption will result in a corresponding 5.1 per cent growth in CO_2 emissions. This is due largely to the projected 6.9 per cent annual escalation of coal consumption, which is the most carbon-intensive fossil fuel. The similar 4 per cent annual growth rates in oil and natural gas consumption will also contribute to an increase in emissions. However, energy market integration would allow national Governments of the ASEAN members to more easily address such issues. Furthermore, other main energy policy challenges, including security of energy supply and/or demand, economic efficiency of the energy sector and social equity (particularly access to affordable modern energy) would be solved (Andrews-Speed, 2011).

A simulation study of bilateral power trade between the Lao People's Democratic Republic and Thailand shows that environmental gains would accrue to both countries together with economic gains. It shows that CO_2 emissions would decrease by 2 per cent when compared with the base case (Watcharejyothin and Shrestha, 2009). If this CO_2 emissions reduction potential is extrapolated to the other ASEAN or Asian countries, the level of CO_2 emissions reduction would be non-marginal.

E. Conclusion

There are three broadly defined categories of integration – economic, market and energy market integration. Economic integration has five different stages in terms of the degree of removal of tariffs and openness. A free trade area is the lowest level in the economic integration while complete economic integration is the highest one. AFTA is currently the only economic integration in the region. AEMI can be considered another economic integration. Market integration can be accomplished if prices among different markets exhibit similar patterns in the long term. The benefits of market integration are that there would be economies-of-scale among market energy firms and market firms would become efficient and innovative. AEMI will be a form of energy market integration in the region, which will bring convergence in prices in the long term, make the economy-of-scale viable and strongly encourage firms to be efficient and innovative.

Energy market integration in the region can be achieved through the standardization of energy products, which will bring price equalization and an increase in welfare due to decreases in energy prices. It would bring the ASEAN members comparative advantages in primary energy products. AEMI, as a form of energy market integration, will provide more efficient energy product prices through the reallocation of resources from less efficient energy product providers to more efficient ones and, hence, lead to equal energy product prices. The benefits of equal and lower energy prices are quantified by equivalent variation (EV) and compensation variation (CV). The results present direct positive impacts on welfare for the ASEAN members.

The experiences of the European Union in energy market integration offer valuable lessons for promoting AEMI. The strategies used in the European Union were to integrate the energy markets and make them competitive. The lessons drawn from the European Union experiences are: (a) the completion of energy market reform; (b) balancing regulatory governance between national regulatory agencies and a European Union-wide regulatory agency; (c) avoidance of a slow decision process; (d) an agreement on the structure of a future integrated energy market; and (e) adapting future challenges and reflecting non-market considerations in the integrated energy market. Apart from the European Union experience, there have been strong movements in integrating electricity markets in West Africa.

One of the two key lessons for ASEAN with regard to creating a successful AEMI, is the establishment of an appropriate institution comprising national power utilities. The other lesson is the creation of a regional operational regime for power transmission. These are the key lessons for achieving success. However, there are also other lessons to be learnt: harmonization of environmental and social rules and regulations; the implementation of a utility-led institutional framework; a power pool as an arrangement between two or more interconnected electric systems; a practical mechanism for an interconnected power system; and a strong legal basis for regional interconnection.

AEMI will help the AEC function well by making energy products and services flow freely, which, in turn, will make energy product prices converge and stable, and encourage firms

to be more efficient and innovative. With an integrated energy market, in place ASEAN will enjoy various benefits such as economic, energy and environmental benefits. Higher welfare, measured in equivalent variation (EV), and increases in GDP among member countries are seen as the main economic benefits of AEMI. The welfare benefits range from US$ 58.66 million for the Lao People's Democratic Republic to US$ 8,856.67 million for Indonesia. An EV approach presents an increase in real GDP for the ASEAN members that could reach between 1 and 3 percentage points of real GDP. Specifically, real GDP would be 0.89 per cent higher for Cambodia and 3.46 per cent higher for Malaysia. Other economic benefits are converging and stable prices, higher foreign direct investment in the region and a more elastic demand that gives consumers more choices.

Apart from the economic benefits, AEMI will provide energy benefits such as improvements in energy security, higher energy efficiency, lower energy system costs, better access, a higher level of energy diversification and improvements in energy development indicators. By linking energy-deficient countries to energy-abundant countries in the region, AEMI will enhance the level of energy security for all those countries. It will also reduce the energy intensity of the countries and, hence, increase energy efficiency. With an integrated energy market, the energy intensity level is expected to reach 452 TOE in 2030 due to a more diversified fuel mix, and higher availability of efficient and cleaner fuels.

AEMI is expected to decrease energy system costs by 3 per cent if up to 20 per cent of each ASEAN member's demand is allowed to be imported, and by 3.9 per cent if up to 50 per cent is allowed. AEMI will enable energy diversification among the countries and, hence, they can become more resilient to exogenous energy shocks. AEMI will raise energy development indicators by enabling greater access to modern energy and producing less amounts of pollution.

Together with economic and energy benefits, AEMI will bring environmental benefits to the ASEAN members. The key environmental benefit will be lower levels in CO_2 emissions. A simulation study of the power trade between two countries shows that the power trade via an integrated energy market could decrease CO_2 emissions by 2 per cent compared with a base case.

The various benefits of AEMI support the necessity for integrating the energy markets in the region. Through AEMI, the materialization of these benefits will be much easier under the AEC, where energy products and services will be able to flow freely. AEMI is therefore an important part of the move towards the implementation of the AEC.

References

Abdoul, K. Kabele-Camara (2012). "Achieving energy security in ACOWAS through the West Africa gas pipeline and power pool projects: Illusion or reality.", Dissertation.

Adams, P. D. (2005). "Interpretation of results from CGE models such as GTAP", *Journal of Policy Modeling*, vol. 27; pp. 941-959.

Andrews-Speed, P. (2011). "Energy market integration in East Asia: A regional public good approach," ERIA Discussion Paper Series, ERIA-DP-2011-06. Economic Research Institute for ASEAN and East Asia, Jakarta.

ASEAN (2013). *Master Plan on ASEAN Connectivity.* Jakarta, Indonesia.

ADB (2013). *Asian Development Outlook 2013*: *Asia's Energy Challenge.* Asian Development Bank, Manila.

Balassa, B. (1961). *The Theory of Economic Integration*. Allen & Unwin, Tokyo.

Barroso, J. M. (2006). "The EU and energy: Looking to the future", *EU Focus*, September 1-3.

Berger, R. (2011). *Market Potential in Energy Efficiency in Southeast Asia*. Eurocham Sustainability Committee, Singapore.

Besanko, D., D. Dranove, M. Shaley and S. Schaefer (2010). *Economics of Strategy.* John Wiley & Sons, Inc., Hoboken, United States.

Bhattacharya, A and S. Kojima (2010). "Technical report: Economic impact analysis of East Asia energy market integration", in X. Shi and F. Kimura (eds.), *Energy Market Integration in the East Asia Summit Region: Review of Initiative and Estimation of Benefits*. ERIA Research Project 2009-12, pp. 40-100. Economic Research Institute for ASEAN and East Asia, Jakarta.

Boethius, G. (2012). "Forging the ties that bind: Comparing the factors behind electricity market integration in the EU and ASEAN". Working Paper, No. 6. EU Centre in Singapore.

Brockmeier, M. (1996). "A graphical exposition of the GTAP model", GTAP technical paper. Center for Global Trade Analysis, Purdue University, United States.

Chang, Y. and L. Yao (2012). "Energy and the Greater Mekong Subregion (GMS): Cooperation, competition and development," in D. Zha (ed.), *Managing Regional Energy Vulnerabilities in East Asia*. Routledge.

Chang, Y. and Y. Li (2013). "Power generation and cross-border grid planning for the integrated ASEAN electricity market: A dynamic linear programming model," in *Energy Strategy Reviews* (in press).

De Jong, H. M. and R. A. Hakvoort (2008). "European electricity market integration: An analysis of the European governance dynamics," Proceedings of the thirty-first IAEE International Conference, "Bridging Energy Supply and Demand: Logistics, Competition and Environment", June, Istanbul.

Domanico, F. (2007). "Concentration in the European electricity industry: The internal market as solution?" *Energy Policy*, vol. 35, No. 10; pp. 5064-5076.

EIA (2010). *Annual Energy Outlook 2010*, The U.S. Energy Information Administration. Available at http://www.eia.gov/oiaf/aeo/ (accessed 03 October 2013).

EIAS (2013). "Asian development outlook 2013: Asia's energy challenge", Event Report. European Institute for Asian Studies, Brussels.

ERIA (2010). *Energy market Integration in the East Asia Summit Region: Review of Initiatives and Estimation of Benefits.* EAS ECTF EMI Phase II Study. Economic Research Institute for ASEAN and East Asia, Jakarta.

European Commission (2010). "From regional market to a single European market", prepared by Everis and Mercados EMI.

Gnansounou, E., H. Bayem, D. Bednyagin and J. Dong (2007). "Strategies for regional integration of electricity supply in West Africa", *Energy Policy*, vol. 35; pp. 4142-4154.

Haase, N. (2008). "European gas market liberalization: Are regulatory regimes moving towards convergence?" NG 24, Oxford Institute for Energy Studies, United Kingdom.

Hamid, K. A., Z. A. Rashid and R. Z. R. Mohammad (2011). "Effect of energy price increase on East Asian region's food industries' interconnectedness and integration", in F. Kimura and X. Shi (eds.), *Deepen Understanding and Move Forward: Energy Market Integration in East Asia*, ERIA Research Project Report 2010-25, pp.266-297. Economic Research Institute for ASEAN and East Asia, Jakarta.

Hanslow, K. J. (2000). "A general welfare decomposition for CGE Models", GTAP Technical Paper No.19. Global Trade Analysis Project, Center for Global Trade Analysis, Department of Agricultural Economics, Purdue University, United States.

Hertel, T. W. (ed). (1997). *Global Trade Analysis: Modeling and Applications*. Cambridge University Press. United Kingdom.

Hung, N. M. (2009). "Status of renewable energy in the ASEAN region", paper presented at IEA-RETD Workshop on Cross-Regional Dialogue on Renewable Energy Visions and Initiatives, 18 November, ASEAN Centre for Energy, Tokyo.

IEA (2012). *World Energy Outlook 2012*. International Energy Agency, Paris.

IEEJ (2011). *The 3rd ASEAN Energy Outlook*. Institute of Energy Economics, Japan.

Jude, A. J. (2012). "Regional energy security challenges", paper presented at the International Conference on Transboundary River Basin Management, 1-4 May, Phuket, Thailand.

Kimura, F. and X. Shi (2011). *Deepen Understanding and Move Forward: Energy Market Interaction in Eat Asia*, ERIA Research Project Report 2010, No. 25. Economic Research Institute for ASEAN and East Asia, Jakarta.

Kimura, S. (2012). *Analysis on Energy Saving Potential in East Asia Region*, ERIA Research Project Report 2011, No. 18. Economic Research Institute for ASEAN and East Asia, Jakarta.

Koyama, K. and I. Kutani (2012). *Study on the Development of an Energy Security Index and an Assessment of Energy Security for East Asian Countries* ERIA Research Project Report 2011, No. 13. Economic Research Institute for ASEAN and East Asia, Jakarta.

Kroes, N. (2007). "Improving Europe's energy markets through more competition", Resource Document by the European Commissioner for Competition Policy. Available at http://europa.eu/rapid/pressReleasesged=0&language=EN&guiLanguage=en (accessed 22 January 2010).

Leonard, D. (2005). *Guide to the European Union: The Definitive Guide to All Aspects of the EU*, ninth edition, *The Economist*.

Lidula, N. W. A., N. Mithulananthan, W. Ongsakul, C. Widjaya and R. Henson (2007). "ASEAN towards clean and sustainable energy: Potentials, utilization and barriers", *Renewable Energy*, 32; pp. 1441-1452.

Malik, C. (2011). "Analysis on energy saving potential in East Asia region", Working Report. ERIA Working Group on Energy Saving Potential. Jakarta.

McCarthy, D. M. P. (2006). *International Economic Integration in Historical Perspective*. Routledge, New York.

Meeus, L. and R. Belmans (2008). "Electricity market integration in Europe," *Revue-E*, vol. 124, No. 1; pp. 5-10.

Moural, B. (2006). "The West Africa gas pipeline and power pool project building blocks for regional energy integration",. World Bank Group, Washington, D.C.

Mulqueeny, K. (2011). "Case studies on regional cooperation: Report on ASEAN energy regulators' network", paper presented at IPEEC Policy Dialogue on Energy Efficiency in Asia, 20 October, Jakarta.

Pollitt, M. G. (2009). "Electricity liberalization in the EU: A progress report", Working Paper in Economics, No. 0953. University of Cambridge, United Kingdom.

Ramli, H. and M. Abdullah (2009). "Journey of ten brothers in securing energy within ASEAN: Yesterday, today and tomorrow", Evaluation Report. Petroliam Nasional Berhad, Kuala Lumpur.

Sheng, Y. and X. Shi (2013). "Energy market integration and equitable growth across countries," *Applied Energy*, 104: 319-325.

——— (2011). "Energy market integration and economic convergence: implications for East Asia", ERIA Discussion Paper Series, ERIA-DP-2011-05. Economic Research Institute for ASEAN and East Asia, Jakarta.

Sheng, Y., X. Shi and D. Zhang (2013). "Economic development, energy market integration and energy demand: Implications for East Asia," Energy Strategy Reviews, (in press)

Situmeang, H. H. (2013). "Sustainable energy salient items", paper presented at Internal Discussion on Sustainable Energy IESR, World Energy Council, 21 January 2013, Jakarta.

Taw, N. P. (2013). "World Economic Forum on East Asia", Energy Summit Report. World Economic Forum, Geneva.

The Economist (2007). "Fit at 50? A special report on the European Union," *The Economist*, 17 March 2007.

United Nations Commodity Trade Statistic Database (Comtrade) (2013). Available at http://comtrade.un.org/db/default.aspx (accessed 11 June 2013).

Watcharejyothin, M. and R. M. Shrestha (2009). "Effects of cross-border power trade between Laos and Thailand: Energy security and environmental implications," *Energy Policy*, vol. 37; pp. 1782-1792.

Wu, Y. (2012). "Electricity market integration: Global trends and implications for the EAS region," *ERIA Discussion Paper Series*, ERIA-DP-2012-16. Economic Research Institute for ASEAN and East Asia, Jakarta.

Wu, Y., X. Shi and F. Kimura (2012). "Energy market integration in East Asia: Theories, electricity sector and subsidies," *ERIA Research Project Report* 2011, No. 17. Economic Research Institute for ASEAN and East Asia, Jakarta.

Yu, X. (2003). "Regional cooperation and energy development in the Greater Mekong Sub-region," *Energy Policy* ,vol. 31; pp. 1221-1234.

III. AEMI and ASEAN energy poverty

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Abstract

Based on available statistics, between 127 and 130 million people in South-East Asia lack access to electricity. At least 228 million still rely on traditional biomass for cooking, and lack access to clean and modern cooking facilities, with dire consequences for their quality of life and human development. Discussions for an integrated Association of Southeast Asian Nations (ASEAN) energy market cannot overlook this energy poverty situation in the region. In fact, the overall goal of AEMI to achieve balanced and equitable economic growth and development for all countries in the region cannot be realized while people continue to suffer from energy poverty. This chapter maps the energy poverty situation in the region, and reviews the links between energy access and economic and human development. It also draws a connection between AEMI and the eradication of energy poverty or attaining universal energy access, in terms of benefits and strategies, particularly with regard to mapping investment requirements and taking inventory of financing options. The chapter concludes with some recommendations for near-term actions.

A. Introduction

The International Energy Agency (IEA) defines energy poverty as a lack of access to modern energy services, i.e., access to electricity and clean cooking facilities. Reddy and Reddy (1994) as cited in Masud and others (2007), said that energy poverty could be defined as "the absence of sufficient choice in assessing adequate, affordable, reliable, high-quality, safe and environmentally benign energy services to support economic and human development". This definition of energy poverty also implies the strong link between access to modern energy services and economic and human development.

In South-East Asia, more than 127 million people lack access to electricity while at least 228 million still rely on traditional biomass for cooking and lack access to modern cooking facilities. An IEA (2009) projection indicates that in the absence of concerted efforts, 63 million (9 per cent) of the ASEAN population will still lack electricity in 2030, despite wider-spread prosperity and more advanced technology.

The discussion on ASEAN Energy Market Integration (AEMI), building on ongoing ASEAN Energy Cooperation, cannot ignore the issue of energy poverty if its ultimate goal is the balanced and equitable economic growth and development of all countries in the region. Indeed, the objectives of AEMI cannot be achieved while people continue to suffer from energy poverty. Thus, among other targets, AEMI should aim for universal access or energy access for all by 2030.

This chapter examines the issue of energy poverty in ASEAN with four objectives in mind: (a) mapping out energy poverty across ASEAN; (b) analyzing whether AEMI could provide a framework for eliminating energy poverty by 2030 (the so called universal access to energy);

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(c) identifying the policy components and infrastructure needs for AEMI to deliver such a promise; and (d) spelling out the design elements needed within AEMI to allow the realization of such an approach. The chapter is organized into seven sections. Section B maps out the energy poverty situation in ASEAN while section C reviews the links between energy access and development. Section D details how the issue of energy poverty is addressed in the ASEAN and discusses how AEMI could provide a framework for eliminating energy poverty. Section E suggests key design elements of AEMI strategy for moving towards the elimination of energy poverty, including a methodology for monitoring progress. Section F provides an indication of the investment requirements for achieving universal access and discusses the financing options. Section G provides a summary, reiterating the severity of energy poverty in the region, what AEMI should do about it and some recommendations for near-term actions.

B. Energy poverty in ASEAN

Worldwide, approximately 1.3 billion people still lack access to electricity while 2.6 billion rely on traditional biomass stoves and open fires for cooking and heating (REN21, 2013). In the ASEAN region, the total number of people without electricity is about 127.4 million, of whom about 49 per cent are in Indonesia, while 42 million people also lack electricity access in Myanmar and the Philippines (table 1). Only four countries (Brunei Darussalam, Malaysia, Singapore and Viet Nam) have electrification and urban electrification rates of about 100 per cent. In Indonesia, 128 million people also still rely on traditional biomass for cooking or lack access to modern and clean cooking facilities, while the figure is close to 100 million in both the Philippines and Viet Nam (table 2). In rural areas, the population without electricity access is much greater than in urban areas. Cambodia and Myanmar have the lowest rural electrification ratios. Thus, looking at electricity access among the 10 ASEAN members, improving the rural electrification ratio is still a major challenge at the national and regional levels. This challenge is compounded in populous and archipelagic countries such as Indonesia and the Philippines.

Table 1. Electricity access in ASEAN, 2010

Region	**Population without electricity** (Million persons)	**Electrification rate** (%)	**Urban electrification rate** (%)	**Rural electrification rate** (%)
Brunei Darussalam	0.0	100	100	99
Cambodia	10.0	31	91	16
Indonesia	63.0	73	94	56
Lao PDR	2.2	63	88	51
Malaysia	0.2	99	100	98
Myanmar	26.0	49	89	28
Philippines	16.0	83	94	73
Singapore	0.0	100	100	100
Thailand	8.0	88	98	82
Viet Nam	2.0	98	100	97

Source: IEA, 2012.

Table 2. Population relying on traditional biomass for cooking

Regions and selected countries	Percent of population	Million
Developing Asia	51	1,814
India	66	772
Bangladesh	91	149
Pakistan	64	111
Indonesia	55	128
Philippines	50	47
Viet Nam	56	49
Rest of developing Asia	54	171
All developing countries	49	2,558
World	38	2,588

Source: REN21, 2013.

There are supply and demand side reasons as well as institutional reasons why some countries are able to increase their electrification ratio more rapidly than others. First, the growth of electricity production is relatively lower than economic growth. Electricity production depends on several factors such as availability of investment funding and energy resources, the investment climate in the electricity sector, road infrastructure and geographical location (landlocked). Second, due to high fees for connection to the power grid and/or expensive monthly tariffs, poor households cannot obtain benefits from the power grid extension. Third, rural electrification programmes are not sustainable. Due to their low capacity to manage and adoption of inappropriate technology, many households in rural areas find themselves back in the dark after obtaining electricity for a few months.

The Asian economic crisis in 1997-1998 had a negative impact on the growth of electricity production across the ASEAN countries (table 3). Between 1991 and 1996, six countries recorded double digit growth, with Cambodia showing the highest growth and the Philippines recording the lowest. During the economic crisis, Thailand recorded electricity production growth of below 1 per cent, while Indonesia recorded almost 7.4 per cent electricity production growth while even Viet Nam, Singapore and the Philippines showed notably higher growth. This indicates that the economic crisis affected the countries differently. Surprisingly, post-crisis, the growth of electricity production was lower than before the crisis except in the case of Viet Nam. This indicates a negative situation in countries that still had a relatively low electrification ratio. For example, in Cambodia, with the lowest electrification ratio, the growth of electricity production decreased from just under 26.8 per cent between 1991 and 1996 to less than 9.7 per cent between 1999 and 2010. A similar situation prevailed in Indonesia where 63 million people were without electricity, 44 per cent of whom were in rural households.

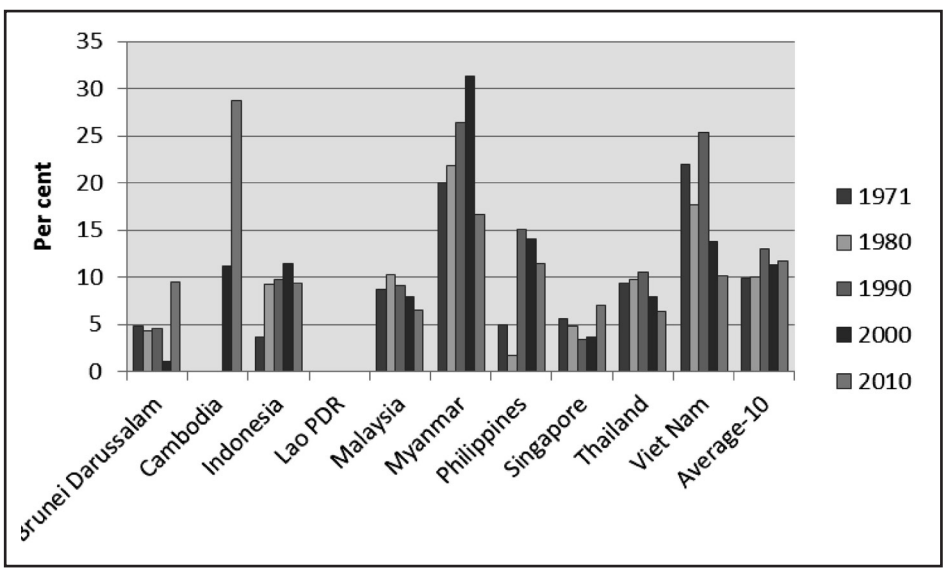
Table 3. Average annual growth of electricity production (%)

Country	Pre-crisis (1991-1996)	During crisis (1997-1998)	Post-crisis (1999-2010)
Brunei Darussalam	10.47	8.70	3.79
Cambodia	26.77	22.94	9.67
Indonesia	12.94	7.38	6.71
Lao PDR	n.a.	n.a.	n.a.
Malaysia	14.37	8.73	6.32
Myanmar	8.20	2.90	5.25
Philippines	5.87	6.42	4.20
Singapore	7.40	8.55	4.01
Thailand	12.56	0.18	4.91
Viet Nam	11.91	13.14	13.12

Source: Calculated from World Development Indicators, World Bank.

Improving electricity access cannot be fully realized if the transmission and distribution (T&D) losses are high. High T&D losses indicate a high level of inefficiency. This affects the quality of power supply. Low T&D can improve reliability of power supply and increase service area. Countries with a low electrification ratio tend to have a high level of T&D loss such as Cambodia and Myanmar (figure 1). Surprisingly, however, countries with a high electrification ratio such as Viet Nam, the Philippines, and Brunei Darussalam had higher T&D losses than Indonesia in 2010. In the 10 ASEAN countries, the average T&D losses tended to increase; even in Singapore, the T&D loss in 2010 was higher than in 2000.

Figure 1. Electric power transmission and distribution losses (per cent of output)

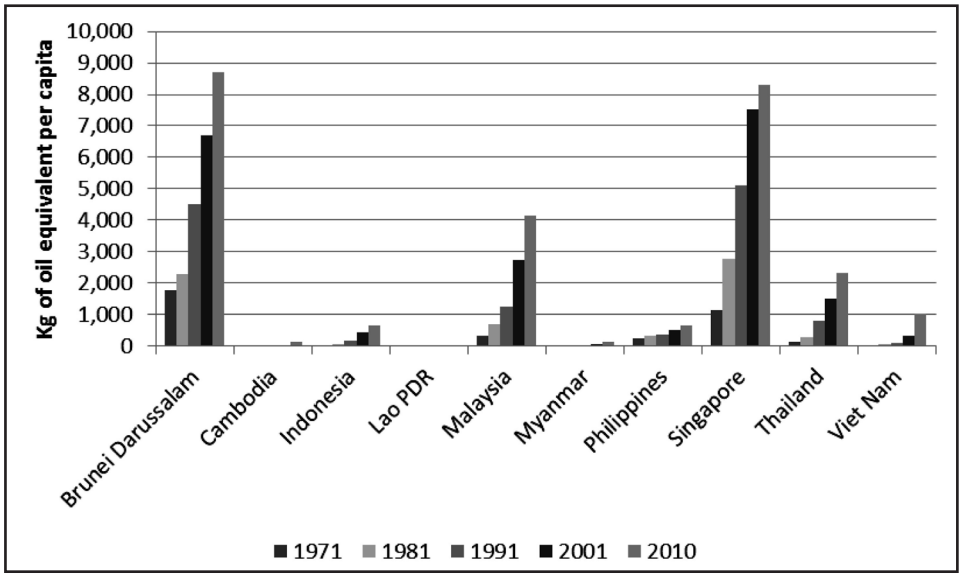


Source: World Development Indicators, World Bank.

Taking a broad perspective of energy poverty, it appears that there is imbalance across the countries. As shown in figure 2 and table 4, there is a huge gap in terms of energy use per capita among ASEAN countries. Energy use per capita in Brunei Darussalam and Singapore was above 8,000 kg of oil equivalent, while Malaysia and Thailand were above 4,000 kg and

2,000 kg of oil equivalent respectively. Energy use per capita for the other countries was below 1,000 kg of oil equivalent. Table 4 also shows that the stage of economic development (together with energy policy) determines intensity and efficiency of energy use. While other countries showed increasing GDP per capita, Brunei Darussalam moved in the opposite direction. Because energy use increased between 1995 and 2010, it appears that energy intensity (ratio of energy use to GDP) in Brunei Darussalam tended to increase. Other countries that also indicated an increasing level of energy intensity are Malaysia and Thailand. On the other hand, in Cambodia, Indonesia, Singapore and Viet Nam, energy intensity tended to decrease as the respective rates of growth in GDP per capita were higher than the growth of energy use per capita. In the Philippines, energy use per capita decreased while GDP per capita increased. Thus, it appears that only the Philippines was successful in using energy more efficiently. The links between energy access and development are reviewed further in section C.

Figure 2. Energy use



Source: World Development Indicators, World Bank.

Table 4. Energy use per capita vs. GDP per capita in ASEAN

Country	Energy use per capita (kgoe)			GDP per capita (Constant 2005 US dollars at PPP)		
	1995	2010	Growth per annum (%)	1995	2010	Growth per annum (%)
Brunei Darussalam	7,838	8,274	0.36	50,304	45,319	-0.69
Cambodia	263	350	1.92	841	1,937	5.72
Indonesia	674	864	1.67	2,785	3,873	2.22
Malaysia	1,635	2,569	3.06	9,496	13,767	2.51
Philippines	482	433	-0.71	2,515	3,554	2.33
Singapore	5,337	6,456	1.28	32,880	52,314	3.14
Thailand	1,050	1,768	3.53	5,755	7,987	2.21
Viet Nam	304	681	5.52	1,231	2,875	5.82

Source: World Development Indicators, World Bank.
Note: No data available for the Lao PDR and Myanmar.

C. Energy and development

Providing access to modern energy services enhances countries' attainment of the Millennium Development Goals (MDGs). Figure 3 reviews the links between energy and MDGs. Winkler and others (2011) emphasized the fact that improvement of electricity access and affordability were important. Kanagawa and Nakata (2008) showed the relationship between energy and poverty indicators such as health, education, income and environment, and indicated that access to electricity depended on infrastructure conditions, capacity of supply, government policy and international cooperation. However, the United Nations Secretary-General's Advisory Group on Energy and Climate Change (AGECC) (2010) argued that existing energy systems were inadequate to meet the needs of the world's poor and are jeopardizing the achievement of the MDGs. AGECC (2010) suggested two goals. First, ensure universal access to modern energy services by 2030. In this regard, AGECC (2010) agreed with the IEA suggestion of a minimum threshold of about 100 kWh of electricity and 100 kgoe of modern fuels (equivalent to approximately 1,200 kWh) per person per year. Second, reduce global energy intensity by 4 per cent by 2030.[4]

Figure 3. A snapshot of energy linkages to MDGs

MDG	Energy Linkages
1 Eradicate extreme poverty and hunger	Energy inputs such as electricity and fuels are essential to generate jobs, industrial activities, transportation, commerce, micro-enterprises, and agriculture outputs. Most staple foods must be processed, conserved, and cooked, requiring energy from various fuels.
2 Achieve universal primary education	To attract teachers to rural areas electricity is needed for homes and schools. After dusk study requires illumination. Many children, especially girls, do not attend primary schools in order to carry wood and water to meet family subsistence needs.
3 Promote gender equality and empower women	Lack of access to modern fuels and electricity contributes to gender inequality. Women are responsible for most household cooking and water-boiling activities. This takes time away from other productive activities as well as from educational and social participation. Access to modern fuels eases women's domestic burden and allows them to pursue educational, economic, and other opportunities.
4 Reduce child mortality	Diseases caused by unboiled water, and respiratory illness caused by the effects of indoor air pollution from traditional fuels and stoves, directly contribute to infant and child disease and mortality.
5 Improve maternal health	Women are disproportionately affected by indoor air pollution and water—and food-borne illnesses. Lack of electricity in health clinics, lack of illumination for nighttime deliveries, and the daily drudgery and physical burden of fuel collection and transport all contribute to poor maternal health conditions, especially in rural areas.
6 Combat HIV/AIDS, malaria, and other diseases	Electricity for communication such as radio and television can spread important public health information to combat deadly diseases. Health care facilities, doctors, and nurses, all require electricity and the services that it provides (illumination, refrigeration, sterilization, etc.) to deliver effective health services.
7 Ensure environmental sustainability	Energy production, distribution, and consumption has many adverse effects on the local, regional, and global environment; these effects include indoor, local, and regional air pollution; local particulates; land degradation; acidification of land and water; and climate change. Cleaner energy systems are needed to address all of these effects and to contribute to environmental sustainability.
8 Develop a global partnership for development	The World Summit for Sustainable Development (WSSD) called for partnerships between public entities, development agencies, civil society, and the private sector to support sustainable development, including the delivery of affordable, reliable, and environmentally sustainable energy services.

Source: UNDP, 2005.

4 Energy intensity is measured by the quantity of energy per unit of economic activity or output (GDP).

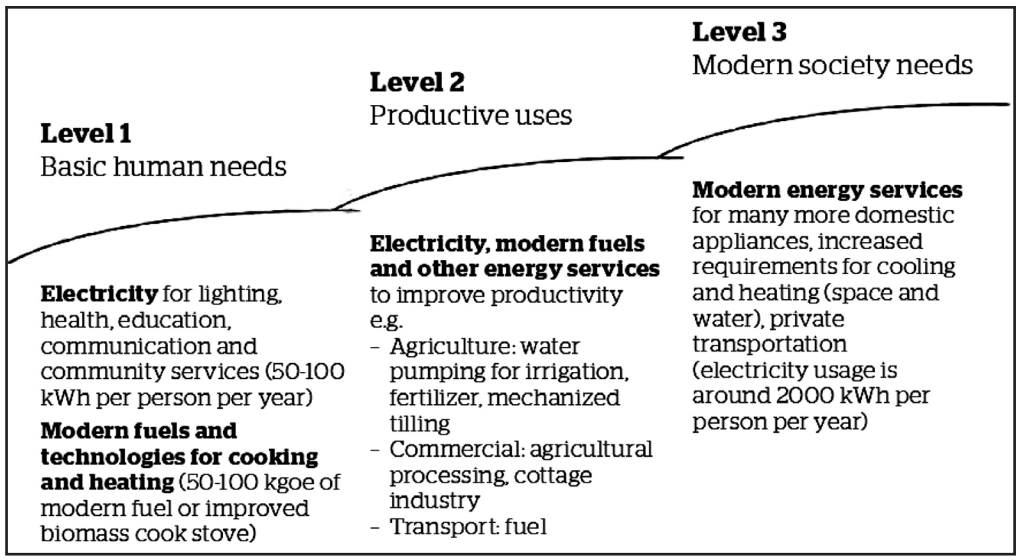
Table 5 shows that Myanmar has the lowest electricity consumption per capita in ASEAN, while Brunei Darussalam has the highest. Following the minimum threshold of 100 kWh, nine ASEAN members were above the standard in 2010 (no data were available for the Lao PDR at the time of this study). In the context of modern society's needs (figure 4), only Brunei Darussalam, Malaysia, Singapore and Thailand had electricity consumption per capita above the standard. Thus, to obtain 2,000 kWh per capita consumption per year, most of the ASEAN members need to increase electricity production. Interestingly, Viet Nam has shown impressive results, as its electricity consumption increased more than 350 per cent between 2000 and 2010.

Table 5. Electric power consumption (kWh per capita)

Country	1971	1980	1990	2000	2010
Brunei Darussalam	1,754	1,699	4,355	7,577	8,723
Cambodia	n.a.	n.a.	n.a.	33	144
Indonesia	14	47	165	395	639
Lao PDR	n.a.	n.a.	n.a.	n.a.	n.a.
Malaysia	310	657	1,146	2,720	4,136
Myanmar	20	34	43	73	121
Philippines	236	373	361	502	641
Singapore	1,155	2,718	4,983	7,575	8,307
Thailand	120	291	709	1,462	2,335
Viet Nam	41	55	98	295	1,035

Source: World Development Indicators, World Bank.

Figure 4. Incremental levels of access to energy services

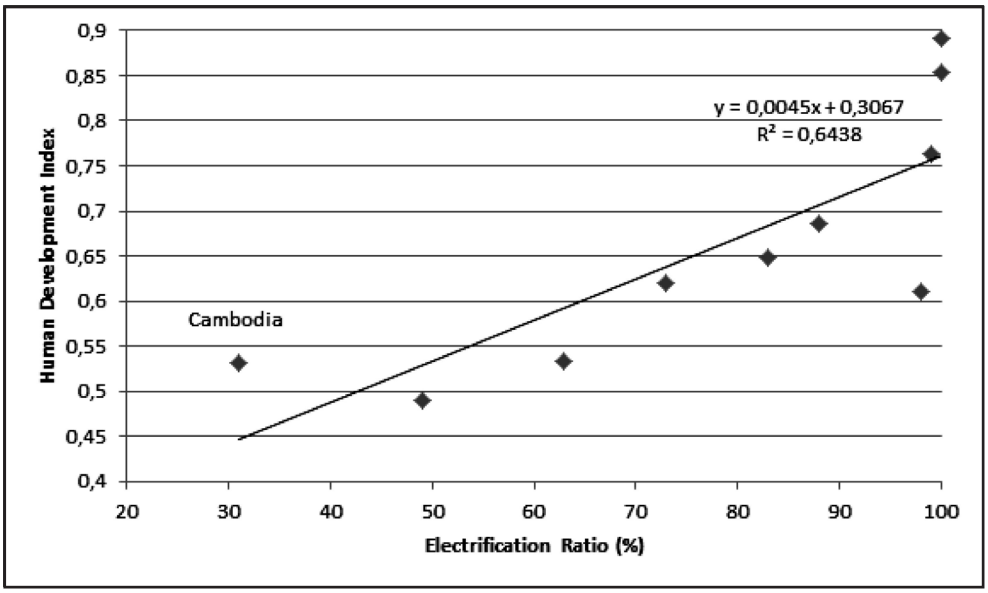


Source: AGECC, 2010.

Figure 5 plots the positive correlation between electrification ratio and human development index (HDI). In the case of Indonesia and Viet Nam, although the electrification ratio in Viet Nam was higher than in Indonesia, the latter country has a higher HDI than Viet Nam. A similar

result is obtained between Cambodia and Myanmar. This indicates that access to electricity is a necessary condition for improving quality of life, but it is not sufficient. Countries need to develop other basic services for improving people's welfare.

Figure 5. Electrification Ratio and Human Development Index in 2010



Sources: World Development Indicators, the World Bank; and Human Development Report, UNDP.

D. AEMI and energy access

Both the need and the commitment to address energy poverty are already visible in the ASEAN regional energy cooperation framework and in the concept of East Asia energy market integration. In the ASEAN Plan of Action for Energy Cooperation (APAEC) 2010-2015, the approaches to achieve the APAEC objectives include "strengthening coordination, participation in all program areas to narrow the development gap, improve energy access and to facilitate economic integration of the ASEAN region" (ASEAN Centre for Energy, 2010).

The commitment "to accelerate the implementation" of APAEC 2010-2015 by aiming "to strengthen coordinating efforts between ASEAN Member States" was reiterated during the twenty-second ASEAN Summit, held on 24-25 April 2013. The same summit, with the apt theme "Our people, our future together", also reiterated commitment of the ASEAN members "to narrowing the development gaps by implementing the IAI Work Plan (2009-2015) and the ASEAN Roadmap towards realizing the Millennium Development Goals with special focus on achievable goals and possible scenarios and priorities beyond 2015," including "addressing cross-cutting issues of the MDGs." These "scenarios and priorities beyond 2015" should very well include energy market integration, and "cross-cutting issues of the MDGs" should include energy poverty. Indeed, the twenty-second ASEAN Summit "noted the importance of realizing a truly people-centered ASEAN as a central element of a post-2015 vision of ASEAN."[5]

5 Statement by the Chairman of the twenty-second ASEAN Summit. Available at www.asean.org/news/asean-statement-communiques/item/chairmans-statement-of-the-22nd-asean-summit-our-people-our-future-together (accessed 7 August 2013).

On the other hand, energy market integration in the East Asian region was recognized as a desirable objective during the second East Asia Summit in 2007. In the Cebu Declaration on East Asian Energy Security, signed on 15 January 15, 2007, the East Asian member States specifically declared that they would "encourage the open and competitive regional and international markets geared towards affordable energy at all economic levels" (East Asia Summit, 2007). The Cebu Declaration specifically called for gearing the energy markets towards affordable energy for all, including the poor.

The proposed AEMI takes off from the existing efforts toward greater ASEAN energy cooperation. However, AEMI is much more than regional energy cooperation as it involves integrating markets. Since the type of integration within the larger East Asia Summit framework is expected to take a long time, so AEMI is proposed as a more gradual approach towards regional energy market integration.

Inasmuch as AEMI will involve the liberalization of the flow of energy products and investments across ASEAN, and the interconnection of physical infrastructures in certain parts of the region, the policy requisites will include: (a) energy trade and investment liberalization; (b) reforms in domestic energy market structures; (c) harmonization of energy standards and regulations; and (d) coordination of energy sector planning and development.

The benefits from the implementation of these policy reforms may have an impact on energy poverty through channels such as price effect, productivity and wealth effects, and knowledge dissemination. The expected lower real prices of energy as a result of trade and investment liberalization can make the prices of energy products and services more affordable to the poor. Structural reforms in energy markets have the potential to improve the total factor productivity and raise the overall economic development of a country. These productivity and wealth effects will benefit the total population and will make more resources available for programmes, such as rural electrification programmes, that aim to deliver energy services to the unserved section of the population. Formulating and implementing domestic investment programmes to address energy poverty can also benefit from the knowledge to be gained from region-wide harmonization of energy standards and regulations as well as coordinated energy sector planning and development.

An estimation of the benefits that will stem from AEMI was not available at the time of this study; however, an estimation of the benefits from energy market integration (EMI) in the East Asia Summit (EAS) region by Bhattacharya and others (2010) demonstrated the price, productivity and wealth effects. (The EAS region considered in this study comprises 16 countries – the 10 ASEAN members plus Australia, China, India, Japan, New Zealand and the Republic of Korea.) The results show that the EAS region as a whole will gain, although the distribution of economic benefits will not be balanced across the region.

Notwithstanding the unbalanced distribution, the positive impacts of EMI on economic growth and development will have beneficial effects in terms of raising access to goods and services, including energy access. A study by Sheng and Shi (2013) on the impact of EMI on equitable economic growth showed that EMI is likely to promote the economic growth of individual countries as well as facilitate equitable growth within a region.

Using panel data regressions, the study adopted a convergence analysis in which two concepts of convergence were employed – the dispersion of real per capita income across countries falling over time, and a poor country or region growing faster than a rich one. To measure EMI, an energy trade index and a competition index were defined and measured. The EMI indexes were then used in the regressions. The results provided support for convergence in economic growth as EMI tends to increase the rate at which income per capita in developing countries catches

up with that of their more developed neighbors. The authors also concluded that developing countries would gain more than the developed countries from active involvement in EMI.

E. AEMI strategy

1. Key design elements

AEMI can address energy poverty by specifically incorporating it in the AEMI agenda up to 2030. The following are the key design elements of the AEMI strategy towards removing energy poverty or achieving universal access by 2030:

(a) Promotion of AEMI among developed and less developed economies in the region;

(b) AEMI must make sure energy goods and services are covered in the trade and investment agreements under AEC;

(c) Putting mitigation measures for fossil fuel subsidy reforms in place;

(d) The adoption of international standards on technologies (products and systems) that address energy poverty or increase energy access;

(e) Continuation and enhancement of regional cooperation on renewable energy distributed generation and off-grid systems, including especially micro- and mini-grids.

(a) Promotion of AEMI among developed and less developed economies in the region

One of the potential benefits of energy market integration is the reduction in income disparity across countries in the region (Sheng and Shi, 2011). A more integrated energy market will help poor countries catch up with their rich neighbors. "Energy market integration tends to increase the rate at which income per capita in developing countries catches up with that of their more developed neighbors" (Sheng and Shi, 2013). Thus, AEMI "should be promoted more confidently and positively, not only among developed countries but also [by] involving least developed countries (LDCs)...[In fact,] developed countries can also play an important role by helping LDCs to overcome difficulty through capacity-building programmes" (Sheng and Shi, 2011).

(b) AEMI must make sure energy goods and services are covered in the trade and investment agreements under AEC

General trade and investment liberalization is covered in the existing bilateral and multilateral free trade agreements. Following Bhattacharya and others (2010), the remaining task under AEMI is to make sure energy goods and services as well as investments in the energy sector are covered in the scope of these agreements. "A detailed review of energy trade and investment in the current regional agreements and frameworks will provide background for policy discussions and potential areas for improvement in the existing agreements" (Bhattacharya and others, 2010).

(c) Putting mitigation measures for fossil fuel subsidy reforms in place

"The development of a comprehensive long-term road map, which integrates economic, political and social issues, so as to achieve market-oriented energy pricing mechanisms, is crucial for progress in regional energy market integration" (Bhattacharya and others, 2010). A key feature of energy market integration, including the envisioned AEMI, is energy pricing

reform, particularly the reform of fossil fuel price subsidies. However, fossil fuel subsidy reforms have mixed impacts on energy poverty.

Overall, subsidy reforms are necessary because of their positive or desirable impacts on the economy as well as health and environment (IMF, 2013). Households can gain improved energy access due to expanding distribution and improved quality of services, as a result of reduced subsidies or subsidy reforms.

On the other hand, subsidy reforms could increase energy poverty by increasing risk of reduced energy access through income and price effects. "Effective incomes would be expected to go down in the short term, as price increases push up costs, and…the poor struggle to adapt. Some households can suffer from reduced energy access if energy becomes expensive and there are no affordable alternatives" (Beaton and others, 2013). For example, kerosene is often important for low-income households, particularly those that do not have access to electricity. Reforming, if not removing altogether, subsidies on kerosene has high income effects on the poor. In the Philippines, diesel-fired generating sets (gen-sets) provide electricity to small islands, including those with small distribution networks. The gradual removal of subsidies on fossil fuels would have had income and inflationary impacts on the households living in these communities.

AEMI should, therefore, include measures that mitigate the impact of energy pricing reforms. For fossil fuel subsidy reforms, these mitigation measures include infrastructure programmes (e.g., rural electrification programmes that extend utility distribution networks or install decentralized systems) and facilitation of investment on energy access (e.g., private sector micro- and mini-grids) (Beaton and others, 2013). For example, rural electrification programmes mitigate the income and price effects of energy-pricing reforms by contributing or having positive impacts on poverty reduction.[6] Navarro (2013) found "a positive relationship between rural electrification and poverty reduction in the Philippines." This same study demonstrated that increased access to electricity of households in Philippine rural areas as a result of various rural electrification programmes was associated with a substantial increase in per capita income and per capita spending (Navarro, 2013).

Energy access programmes should include the provision of affordable alternative energy sources that can mitigate the impact of subsidy reform on low-income groups (IMF, 2013). In the Philippines, the USAID-AMORE[7] programme has designed schemes so that solar home systems and solar lanterns become affordable substitutes to kerosene that had been deregulated. In fact, the basis for pricing these cleaner alternatives for providing lighting to poor households in Mindanao was the price at which households were procuring kerosene (AMORE, 2011).

"Well-targeted measures to mitigate the impact of energy price increases on the poor are [also] critical for building public support for subsidy reforms" (IMF, 2013).

(d) The adoption of international standards on technologies (products and systems) that address energy poverty or increase energy access

Market integration is often accompanied by harmonization of international product and systems standards in order to facilitate cross-border trade and investments, which is one key feature of market integration. Standards benefit customers and end-users primarily by ensuring quality

6 See Navarro, 2013, for an overview discussion on the impact of rural electrification on poverty.

7 United States Agency for International Development-Alliance for Mindanao and Multi-Regional Renewable Rural Electrification and Development (USAID-AMORE), Phase III.

and safety of products as well as systems or installations. They also benefit enterprises. One benefit of standards to enterprises providing energy access goods and services is sustainable growth deriving from customer satisfaction, resulting in repeat sales and referrals (Ngigi, 2013). With market integration, another benefit of standards (for example, to consumers) – i.e., harmonized standards through the adoption of international standards – is access to quality goods and services. Another benefit to enterprises is increased access to markets beyond national borders and, thus, increased sales.

Solar PV systems, for example, have been the most economical way of providing basic electricity services, such as lighting and clean drinking water, to individual households in very remote rural areas. According to the International Electrotechnical Commission (IEC, 2010), with the cost of solar panels decreasing, solar PV is becoming a competitive way, compared to mini-hydro and biomass, of meeting community or village demand or for mini-grid application. Indeed, solar PV has proven itself cost-effective in many off-grid applications.

The IEC Technical Committee (TC) 82 has developed international standards for solar PV systems that may be adopted by countries in ASEAN – for example, in Indonesia, the Lao PDR, Myanmar and the Philippines, which have a large portion of their respective populations still without access to electricity and modern fuels. TC 82 "Solar photovoltaic energy systems" prepares international PV standards for systems that convert solar energy into electrical energy and for all the elements in the entire PV energy chain, including off-grid lighting systems. IEC TC 82 standards are used by qualification testing laboratories throughout the world in testing products submitted by manufacturers who wish to enter the PV marketplace. Included among users are teaching and research universities and colleges, and government laboratories with an interest in PV technologies.

Standards are also written for balance of systems components – such as inverters and charge controllers – and for grid safety when operating DC to AC inverter systems connected to the utility grid. Systems standards are also written for use by systems integrators in the commissioning of small and large photovoltaic generating systems. Technical specifications are also written for use in specifying, commissioning and operating PV and hybrid stand-alone systems or micro-grids in developing countries. Customers here are systems integrators, system owners, utilities, the World Bank and Governments that provide funding for such systems.

IEC has also released TS (Technical Specification) IEC/TS 62257-9-5 for solar-powered light-emitting diode (LED) lighting devices, such as solar lanterns. "Part of the effort to expand access to modern off-grid lighting among low-income households in developing countries, the new specification represents an important step in aiding governments to harmonize their national standards, paving the way for market expansion for quality-assured devices" (IEC, 2013).

On the other hand, EVN and ICASEA (2013) list the IEC standards that govern the selection and design of off-grid system components and procedures for system sizing. These include standards for mini-grids that offer a means of providing electricity from renewable and other sources to those who do not have access to electricity because they live in remote or rural areas, or in islands not connected to the main grid. Mini-grids are expected to supply 40 per cent of new capacity by 2030 (IEC, 2013).

Table 6. IEC Standards for off-grid systems

Standards	Features
IEC 62257-1:2003:	Contains recommendations for small renewable energy and hybrid systems for rural electrification specifically Part 1: General introduction to rural electrification.
IEC 62257-8-1:2007:	Contains recommendations for small renewable energy and hybrid systems for rural electrification specifically Part 8-1: Selection of batteries and battery management systems for stand-alone electrification systems – Specific case of automotive flooded lead-acid batteries available in developing countries.
IEC 62257-7-3:2008:	Contains recommendations for small renewable energy and hybrid systems for rural electrification specifically Part 7-3: Generator set – Selection of generator sets for rural electrification systems.
IEC 62257-3:2004:	Contains recommendations for small renewable energy and hybrid systems for rural electrification specifically Part 3: Project development and management.
IEC 61427:	This standard is about secondary cells and batteries for renewable energy storage, general requirements and methods of test. This IEC specifies the particular operating conditions experienced by secondary batteries in photovoltaic applications during their use.
IEC 62124:	This standard is about photovoltaic (PV) stand-alone systems and design verification. This standard verifies system design and performance of stand-alone PV systems.

Source: EVN and ICASEA, 2013.

(e) Continuation and enhancement of regional cooperation on renewable energy distributed generation and off-grid systems, including especially micro- and mini-grids

In many remote rural areas in ASEAN that have not been reached by electricity grids, particularly in Indonesia, Myanmar, the Philippines, Thailand and Viet Nam, access to electricity can only be made economically and technically possible by the development of off-grid and distributed generation systems, including micro- or mini-grids and stand-alone individual households systems (e.g., solar home systems or SHS). AEMI should continue the national efforts and build on them to further ASEAN regional cooperation in this regard, including those by HAPUA and RE-SSN. In fact, ASEAN could learn from successful experiences within these countries and present these as model approaches in the framework of existing regional cooperation to boost national efforts. In addition to knowledge-sharing and dissemination of best practices, another area for regional cooperation is the harmonization of national standards on off-grid systems through the adoption of recognized and applicable international standards (e.g., those by IEC, as shown in table 6).

2. Monitoring progress[8]

Part of the AEMI strategy should be to monitor the progress towards reaching the energy poverty reduction target or the attainment of universal energy access.

The IEA has devised an Energy Development Index (EDI) in order to better understand the role that energy plays in human development (IEA, 2010). EDI tracks progress in the transition of a country or region to the use of modern fuels. By publishing EDI updates on an annual basis, IEA hopes to raise the international community's awareness of energy poverty issues and to assist countries in monitoring their progress towards modern energy access. Indeed, a robust set of indicators for measuring energy poverty is needed in order to provide a rigorous analytical basis for policy-making. These indicators should include:

(a) Improvement in the availability of information about the range and impacts of options for action, and the actions that countries are taking to increase access to energy;
(b) Helping countries to monitor actions that they take to meet their agreed target;
(c) Enhancing the effectiveness of the implementation of such policies at the national and local levels.

The EDI is calculated in such a way as to mirror the UNDP Human Development Index and comprises four indicators, each of which captures a specific aspect of potential energy poverty:

(a) Per capita commercial energy consumption, which serves as an indicator of the overall economic development of a country;
(b) Per capita electricity consumption in the residential sector, which serves as an indicator of the reliability of, and consumer's ability to pay for, electricity services;
(c) The share of modern fuels in total residential sector energy use, which serves as an indicator of the level of access to clean cooking fuels;
(d) The share of a population with access to electricity.

A separate index is created for each indicator, using the actual maximum and minimum values for the developing countries covered. Performance in each indicator is expressed as a value between 0 and 1, calculated using the following formula:

$$\text{Indicator} = \frac{\text{Actual value} - \text{minimum value}}{\text{Maximum value} - \text{minimum value}}$$

The EDI is then calculated as the arithmetic mean of the four values for each country.

An EDI maybe calculated specifically for ASEAN as part of AEMI, considering only the maximum and minimum values of each component indicator for this region.

A correlation can also be drawn between EDI for ASEAN and the energy market competition index (EMCI), which was proposed as a measure of energy market integration (Sheng and Shi, 2013). Using the principal components analysis (PCA), EMCI is a function of energy consumption productivity (GDP/energy consumption) and electricity share (electricity consumption/total energy consumption). Increasing energy access should increase energy consumption productivity and electricity share, and thus the energy market competition index.

8 This section is derived extensively from IEA, 2010 (pp. 29-35).

Another important component of AEMI strategy towards eliminating energy poverty is a mapping of investment requirements and an inventory of options to finance those investments.

F. Investment requirements and financing options

Financing has become the major issue for promoting rural electrification and increasing electricity access for three reasons. First, due to geographic and topographic challenges, the construction of grid connections to rural areas is often extremely expensive. Second, off-grid connections also need huge investment because most technologies are not domestically produced. Third, administrative tasks, including monitoring, evaluating and collecting retribution, are not easy. Finally, a lack of, or inadequate, income due to a lack of economic opportunities makes it difficult for poor people to obtain access to electricity (both connection and installation). The vicious cycle of energy poverty was addressed by McCawley (1978), who pointed out six main elements of the rural electrification problem: technical difficulties; quality of service; administration; level of demand; high costs; and the financing programmes. The six elements are interconnected. AEMI should facilitate the financing of rural electrification to overcome energy poverty.

1. Investment requirements

Comprehensive data on investment requirements for eliminating energy poverty in ASEAN are unavailable, but two issues of the International Energy Agency (IEA)'s *World Energy Outlook* provided aggregate estimates for Developing Asia, which can provide clues to the likely size of ASEAN investment requirements. Developing Asia includes all the ASEAN members.[9]

In the *World Energy Outlook 2010*, IEA estimated that the bulk of the investment for electrification by 2015 would be incurred more rapidly in developing Asian countries than in sub-Saharan Africa, even though the latter region has a lower electrification rate. As of 2009, the electrification rate in sub-Saharan Africa was 31 per cent, whereas in Developing Asia, it was 78 per cent. The investment requirements from 2010 to 2015 were expected to be US$ 80 billion in sub-Saharan Africa and US$ 127 billion in Developing Asia. Investment in electrification was projected to grow more rapidly in Developing Asia, primarily because economic growth was expected to be more rapid in these countries than in sub-Saharan Africa.

In the *World Energy Outlook 2011*, IEA estimated the investment required to achieve the goal of universal access to electricity and clean cooking facilities by 2030, which was referred to as the "Energy for All Case" in the projections. Access to electricity was defined not only as first supply connection to a household but also as involving minimum consumption of 250 kilowatt-hours (kWh) per year for a rural household and 500 kWh per year for an urban household. The IEA report also projected investment requirements in the "New Policies Scenario", which was a scenario based on broad policy commitments and plans that had been announced by countries around the world to address energy security, climate change and local pollution, and other pressing energy-related issues. (See Annex B of the *World Energy Outlook 2011* for

9 Developing Asia, as categorized by IEA, includes: Bangladesh; Brunei Darussalam; Cambodia; China; Taiwan Province of China; India; Indonesia; the Democratic People's Republic of Korea; Malaysia; Mongolia; Myanmar; Nepal; Pakistan; the Philippines; Singapore; Sri Lanka; Thailand; Viet Nam and other non-OECD Asian countries (Afghanistan; Bhutan; Cook Islands; Timor-Leste; Fiji; French Polynesia; Kiribati; Lao People's Democratic Republic; Macau, China; Maldives; New Caledonia; Papua New Guinea; Samoa; Solomon Islands; Tonga and Vanuatu).

an enumeration of these commitments and plans.) However, IEA explained that the projected investment levels in the New Policies Scenario would not be enough to achieve universal access to modern energy services by 2030.

In the Energy for All Case, the additional investments between 2010 and 2030 in Developing Asia would total US$ 241 billion (table 7). On a global scale, achieving universal access or energy for all would require a total investment of US$ 641 billion, implying an investment of more than 5.3 times the investment in electricity access in 2009.

Table 7. Additional investment required to achieve universal access to electricity (billion in 2010 US dollars)

Region	2010-2020	2021-2030	Total
Africa	119	271	390
Sub-Saharan Africa	118	271	389
Developing Asia	119	122	241
India	62	73	135
Rest of Developing Asia	58	49	107
Latin America	3	3	6
Developing countries*	**243**	**398**	**641**
World	**243**	**398**	**641**

Source: IEA, 2011.
Note: *The developing countries total includes Middle Eastern countries.

India accounted for 46 per cent of total population without electricity access as of 2013, based on REN21 (2013), and for 56 per cent of additional investments required to achieve universal access by 2030 (table 7). ASEAN accounted for 20 per cent of total population without electricity access. If the additional investments required to achieve universal access by 2030 were just proportional to population without electricity access, then ASEAN would need about US$ 48 million to achieve universal access by 2030.

However, IEA arrived at the above estimates by first determining the regional cost per megawatt-hour (MWh) from estimates of regional costs and consumer density. It then assessed the necessary combination of on-grid (grid extension), mini-grid and isolated off-grid solutions. Mini-grids provide centralized generation at a local level and use village-level distribution networks. Off-grid solutions are stand-alone systems that do not entail transmission and distribution costs. The cost per MWh of delivering electricity through the grid is lower than through mini-grids or off-grid solutions, and IEA estimated that grid extension was the most suitable option for all urban zones and around 30 per cent of rural areas. The remaining 70 per cent of rural areas were projected to be connected through mini-grids (65 per cent) or stand-alone off-grid solutions (35 per cent).

2. Financing options

In meeting energy poverty reduction targets, defining the sources of financing depends, in part, on the types of technical solutions that are best suited for the types of demand – for example, on-grid connection extensions, mini-grid distribution system and off-grid electrification. ASEAN countries would benefit from a bottom-up approach in defining the suitability of technical

solutions as well as the corresponding financing requirements and strategies. The financing options for putting these technical solutions in place are government budget, multilateral and bilateral official development assistance, and private sector financing. These options can be pursued individually or as a combination of two or more options. According to *World Energy Outlook 2011* (IEA, 2011), the global demand for universal access could be financed using these options, depending on the level of household energy expenditure, as outlined in table 8.

Table 8. Financing options for pursuing universal access to electricity

	Level of household energy expenditure	Main source of financing	Other sources of financing
On-grid	Higher	Private sector	Developing country utilities
	Lower	Government budget	Developing country utilities
Mini-grid	Higher	Government budget, Private sector	Multilateral and bilateral guarantees
	Lower	Government budget	Multilateral and bilateral concessional loans
Off-grid	Higher	Multilateral and bilateral guarantees and concessional loans	Private sector, Government budget.
	Lower	Multilateral and bilateral concessional loans and grants	Government budget.

Source: Adopted with modifications from IEA, 2011.

For on-grid electrification, the investment requirements of higher energy expenditure households can be primarily financed by the private sector, with supplemental financing from developing country utilities. The investment requirements for on-grid electrification of lower energy expenditure households, on the other hand, can be financed by government budgets, supplemented by the budgets of developing country utilities.

For mini-grid electrification, higher energy expenditure households can be given electricity connection mainly through government budgets and private sector financing, and secondarily through multilateral and bilateral guarantees. The multilateral and bilateral guarantees can serve as credit enhancements for private sector financing. Connecting lower energy expenditure households to mini-grids, on the other hand, can be primarily through government budgets, which can be supplemented by multilateral and bilateral concessional loans.

Off-grid electrification is a technical solution that can justify soft financing, as this solution is usually for very remote rural areas. For higher energy expenditure households, the presence of multilateral and bilateral guarantees is very important for any private sector financing that may be feasible; multilateral and bilateral concessional loans can be the primary financing source and government budgets can provide supplemental financing. For lower energy expenditure households, off-grid electrification can be mainly financed by multilateral and bilateral concessional loans, and grants, with government budgets providing support.

An emerging financing option for increasing energy access is carbon finance. In carbon finance, projects that help to reduce greenhouse gas emissions earn carbon credits that are then sold within the Clean Development Mechanism (CDM). The CDM is a mechanism for emissions trading, which was defined in the Kyoto Protocol to the United Nations Framework Convention on Climate Change in 2007. IEA (2011), however, warned that existing substantial obstacles to using carbon finance for increasing energy access must first be overcome. Such obstacles include the long, uncertain and expensive process for determining the emissions baseline, assessing and registering projects, and monitoring and certifying the carbon credits. Nevertheless, procedural improvements are emerging and the World Bank Carbon Finance Unit has been developing methodologies such as the standardized approach in small-scale CDM methodology for grid rural electrification, i.e., the replacement of stand-alone rural power generation and traditional fuels with more efficient grid extensions and new local mini-grids (Spors, 2011).

G. Conclusion

1. AEMI and ASEAN energy poverty

The strong connection between AEMI and energy poverty has been established, both at the macro and the energy sector levels. At the macro level, energy market integration can contribute to national economic growth and development by facilitating the catching up of less developed economies to those more developed. However, this will not be possible without addressing the issue energy poverty or increasing energy access, as "lack of access to modern energy services is a serious hindrance to economic and social development, and must be overcome if the UN Millennium Development Goals (MDGs) are to be achieved" (IEA, 2010).

At the energy sector level, integration of energy markets would allow national Governments to more easily address the energy policy challenges that face any country, including: security of energy supply and/or demand; economic efficiency of the energy sector; social equity, particularly access to affordable energy; and reduced emissions of pollutants (Andrews-Speed, 2011). Energy security has been the first priority among these policies, and energy security itself rests on three pillars: the adequacy and reliability of physical energy supply; environmental sustainability; and affordable access (ADB, 2013).

Indeed, AEMI cannot come about without addressing the situation of the more than 127 million people in the region without access to electricity and at least 228 million people without access to modern cooking fuels and technologies. To be sure, ASEAN recognizes the severity of the energy poverty situation in the region and is committed in closing the gap on energy access through energy cooperation that, to all intent and purposes, is the precursor to energy market integration.

2. Recommendations for future action

This study recommends the five actions listed below that need to be taken within or alongside AEMI in order to accelerate energy access on the one hand, and to mitigate the possible impacts of AEMI on the other hand. This is addressed to the various ASEAN energy sector bodies, including, in particular, SOME, AMEM, the relevant subsector networks, HAPUA and ACE.

(a) *Estimate the direct and indirect impacts of energy prices subsidy reform on the poor*

Assessing the impacts of fossil-fuel subsidy reform is "an important foundation for persuasively communicating the necessity for reform and for designing policies to reduce the impact of higher fuel prices on the poor" (IMF, 2013, p. 26). Beaton and others (2013) discussed the qualitative and quantitative approaches to assessing the impacts of subsidy reform.

(b) *Disseminate and share knowledge and experiences on fossil-fuel subsidy reform and mitigating impacts*

"South-East Asian countries have a wealth of experience in reducing and reforming fossil-fuel subsidies, and can learn from one another's experiences. Opportunities for increased policy dialogue and sharing case studies would help replicate successes and share the lessons that have been learnt"(Beaton and others, 2013, p. 94).

(c) *RE-SSN and HAPUA should continue and expand cooperation on off-grid and decentralized renewable energy systems, and perhaps coordinate with each other to accelerate the elimination of energy poverty.*

Off-grid systems that are fuelled by renewable energy sources, whether decentralized stand-alone systems or micro- and mini-grids, are the most economical solutions to providing electricity access in still many cases (because of the non-viability of grid or line extension). As they are aware of this fact, RE-SSN and HAPUA should make this a priority topic in their respective work programmes, including the possibility of joint-discussions.

A potential area for joint discussion is the adoption of regional and national standards on off-grid and decentralized systems, including micro- and mini-grids, based on existing international standards.

(d) *Estimate the investment requirements for achieving universal energy access by 2030 and study financing options.*

In cooperation with IEA/OECD, it is recommended that ACE determine the investment requirements needed for achieving universal energy access by 2030 in ASEAN or among ASEAN members. This undertaking should not be limited to estimating the investment requirements in United States dollar terms, but more importantly the technological options behind such investments. Equally important are the potential sources of financing for those investments. This is to put real value on, and stress the urgency of the tasks ahead. Above all, insofar as AEMI is concerned, such an undertaking should point to aspects of cooperation in the area of energy access, as AEMI cannot be realized if some people in the region remain without access to clean energy.

(e) *Start a collaborative research project to investigate the best practices in promoting rural electrification programmes.*

Research needs to address the technical difficulties, quality of service, administration, level of demand, high costs and financing programmes. This study aims to become the "White Book" in promoting rural electrification programmes in the ASEAN.

References

ADB (2013). *Asian Development Outlook 2013*. Asian Development Bank, Manila.

AGECC (2010). *Energy for Sustainable Future*. United Nations Secretary-General's Advisory Group on Energy and Climate Change. New York.

AMORE (2011). "AMORE Solar PV electrification: Prospects and opportunities," presentation at the RE Business Stakeholders' Forum, 12 August 2011, Pasig City, the Philippines.

Andrews-Speed, P. (2011). "Energy market integration in East Asia: A regional public goods approach", ERIA Discussion Paper Series 2011-06. Economic Research Institute for ASEAN and East Asia, Jakarta.

ASEAN Centre for Energy (2010). "ASEAN Plan of Action for Energy Cooperation 2010-2015." Available at: http://aseanenergy.org/media/filemanager/2012/10/11/f/i/file_1.pdf (accessed 8 July 2013).

Beaton, C., I. Gerasimchuk, T. Laan and K. Lang (2013). *A Guidebook to Fossil-Fuel Subsidy Reform*. International Institute for Sustainable Development, Winnipeg, Manitoba, Canada

Bhattacharya, A., F. Kimura, S. Kojima and X. Shi (2010). "Energy market integration in the East Asia Summit region: Review of initiatives and estimation of benefits." ERIA Research Project Report 2009, No. 13. Economic Research Institute for ASEAN and East Asia, Jakarta.

East Asia Summit (2007). "Cebu Declaration on East Asian Energy Security, 15 January 2007." Available at: www.asean.org/news/item/cebu-declaration-on-east-asian-energy-security-cebu-philippines-15-january-2007-2 (accessed 8 July 2013).

EVN and ICASEA (2013). *Technical Manual for Interconnecting Wind Power to Vietnam Power System*. Vietnam Electricity and International Copper Association Southeast Asia, Hanoi and Jakarta.

IEA (2012). *World Energy Outlook 2012*. International Energy Agency, OECD/IEA, Paris.

——— (2011). "Energy for all: financing access for the poor", special excerpt from *World Energy Outlook 2011*. International Energy Agency, OECD/IEA, Paris.

——— (2010). "Energy poverty: How to make modern energy access universal", Special excerpt of the *World Energy Outlook 2010*. International Energy Agency, OECD/IEA, Paris.

——— (2009). *World Energy Outlook 2009*. International Energy Agency, OECD/IEA, Paris.

IEC (2013). "Electrical energy…the IEC helps keep the power on". International Electrotechnical Commission, Geneva.

——— (2010). "TC 82 (Solar Photovoltaic Systems) Strategic Business Plan.". International Electrotechnical Commission, Geneva.

IMF (2013). *Energy Subsidy Reform: Lessons and Implications.* International Monetary Fund, Washington D.C.

Kanagawa, M. and T. Nakata (2008). "Assessment of access to electricity and the socio-economic impacts in rural areas of developing countries," *Energy Policy*, vol. 36; pp. 2016-2029.

McCawley, P. (1978). "Rural electrification in Indonesia – Is it time?" *Bulletin of Indonesia Economic Studies*, vol. 14, No. 2; pp. 34-69.

Masud, J., D. Sharan and B. Lohani (2007). *Energy for all: Addressing the energy, environment, and poverty nexus in Asia*, Asian Development Bank, Manila.

Navarro, A. (2013). "Cost efficiency and effectiveness of the Sitio and Household Electrification Programs," PIDS Discussion Paper Series No. 2013-32, PIDS. Philippine Institute for Development Studies, Makati City, Philippines.

Ngigi, A. (2013). "Standardization and certification of energy products: The experience of DEEP EA Project." IT Power East Africa., Nairobi.

Reddy, A.K.N., and B.S. Reddy (1994). Energy and Social Issues in World Energy Assessment. United Nations Development Programme. New York.

REN21 (2013). *Renewables 2013 Global Status Report*. REN21 Secretariat, Paris.

Sheng, Y. and X. Shi (2013). "Energy market integration and equitable growth across countries", *Applied Energy*, vol. 104; pp. 319-325.

——— (2011). "Energy market integration and economic convergence: implications for East Asia", ERIA Discussion Paper Series 2011-05. Economic Research Institute for ASEAN and East Asia, Jakarta.

Spors, F. (2011). "Standardised Approach in New Draft Small Scale CDM Methodology for Grid Rural Electrification", presentation at UNFCCC Standardisation Workshop, June 2011, Bonn. Available from http://cdm.unfccc.int/methodologies/Workshops/cdm_standards/s2_wb.pdf (accessed 12 July 2013).

UNDP (2005). *Energizing the Millennium Development Goals: A Guide to Energy's Role in Reducing Poverty*. United Nations Development Programme, New York.

Winkler, H., A. F. Simoes, E. L. Rovere, M. Alam, A. Rahman and S. Mwakasonda (2011). "Access and affordability of electricity in developing countries." *World Development*, vol. 39, No. 6; pp. 1037-1050.

IV. Addressing national constraints, energy pricing and subsidies in joining AEMI

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Abstract

The analysis in this chapter focuses on national constraints, which have been divided into two main parts, i.e., institutional challenges, especially energy pricing policy, and infrastructure constraints in the case of the ASEAN Power Grid (APG) and Trans-ASEAN Gas Pipeline (TAGP). There are four main findings. *First*, the exit strategy for energy subsidies has not been discussed in depth at ASEAN Ministers of Energy Meetings (AMEM). As a result, most of ASEAN members are still providing varying levels of energy subsidies. This condition conflicts with the ASEAN Energy Market Integration (AEMI) objectives because subsidies for fossil fuels not only cause over-consumption of such fuels but also reduce the incentives for investment in energy efficiency and renewable energy. *Second*, there is still high national resistance to conducting institutional reform of the energy market. For example in the case of Indonesia, removing fuel subsidy needs approval from the parliament. *Third*, APG can be well developed if each country does its best to (a) develop grid connections close to its borders, (b) harmonize technical standards, (c) minimize the environmental impact, and (d) reduce transmission and distribution loss. However, concern remains over the sustainability of power trading if a country cannot increase its national capacity. *Fourth*, while investing in pipelines is an important part of supporting the TAGP, it is also important to prepare a trading hub, promote a competitive natural gas market and develop the national network of gas infrastructure. The new focus of TAGP has also changed in order to provide more space for LNG trading and providing strategic buffer management of gas. AEMI has six major roles to play in measuring national constraints. First, AEMI can encourage countries to eliminate fossil fuel subsidies, thus ensuring that countries share the responsibility for promoting a more competitive and efficient energy market. Second, AEMI can prepare specific procedures or criteria to be followed before countries decide to provide energy subsidies. Third, AEMI can promote innovative financing that can promote infrastructure connectivity in the context of ASEAN+3. Fourth, AEMI can provide alternative solutions to allow more flexible ways of promoting energy trading. This is an important aspect of creating shortcuts in dealing with infrastructure constraints such as LNG trading, as proposed by the ASEAN Council on Petroleum (ASCOPE). Five, AEMI needs to promote and develop energy education in assessing the linkages between economies, energy and the environment. This can help to develop awareness of the need to measure national constraints such as subsidy, energy infrastructure, energy efficiency and conservation. Finally, as a part of energy education, and due to the fact that benefits and challenges of energy market integration will be distributed unequally across the ASEAN members, it will be necessary to bridge the gap in understanding the benefits of AEMI. Overall, the authors suggest developing an energy security framework for analyzing the correlation between national interest and AEMI interests. It is noted in this chapter that there are two possibilities for investigating the relationship between national constraints and regional objectives. If common interest at the national level is similar to that at the regional level, national constraints should disappear. However, if common interest at the national level conflicts with that at the regional level, national constraints will remain.

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A. Introduction

The ASEAN region is relatively rich in energy resources, although only a few countries are genuinely self-sufficient. Oil, gas, coal, hydro, geothermal and biomass resources are available in Indonesia. Malaysia and Thailand have oil, gas and coal reserves. Brunei Darussalam has quite large reserves of oil and gas. There are potential reserves of oil, gas and hydropower in Myanmar, while oil and hydropower resources are available in Cambodia. The Lao People's Democratic Republic has large hydro potential. Viet Nam has oil, gas, coal, hydro and biomass resources while the Philippines has oil, gas, coal, hydro and geothermal reserves. Singapore has no indigenous energy resources, but the country is very important as a major processing center for oil and petrochemical products, and oil bunkers.

Due to the variety in energy supply and demand conditions, energy cooperation in ASEAN was initiated in the 1970s when Thailand and the Lao PDR were adversely affected by the oil crisis in the 1970s. The ASEAN Council on Petroleum (ASCOPE) was established in 1975. In 1981, The Heads of ASEAN Power Utilities/Authorities (HAPUA) was established. Energy cooperation within ASEAN is challenged by its individual members' energy priorities, bilateral trade partners and development dynamics beyond the ASEAN borders. Indonesia delivers natural gas through a pipeline to Singapore and Malaysia. The Lao PDR supplies electricity to Cambodia, Thailand and Viet Nam, while Cambodia also imports electricity from Thailand and Viet Nam. A joint development area for energy resources development was earlier established between Malaysia and Thailand. ASEAN crude oil is sent to Singapore for refining and portions of the products are sent back to the producing countries.

Energy market integration (EMI) is characterized by the flow of trade and investment. Institutional dimensions and infrastructure connections determine the degree of market integration. Pursuing EMI is not only about economic decisions but also political decisions. Even energy sovereignty tends to be overlooked as compared to the economic objectives. For example, according to the Energy Law of the Republic of Indonesia No. 30, 2007, Part 7 deals with "International Cooperation". Article 10 states that "International cooperation in the energy sector can only be conducted to: (a) guarantee the nation's energy resilience; (b) guarantee the availability of domestic energy; and (c) improve the nation's economy. Further, the law also indicates that any international agreement in the field of energy that has wide-raging and fundamental impacts on people's lives associated with the state financial burden, and/or requiring the amendment of, or making laws, is subject to approval by the House of People's Representatives.[4]

After more than four decades of promoting energy cooperation progress has been made, but there are still abundant tasks that need to be completed. For example, ASEAN is still struggling with the regulatory framework for liquid natural gas (LNG) exports, harmonization of the regulatory framework and technical standards for the operation of the ASEAN Power Grid (APG).[5] Institutional reform such as liberalizing, privatization, deregulation and restructuring is still in progress. This indicates that there is still a challenge to harmonization of national interests and regional objectives. It is argued in this chapter that the key to success for the ASEAN Energy Market

4 According to Government Regulation of Indonesia No. 42, 2012, there are six criteria to be met before importing electricity: (a) local demand cannot be met (if the reserve capacity is less than 30 per cent of the peak load); (b) complementing local needs; (c) no negative impact on national interests such as sovereignty, security and economic development; (d) improvement of the quality of local supply; (e) development of national capacity should be given priority; and (f) the country will not be drawn into energy dependency. With regard to exporting, three criteria must be met: (a) local needs must have been fulfilled; (d) no provision of a subsidy in price; and (c) no impact on the quality of local supply. Thus, the criteria for importing are more complex than for exporting.

5 Joint Ministerial Statement of the thirtieth ASEAN Minister of Energy Meeting on 12 September 2012 in Phnom Penh, Cambodia.

Integration (AEMI) depends on individual efforts by each member country in following up and implementing their commitments. Thus, it is necessary to understand national constraints in terms of institutional and infrastructure challenges, in order to more easily establish AEMI.

B. Institutional challenge – pricing policy

The institutional dimension was discussed at the first meeting of the ASEAN Economic Ministers on Energy Cooperation in Bali in 1980. At that meeting, the framework for energy cooperation, comprising exchanges of information on policy planning, programming and financing, and the strengthening of institutional arrangements was considered by the delegations. The ASEAN members also agreed unanimously that they would need to create a more competitive and efficient energy sector in the region. ASEAN also needs its members to implement their commitments.

However, acceleration of institutional reform is moving slowly. For example, energy pricing reform policy is one of the determinant factors of how energy efficiency and the promotion of new and renewable energy resources can be achieved. Energy subsidies by ASEAN members are likely to be indirect as the Institute for Energy Research has shown. Developing countries provide indirect subsidies by artificially lowering energy prices and paying the difference from government resources. In contrast, the United States and other developed countries offer direct support to energy production in the form of tax credits, loan guarantees or use mandates (Institute for Energy Research, 2013). Beaton and others (2013) also noted that Governments in South-East Asia subsidize fuels to varying extents. For example, Indonesia subsidizes mostly petroleum products and electricity while Thailand subsidizes all energy types, Malaysia provides subsidies for all fuel types except coal and Viet Nam provides subsidies mostly to the electricity sector. The Philippines, however, has removed almost all energy subsidies but uses preferential taxation for some petroleum products.

Most of the ASEAN members still provide energy subsidies varying degrees; some even provide subsidies above world levels.[6] Tables 1 and 2 list pre-tax and post-tax subsidies for petroleum products, electricity, natural gas and coal as of 2011. Post-tax subsidies are higher than pre-tax subsidies.[7] Subsidies for petroleum products are higher than those for other energy commodities. In the case of pre-tax subsidy, Brunei Darussalam allocated 3.32 per cent of GDP for total energy price, while in Indonesia was about 3.24 per cent of GDP. However, in terms of government revenue, the Indonesian Government allocated the highest subsidy rate of about 18.2% of government revenue, while Thailand and Malaysia allocated about 9.59 per cent and 8.57 per cent, respectively. In the case of post-tax subsidies, Malaysia was the highest in terms of its share of government revenue.

6 IMF (2013) conducted a study that covered 19 countries with 22 case studies and 28 major subsidy reform episodes in sub-Sahara Africa, Asia, the Middle East, North Africa, Latin America, the Caribbean, Central and Eastern Europe and the CIS. Of the 28 reform episodes, 12 were classified as a success, 11 as a partial success, and five as unsuccessful. This indicates that not all subsidy reforms are successful. The IMF study found that subsidy reform (fuel) in Indonesia in 2008 was partially successful, while fuel and electricity subsidy reforms in the Philippines were successful.

7 The definition and terminology refer to IMF (2013). Pre-tax subsidy = PW – PC; PW = international price appropriately adjusted for transport and distribution costs; PC = the price paid by consumers. In the case of electricity, the benchmark price is taken as the cost recovery price (e.g., the cost of generation, transmission and distribution of electricity). Pre-tax subsidies only exist in countries where the price paid by consumers is below the international or cost recovery price. Post-tax subsidy = (PW + t*) – PC, t* = adjustment for efficient taxation (t*>0) to reflect revenue needs and a correction for negative consumption externalities. In the case of electricity, the benchmark price is taken as the cost recovery price (e.g., the cost of generation, transmission and distribution of electricity). When a refined petroleum product is imported, the benchmark price is taken as the international FOB price plus the cost of transporting the product to the country's border plus the cost of internal distribution. When the product is exported, the benchmark price is the international FOB price minus the cost of transporting the product abroad (since this cost is saved when the product is consumed domestically rather than exported) plus the cost of internal distribution.

Table 1. Pre-tax subsidies for petroleum products, electricity, natural gas, and coal in 2011

Country	Petroleum products		Electricity		Natural gas		Coal	
	Percentage of GDP	Percentage of Gov. revenue	Percentage of GDP	Percentage of Gov. revenue	Percentage of GDP	Percentage of Gov. revenue	Percentage of GDP	Percentage of Gov. revenue
Brunei Darussalam	2.34	3.77	0.98	1.57	0.00	0.00	0.00	0.00
Cambodia	0.00	0.00	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Indonesia	2.58	14.51	0.66	3.69	0.00	0.00	0.00	0.00
Lao PDR	0.00	0.00	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Malaysia	1.24	5.67	0.33	1.49	0.31	1.41	0.00	0.00
Myanmar	0.54	9.35	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Philippines	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Thailand	0.15	0.66	1.64	7.24	0.14	0.61	0.25	1.08
World	0.30	0.91	0.22	0.64	0.16	0.48	0.01	0.03

Source: IMF, 2013.

able 2. Post-tax subsidies for petroleum products, electricity, natural gas, and coal in 2011

Country	Petroleum products		Electricity		Natural gas		Coal	
	Percentage of GDP	Percentage of Gov. revenue	Percentage of GDP	Percentage of Gov. revenue	Percentage of GDP	Percentage of Gov. revenue	Percentage of GDP	Percentage of Gov. revenue
Brunei Darussalam	5.92	9.51	1.37	2.19	1.12	1.81	0.00	0.00
Cambodia	0.00	0.00	n.a.	n.a.	n.a.	n.a.	0.00	0.01
Indonesia	3.87	21.74	0.72	4.04	0.30	1.67	0.47	2.62
Lao PDR	0.00	0.00	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Malaysia	5.12	23.39	0.56	2.54	0.79	3.36	0.74	3.38
Myanmar	0.97	16.93	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Philippines	0.20	1.18	0.00	0.00	0.08	0.43	0.46	2.65
Thailand	1.40	6.16	1.76	7.77	0.72	3.19	0.84	3.73
World	1.26	3.77	0.26	0.77	0.43	1.28	0.77	2.31

Source: IMF, 2013.

Subsidies on fossil fuels not only cause over-consumption of such fuels, they also reduce the incentives for investment in energy efficiency and renewable energy. On the other hand, ASEAN members also agreed to reduce energy intensity at least by 8 per cent by 2015 based on the 2005 level and to achieve a collective target of 15 per cent of renewable energy in the total regional power installed capacity by 2015.[8] This reflects a contradiction between the regional objectives and the national behavior.

When there are no pricing mechanisms for the negative externalities of energy consumption on the environment, public health and traffic congestion, the presence of subsidies exacerbate these externalities by promoting over-consumption due to the artificially low prices. Energy subsidies also put pressure on the fiscal space of Governments as these subsidies represent government revenues that are foregone and could have been made available for social services. Moreover, the volatility of international fossil fuel prices also translates into volatility in subsidies, thereby complicating budget management.

The intention of developing country Governments to offer subsidies is often good for improving overall social welfare by making energy more affordable by the poor.[9] However, the Asian Development Bank (ADB, 2013) argued that this was not happening, given that many of the poor in Asia lack electricity and gas connections, few own vehicles, and most of them use transport sparingly. Therefore, the main beneficiaries of the subsidies are not really the poor. Citing IEA data, a report by ADB (2013) stated that of the nine Asian countries and two African countries surveyed by IEA in 2011, only 15 per cent of the benefit from kerosene subsidies and only 5 per cent of the benefit from liquefied petroleum gas subsidies went to the poorest 20th percentile.

Similarly, IMF (2013) found that energy subsidies depressed growth in four ways. First, subsidies can discourage investment in the energy sector. Second, subsidies can crowd out growth because they can reduce fiscal space that can be used for public health and education, and other productive public spending. Third, subsidies diminish the competitiveness of the private sector over the longer term. Fourth, subsidies create incentives for smuggling. The same IMF report also indicated the implications of energy subsidies in other dimensions. First, the balance of payments of energy-importing countries is vulnerable to international energy price. Second, subsidies can cause over-consumption of energy, which can negatively affect the environment such as through global warming and local pollution. Third, energy subsidies mostly benefit the rich and will also divert public spending from the poor.

IMF (2013) identified six barriers faced by energy reforms: (a) a lack of information regarding the magnitude and shortcomings of subsidies; (b) a lack of government credibility and administrative capacity; (c) concern regarding the adverse impact on the poor; (d) concern regarding the adverse impact on inflation, international competitiveness and volatility of domestic energy prices; (e) opposition from specific interest groups that benefit from the status quo; and (f) weak macroeconomic conditions. However there are five elements that can

8 Joint ministerial statement of the twenty-seventh ASEAN Ministers of Energy Meeting on 29 July 2009 in Mandalay, Myanmar.

9 In the case of Indonesia, the Energy Law stated that "energy prices shall be determined on the basis of a fair economic value". The Energy Law also stated that "government and regional government shall provide subsidy funding for less wealthy community groups". However, the Government of Indonesia is still providing an energy subsidy; because it is an open subsidy, both the poor and the people enjoy the benefit. This indicates that reducing energy subsidies is always a hard decision.

increase the likelihood of successful subsidy reform (IMF, 2013): (a) a comprehensive reform plan; (b) a far-reaching communications strategy, aided by improvements in transparency; (c) appropriately phased energy price increases, which can be sequenced differently across energy products; (d) targeted mitigation measures for protecting the poor; and (e) depoliticizing energy pricing to avoid the recurrence of subsidies.

The IMF (2013) study illustrated the impact of subsidies on global warming and local pollution by estimating the effects of raising energy prices to levels that would eliminate tax-inclusive subsidies for petroleum products, natural gas and coal. The study noted that by eliminating the subsidies, CO_2 emissions could be reduced by 4.5 billion tons, representing a 13 per cent decrease in global CO_2 emissions. Moreover, the results suggest a reduction in local pollution in the form of 10 million tons of SO_2 emissions and a 13 per cent reduction in other local pollutants, which implies that significant health benefits could be generated at the local level.

Energy subsidy reforms can be pursued at different rates, depending on country-specific factors. As suggested by Beaton and others (2013), the framework for the rate can be referenced using two extremes – the "gradual" rate or the "big bang" approach. The latter approach is defined as a reform that literally produces a significant shock to the economy and the citizens of the country concerned; an extreme example would be the elimination overnight of all energy subsidies. A comparison of these two approaches is given in table 3.

In reality, reforms seldom adhere to either of these extremes, but instead are likely to tend towards one approach more than the other. For example, the subsidy reforms in Eastern Europe following the collapse of the Soviet Union tended towards the “big bang” approach. Beaton and others (2013) reported that a quick withdrawal of subsidies and a fast move to market-based pricing were instituted in Eastern European countries through several rounds of significant price hikes. This type of reform was politically feasible because it was part of much bigger political and economic transformations.

The fossil-fuel subsidy reform in the Philippines, on the other hand, tended towards a gradual approach, although there was one significant drastic step. Previously, the Philippines had an Oil Price Stabilization Fund (OPSF), which was created in 1984 as a measure to protect domestic consumers from debilitating global oil price shocks, such as that which occurred happened in the 1970s. In 1996, the Philippines launched a partial deregulation of the downstream oil industry and introduced a regulator-approved, automatic pricing mechanism that operated concurrently with the continued OPSF operation. In 1998, with the passage of the Downstream Oil Industry Deregulation Act, both OPSF and the automatic pricing mechanism were abolished; this was a significant and drastic step but one that was guided by transition pricing for a few months before prices were fully floated.

Table 3. Comparison of gradual and "big bang" approaches

Performance criteria	Gradual	"Big bang"
Macroeconomic		
Reduction of costs	Gradual	Instantaneous
Impact on inflation and GDP	Low with each price increase, but risk of creating long-term expectations of inflation – "anticipatory inflation."	High, but over a short period.
Microeconomic and social		
Negative social impacts on households and businesses	Low to moderate. Easy to manage by adapting reform plan. Households and businesses have longer to adjust.	High. May lack capacity to promptly change reform strategy. No time for households and businesses to adjust.
Political		
Added risk of political instability	Low, but gives opposition time to organize against reforms.	High.
Use of political capital	High. Each price increase requires political capital. Increases risk of deferrals.	Medium. Only one price increase. but at the cost of a large economic shock.
Administrative		
Added risk of poorly designed reform strategy	Low to moderate. Actual impacts can feed into subsequent plans	High. It is difficult to predict the impact of large economic shocks.
Added risk of poor implementation	Low. Allows for ongoing adjustment of reform strategy.	High. Requires very good projections of impacts and preparations.
Energy markets		
Reduced energy demand	Gradual	Instantaneous
Added risk of hoarding	High. Varies if schedule of price increases is known in advance.	Low. Varies if date of price increase is known in advance.

Source: Beaton and others, 2013.

C. Infrastructure constraints

During the twenty-seventh ASEAN Energy Ministers Meeting held in Myanmar, the ASEAN Plan of Action for Energy Cooperation (APAEC) 2010-2015 was approved with the main content: APG; TAGP; Coal and Clean Coal Technology (CCCT); Energy Efficiency and Conservation (EE&C); renewable energy (RE); regional energy policy and planning (REPP); and civilian nuclear energy (NEC). There are seven working groups within the framework of APAEC, including: ASCOPE; ASEAN Power Utilities/Authorities (HAPUA); ASEAN Forum on Coal (AFOC); Energy Efficiency and Conservation Sub-Sector Network (EE&CSSN); Renewable Energy Sub-Sector Network (RE-SSN); Regional Energy Policy and Planning Subsector Network (REPP-SSN); and the Nuclear Energy Cooperation Sub-Sector Network (NEC SSN).

However, from concept to reality is long journey that is beset by difficulties, constraints and challenges. The development of TAGP, APG and other energy cooperation projects, however, has been quite slow, due to financial constraints, technical difficulties and differences in industry regulatory frameworks among ASEAN members as well as other factors.

1. ASEAN Power Grid

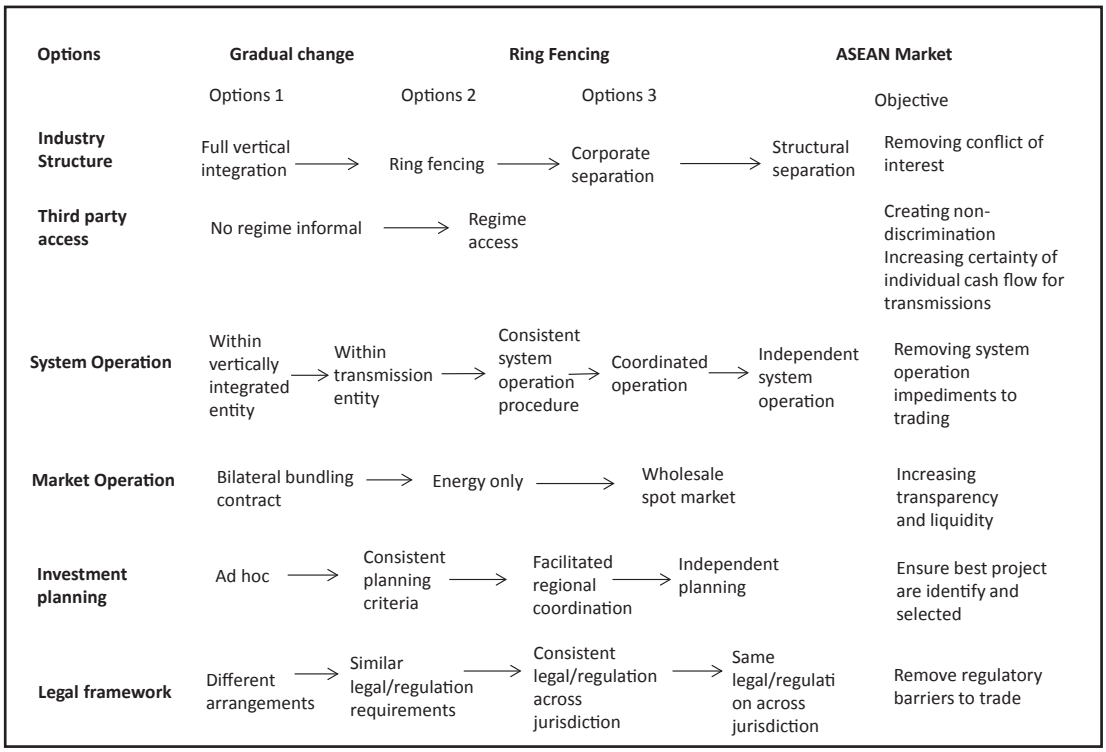
Although the idea of power network interconnection has been developing since 1978, it was approved by ASEAN Governments in 1997 in the "ASEAN vision 2020". The aim is to set up an energy security system for the ASEAN region through a common power network, based on that the members can share the ability of supply, transmission. Therefore, the lack of electricity supply in one member can be fulfilled by the other members through electricity trading. The interconnection among the 10 countries in ASEAN will bring huge economic efficiency both for investors and for users. It will also promote the development of the power market and investments, and ensure energy security for each country. It will play an important role in the process of meeting high energy demand during ASEAN modernization, as the primary energy demand of the region is expected to increase approximately threefold from 2005 to 2030.

However, Bannister and others (2008) pointed out the existence of five barriers to the energy market integration in electricity sector: (a) management of risks and security; (b) the need to recognize the fact that financial impacts may differ from economic benefit cost analysis; (c) the need to clarify and agree on the scope of APG trade; (d) competitiveness, and open access and pricing; (e) rules and procedures for trade. Similarly, Porter and Situmeang (2005) pointed out that at the national level there was no transparent information regarding the price of energy (generating), transmission and distribution. They noted that as a result, the risk facing transmission and generating decisions were relatively high.

Further investigation of the policy options from gradual change to the ASEAN market (figure 1) reveals several constraints that need to be measured at the national level. Option 1 requires a gradual change for unbundling the sector such as generating, transmissions, and distribution. Further, the development of independent regulatory and legal frameworks is necessary for each country. In option 2 (ring fencing changes), a transmission working group can be established for each country and collaboration among them enhanced. Coordinated planning and investment need to be promoted at this stage.

Finally, the long-term objective (APG) can be established. In this situation, transmission and generating cost is separated, groups of transmission operators are created, and a uniform regulatory and legal framework is implemented. There are three types of cross-border interconnections: (a) point-to-point interconnections; (b) limited network-to-network; and (c) full system interconnection. Point-to-point interconnection can be implemented with option 1 (figure 1). Option 2 reflects a limited network-to-network interconnection. Finally, full system interconnection represents AEMI.

Figure 1. Electricity – the dynamics of an evolutionary change process



Source: Porter and Situmeang, 2005.

Equipment for transporting and delivering gas, electricity and other energy supplies from one country to another is similar to commodity trading, and will be subject to national, regional and/or international regulations. These could be pipeline permits, territorial boundaries, other licenses, taxation, quality standards, environmental regulations etc. Each country has its own power market tariff system that is different from that of other countries. In addition, the differences in technical standards of power systems are also a barrier. In fact, the power grid of each ASEAN country is much different, while the power transmission of ASEAN 6 is better than ASEAN 4, which is less developed and unstable.

For a cross-border power project, technical standards are essential during both construction and operation if operational integrity is to be maintained. Differences in standards and procedures may contribute to unreliability of interconnected power grids. For example, unstable voltage levels, frequent power outages and a non-guaranteed power level at 220kV could seriously affect the overall power grid. Further, although electric power transmissions and distribution losses in some ASEAN members tended to decrease between 2000 and 2010, in most of the countries the losses were still above the Organisation for Economic Co-operation and Development (OECD) standard (table 4). Therefore, at the national level, each country needs to improve efficiency and promote investment in transmission and distribution to minimize the losses.

Table 4. Electric power transmission and distribution losses (percentage of output)

Country	2000	2010
Brunei Darussalam	1.14	9.53
Cambodia	11.16	28.77
Indonesia	11.51	9.40
Lao PDR	n.a.	n.a.
Malaysia	8.00	6.54
Myanmar	31.30	16.61
Philippines	14.01	11.52
Singapore	3.64	7.05
Thailand	7.91	6.34
Viet Nam	13.77	10.11
High income: OECD	6.81	5.86

Source: World Development Indicators, World Bank.

There is a need for investment in infrastructure development and technical capacity enhancement. However, in order to promote energy market integration (EMI), it will be necessary to introduce competition in the domestic energy markets. Such an approach often requires the restructuring of vertically integrated energy utilities into separate functional companies. However, the monopoly status of the national energy companies in most of the ASEAN members is a major obstacle to attracting private investment and foreign direct investment in energy infrastructure development in the region (see box 1).

Box 1. Changes in the Electricity Law of Indonesia

In 2002, the Government of Indonesia issued a new law for the electricity sector. The aim of Electricity Law No. 20/2002 was to create a more competitive environment for the power-generating business in the short term and, in the future, in the selling area. Thus consumers would have many options from which to select electricity suppliers who could provide electricity with good quality and services. Based on Electricity Law No. 20/2002, competition and transparency would improve efficiency in the electricity industry. Thus, there was a need to provide equal opportunity for all parties to participate in providing electricity utilities. Supporting electricity utilities means any activities that are related to consultation, development and installation, testing, operation, research and development, education and training, and any activity that is directly related to electricity.

However, on 15 December 2004, Electricity Law No. 20/2002 was canceled by the Constitutional Court because it was in violation of the Constitution. Electricity is a very important and strategic sector with regard to achieving national goals; thus, the Court argued, it should be controlled by the State and cannot be liberalized. As a result, electricity was regulated again by Electricity Law No. 15/1985. On 16 January 2005, Government Regulation No. 3/2005 was issued to replace Government Regulation No. 10/1989. Generally speaking, there are two reasons why the Government issued Government Regulation No. 3/2005. First, Government Regulation No. 10/1989 was based on Electricity Law No. 15/1985, which was highly centralized. On the other hand, in 2004 the Government issued Law No. 32/2004 on local government. Thus, there is a demand for decentralizing electricity authority to local governments. Second, the Government needs to enhance the participation of cooperatives, state-owned enterprises, local government-owned enterprises and the private sector to supply electricity.

Source: Sambodo, 2012.

A typical example of bilateral and regional cooperation in ASEAN in the field energy is grid connection among Greater Mekong Subregion (GMS) countries. In 2000, with the support of ADB (2000),[10] the Master Plan on Power Interconnection was developed for 2000 to 2020 and then adjusted in 2010 within the framework of the Technical Assistance Project TA 6440-REG (ADB, 2007).[11] The proposal to develop power trade in the GMS is anchored on the principle that integration should proceed in four well-defined stages: (a) bilateral cross-border connections through power purchase agreements (PPAs); (b) grid-to-grid power trading between any pair of GMS countries, eventually using transmission facilities of a third GMS country; (c) development of transmission links dedicated to cross-border trading; and (d) when most of the GMS countries have moved to multiple sellers-buyers regulatory frameworks, a wholly competitive regional market can be implemented. The grid connection process among the GMS countries is promoted by high-demand countries such as Thailand and Viet Nam through investment projects of building power plants (mainly hydropower exploitation) together with the power purchase agreement among the countries. The investment project is being implemented in phases up to 2020.

10 Technical Assistance for the Regional Indicative Master Plan on Power Interconnection in the Greater Mekong Subregion. Manila (TA 5920-REG, US$ 900,000, approved on 10 July 2000, and financed by the TA Special Fund and the Government of Norway).

11 Technical Assistance for Facilitating Regional Power Trading and Environmentally Sustainable Development of Electricity Infrastructure in the Greater Mekong Subregion. Manila (TA 6440-REG, US$ 5 million, approved on 19 December 2007, and financed by the Government of Sweden). A small component of the Technical Assistance for GMS Regional Power Trade Coordination and Development (TA 6304-REG) also undertook some simulations to update the regional indicative master plan.

Table 5. Investment projects in GMS

Project	Location	Market	Type	Capacity (MW)	Completion Date
Xekaman3 (IPP)	Lao PDR	Lao PDR/Viet Nam	Hydro	250	2012
Theun-Hinboun Expansion (IPP)	Lao PDR	Lao PDR/Thailand	Hydro	220+60	2012
Xekaman 1 (IPP)	Lao PDR	Lao PDR/Viet Nam	Hydro	322	2014
Sekong 3	Lao PDR	Lao PDR/Viet Nam	Hydro	205	2015
Xekaman 4	Lao PDR	Viet Nam	Hydro	80	2016
Hongsa Liginte (IPP)	Lao PDR	Lao PDR/ Thailand	Coal	1.878	2015
Nam Ngum 3 (IPP)	Lao PDR	Lao PDR/ Thailand	Hydro	460	2017

Source: ADB, 2012.

Note: IPP = independent power producer, MW = megawatt.

However, some obstacles exist in the negotiation process for establishing cooperation among a few countries in the ASEAN region, e.g., the border conflict between Thailand and Cambodia, and the debate between Cambodia, the Lao PDR, Thailand and Viet Nam over the construction of Xayaburi hydropower dam in the context of the impact of hydroelectric dams on the lower Mekong River environment (Lee, 2010). Similarly, Hebertson (2012) pointed out that developing the lower Mekong River dams would involve significant social, economic and environmental costs. Development of the Xayaburi Dam has created two opposing opinions, i.e., the Lao PDR and Thailand are pro-dam while Cambodia and Viet Nam are against the project. Further, Hebertson (2012) pointed out three lessons to be learnt from the Xayaburi project. First, energy planning should not take place behind closed doors. Second, strategic environmental assessments should become a regular part of energy planning. Third, when somone says that hydropower is "renewable" be sure to ask more questions. These conflicts will delay the whole process of forming the APG.

This study found that sustainability of power trading will become a challenge in the future. It appears that power trading has occurred due to lack in power supply; however, if a country can increase its electricity production, power trading may decrease in the future (see box 2). This may waste investment fund that has been allocated by one country. This condition needs to be discussed seriously among the member, especially when industrial, commercial zones tend to develop in the future. Fair competition among the power companies in the countries also need to be promoted.

Box 2. Indonesian-Malaysian interconnection[12]

According to PT.PLN's business plan for 2009-2018, in the area of Kalimantan it plans to buy (import) electricity from SESCo. An interconnection between Sarawak and West Kalimantan will be constructed with transmission at 275 kV. The transmission is designed to supply electricity at a capacity of 200 MW. SESCo is connected with Benkayan's system in Indonesia and Mambong in Sarawak-Malaysia. Indonesia will be responsible for constructing a 180-km transmission line between Benkayan and Malaysia's cross-border and inter-bus transformer at 250 MVA. Power trading or energy exchange will start in 2015. From the Indonesian perspective, there are two benefits to be gained from power trading. First, it can support the steam coal (peat steam) Pontianak 1 project, if the project is delayed due to environmental constraints. Second, power trading can increase power reserves, which is important to improving the energy security system. Furthermore, Indonesia can sell electricity to SESCo. Electricity trading will be promoted under the independent power producer (IPP) scheme. The document indicates that power trading will start with a 50 MW capacity from 2015 until 2018. As the following table shows, West Kalimantan will buy about 34 per cent of the total electricity balance from SESCo. However, the share will decrease to below 10 per cent between 2019 and 2021.

Energy balance in West Kalimantan (GWh)

Year	PT.PLN	SESCo	Total	Share of SESCO in total (%)
2012	1,374	0	1,374	0
2013	1,725	0	1,725	0
2014	1,993	0	1,993	0
2015	1,443	733	2,176	34
2016	1,798	727	2,525	29
2017	1,970	737	2,707	27
2018	2,141	738	2,879	26
2019	2,833	227	3,060	7
2020	3,162	142	3,304	4
2021	3,250	317	3,567	9

Source: PT.PLN, 2012.

2. Trans-ASEAN Gas Pipeline

The implementation of TAGP also remains constrained by regional and national conditions. IEA (2013) raised two main issues that need to be addressed at the regional level. First, there is a lack of a trading hub to facilitate the exchange of natural gas; Singapore appears to be the candidate best suited to develop not only a trading hub in the medium term but also a competitive natural gas market. Second, there is a need to develop a transparent price signal

12 Sambodo, M. T. (2013), 'Facilitating the Penetration of Renewable Energy into the Power System' in Kimura, S., H. Phoumin and B. Jacobs (eds.), *Energy Market Integration in East Asia: Renewable Energy and its Deployment into the Power System*, ERIA Research Project Report 2012-26, Jakarta: ERIA. pp.195-225.

to steer investment in natural gas infrastructures. According to IDA (2013), the offshore East-Natuna natural gas field is a critical factor of TAGP, but it has a very high CO_2 content. This has driven up the cost of developing the resource and consequently pushed back the start-up date (IEA, 2013).

The bilateral connection has been established such as among Malaysia, Thailand and Singapore (table 6). Singapore is also connected with Indonesia. Malaysia has been connected with Thailand and Thailand is also connected with Viet Nam. Thailand technically has become connected with Myanmar and, in 2013, Myanmar will be connected with China. There are two main challenges that need to be addressed: (i) an improvement of the transit capacity, and (b) promotion of LNG re-gasification terminals while waiting for pipeline distribution to materialize (IEA, 2013). In addition, IEA (2013) suggest two market models for promoting more competitive pipeline infrastructure: (a) the pipeline-to-pipeline competition model, and (b) mandatory third-party access to the network model.[13]

At the national level, constructing the national pipeline infrastructure for the domestic market is still a problem. Thus it is relevant to argue that negotiations on AEMI need to be started by solving the infrastructure bottleneck at the national level. Promoting a regional pipeline and forgetting the national pipeline will become a political economic challenge in the medium term. It is important to maintain a balance between the regional pipeline target and national pipeline targets. It is important that Governments allow markets to determine natural gas prices with minimal interference from short-term political considerations. It is also important to separate transportation activities from commercial activities, price deregulation at the wholesale level, sufficient network capacity and non-discriminatory access, and a competitive number of market participants with the involvement of financial institution.

Table 6. Intra- and interregional pipeline(s) in Asia Pacific

Intraregional	Pipeline	Operational (year)	Capacity (bcm/yr)
Myanmar-China	Myanmar-China Pipeline	2013	12.0
Myanmar-Thailand	Yadana-Export Pipeline	1998	5.4
	Yetagun-Export Pipeline	2000	2.0
Thailand-Vietnam	PM3-Ca Mau Pipeline	2007	2.0
Thailand-Malaysia	Trans-Thailand-Malaysia Gas Pipeline (TTM)	2005	7.7
Malaysia-Singapore	Peninsular Gas Utilisation Pipeline System (PGU)	1991	1.5
	Peninsular Gas Utilisation Pipeline System (PGU)	2007	1.1
Indonesia-Singapore	West-Natuna Transportation System	2001	3.4
	Grissik-Singapore Pipeline	2003	3.6

Source: IEA, 2013.

Following ASCOPE (2011), the strategic focus of TGAP has been expanded. Although the aspiration is still the same on energy security, in terms of strategic focus and enablers it has changed. For example, in the case of strategic focus, instead of constructing pipelines to move gas supply to meet demand, developing LNG terminals is promoted for developing

13 In the case of the pipeline model, competition is organized between suppliers who build the infrastructure to deliver to customers (IEA, 2013). In the second model, a distinction can be made between a market with wholesale competition and a market with full retail competition; in the latter case, competition is introduced into the final part of the value chain, while wholesale competition stops short of the retail segment (IEA, 2013).

LNG trading. ASCOPE (2011) also suggested collaboration in two key initiatives to assure regional gas supply security, i.e., the strategic gas buffer management and LNG cooperation. A strategic gas buffer management aims to assist the countries during the crisis time. Thus it can secure top level commitment from ASEAN leaders. In the case of LNG cooperation, an MoU between member countries is required to outline requirements for implementation of LNG cooperation, especially in the commercial and technical areas (ASCOPE, 2011). Thus, if the current focus and proposed new focus of TGAP are compared, two important elements can be seen (ASCOPE, 2011). First, due to slow progress in pipeline construction, flexibility in the means of trading is created. LNG trading is promoted to ensure energy security. Second, there are three consequences that need to be prepared: (a) regulatory framework on piped gas and LNG terminals; (b) a commercial framework; and (c) technical collaboration.

D. The way forward

The third ASEAN Energy Outlook indicates three major findings: (a) the degree of dependency on fossil fuels, and especially oil, tends to increase; (b) the region has become a net importer of oil; and (c) use of coal is increasing. In response to energy supply security and global environmental stability, the outlook offers promoting clean coal technology, improving energy efficiency, developing renewable and alternative energy, improving energy investment climate, and sharing best practices. However, an exit strategy on fossil fuel subsidy is still missing, even if that fact has not been clearly mentioned in joint press statements by ministers at energy meetings. The majority of ASEAN members implement pre-tax and post-tax subsidies above the world average. ASEAN appears keep this issue at the national level, but it will have a huge impact on the regional level. Although energy cooperation was established in the 1970s, price distortion is one of the reasons why progress has been very slow. AEMI can encourage countries to eliminate fossil fuel subsidies. This will indicate that countries share responsibility in promoting a more competitive and efficient energy market.

The nature of EMI requires several conditions. Kimura and Shi (2010) pointed out two elements: (a) improvement of domestic energy access and usage efficiency in developing countries; and (b) encouragement of the free flow of foreign direct investment to the energy sector. Sheng and Shi (2013) argued that eliminating obstacles and monopolies in domestic energy markets appeared to be a more important factor in contributing to the ability of poor countries to catch up with rich countries. Thus, energy price reform needs to be done simultaneously with energy market integration. There are two options for dealing with market reform – the "gradual" rate or the "big bang" approach. The key point to choosing the right reform is to understand the nature, conditions and assumptions of the two approaches. Therefore, AEMI could prepare specified procedures or criteria before countries decide to provide energy subsidies.

The Asian economic crisis in 1997/1998 had substantial impacts on joint collaborative efforts in the energy sector, particularly with regard to TAGP and APG. Due to financial difficulties, there has been no substantial investment at the national level. ASEAN as a region and its individual members need to establish a reserve fund for infrastructure connections. Electricity companies such as PT.PLN in Indonesia have three major sources of funding for new power investments, i.e., state budgets, PT.PLN's self-financing, and other funding obtained from issuing obligations (bonds), multilateral loans such as those from IBRD and ADB, or bilateral loans from JICA, AFD and China. In addition, ASEAN also provides financing modalities such as the ASEAN infrastructure financing mechanism. PT.PLN has utilized green funding from the Clean Development Mechanism and Voluntary Carbon Mechanism.

Innovative financing needs to be promoted for infrastructure connectivity, and ASEAN+3 can provide more resources for investment. The rationality of ASEAN+3 needs to be expanded not only for managing high energy prices and for addressing several issues – energy security, the oil market, oil stockpiling, natural gas, renewable energy, energy efficiency and conservation – but also on how to assist the ASEAN countries in promoting cross-border investments.

ASEAN has established channels to harmonize regulatory practices and technical standards, such as the ASEAN Energy Regulators Network, to support APG (collaboration with ADB as well as UNEP) as well as a common regional framework to facilitate more oil and gas trading and marketing within the region.[14] ASCOPE also follows the LNG export regulatory framework of the United States.[15] The ASEAN-Russia Energy Cooperation Work Programme (2010-2015) focuses on three areas such as capacity-building programmes, the peaceful use of nuclear energy, and coal, oil and gas exploration.[16] These types of collaboration need to be promoted in the future.

It is important for AEMI to be able to measure the financial constraints, technical difficulties and differences in the industry regulatory frameworks among ASEAN members. It is also important that AEMI be able to improve the level of efficiency in providing electricity, such as the reduction of transmission and distribution losses. Thus, it will be possible to reduce the efficiency gap among ASEAN members. Enhancing energy market competition at the national level can provide positive feedback in accelerating energy market integration. Further, it is also important that in promoting EMI the environment will not be harmed. Thus nature and human life will receive positive feedback (Lee, 2010). Promoting green energy in the context of AEMI needs support from developed countries. AEMI, in the context of ASEAN+3, also needs to develop the technological capability of all ASEAN members. The institutional setting to smooth market reform also needs to be shared.

Finally, it is suggested that an energy security analysis can provide a framework for analyzing the relationship between national constraint and regional objectives. Three scenarios or policies can be prepared, such as: (a) considering only national efforts, and a combination of the national and regional levels; (b) an analysis of how AEMI can change the direction of the energy security indicator at the national level; and (c) developing the Sovacool (2012) framework. As shown in table 7, energy security covers the five elements of availability, affordability, technology development and efficiency, environmental sustainability, and regulation and governance. This framework can be developed as an outline for energy education, which will become the key element in providing an energy knowledge bridge between current and future generations. Promoting energy education can create a better understanding in mapping out the linkages among the economic, energy and environmental aspects.

14 Joint ministerial statement of the twenty-ninth ASEAN Ministers of Energy Meeting on 20 September 2011 in Jerudong, Brunei Darussalam.

15 ASEAN also promotes energy efficiency through education in collaboration with the United States.

16 Joint media statement of the twenty-eighth ASEAN Ministers of Energy Meeting on 23 July 2010 in Da Lat, Viet Nam.

Table 7. Energy security dimensions and components

No.	Dimension	Component	Metric	Unit
1	Availability	Security supply	Total primary energy supply per capita	BOE per capita
2		Production	Average reserve to production ratio for the three primary energy fuels (coal, natural gas and oil)	Remaining years of production
3		Dependency	Self-sufficiency	Percentage of energy demand by domestic production
4		Diversification	Share of renewable energy in total primary energy supply	Percentage of supply
5	Affordability	Stability	Stability of electricity price	Percentage of change
6		Access	Percentage of population with high quality connections to the electricity grid	Percentage of electrification
7		Equity	Households dependent on traditional fuels	Percentage of population using solid fuel
8		Affordability	Retail price of petrol	Average price in US$ PPP for 100 liter of regular gasoline/ petrol
9	Technology development and efficiency	Innovation and research	Research intensity	Percentage of government expenditures on research and development compared to all expenditures
10		Energy efficiency	Energy intensity	Energy consumption per dollar of GDP

Table 7. Energy security dimensions and components *(continued)*

No.	Dimension	Component	Metric	Unit
11	Technology development and efficiency	Safety and reliability	Grid efficiency	Percentage of electricity transmissions and distribution losses
12		Resilience	Energy resources and stockpiles	Years of energy reserves left
13	Environmental sustainability	Land use	Forest cover	Forest area as a percentage of land area
14		Water	Water availability	Percentage of population with access to improved water
15		Climate change	Per capita energy-related carbon dioxide emissions	Metric tons of CO_2 per person
16		Pollution	Per capita sulfur dioxide emissions	Metric tons of SO_2 per person
17	Regulation and governance	Governance	Worldwide governance rating	Worldwide governance score
18		Trade and connectivity	Energy export	Annual value of energy exports in 2009 US$ PPP – (billion)
19		Competition	Per capita energy subsidies	Cost of energy subsidies per person (2009 US$ PPP)
20		Information	Quality of energy information	Percentage of data complete

Source: Sovacool, 2012.

References

ASCOPE (2011). "Trans ASEAN Pipeline Task Force: Redefining the region's cooperation on energy security", TAGP Task Force. Indonesia.

ADB (2013). *Asian Development Outlook 2013: Asia's Energy Challenge*. Asian Development Bank. Manila.

——— (2012). *Greater Mekong Subregion power trade and interconnection: Two decades of cooperation*. Asian Development Bank, Manila.

——— (2007). "Technical assistance for facilitating regional power trading and environmentally sustainable development of electricity infrastructure in the Greater Mekong Subregion", TA 6440-REG and TA 6304-REG. Asian Development Bank, Manila.

——— (2000). "Technical assistance for the Regional Indicative Master Plan on Power Interconnection in the Greater Mekong Subregion", TA 5920-REG. Asian Development Bank, Manila.

Bannister, H., G. McDonnel, S. Thorncraft, X. Hu, B. Whitlock and C. Malik (2008). *Energy Market Integration in the East Asia Summit Region*. Available at http://zap3d.com:82/portals/0/images/pdf/ECTF%20%E2%80%93%20Energy%20Market%20Integration%20in%20the%20East%20Asia%20Summit%20Region.pdf (accessed 5 January 2013).

Beaton, C., I. Gerasimchuk, T. Laan, K. Lang, D. Vis-Dunbar and P. Wooders (2013). *A Guidebook to Fossil-Fuel Subsidy Reform for Policy-Makers in Southeast Asia*. International Institute for Sustainable Development, Geneva.

Hebertson, K. (2012). "Water conflict in the Mekong: Lessons from the Xayaburi controversy", *ESI Bulletin on Energy Trends and Development*, vol. 5, No.3.

IMF (2013). *Energy Subsidy Reform: Lessons and Implications*. International Monetary Fund, Washington, D.C.

Institute for Energy Research (2013). "Developing countries subsidize fossil fuels, artificially lowering prices". Available at www.instituteforenergyresearch.org/2013/01/03/developing-countries-subsidize-fossil-fuel-consumption-creating-artificially-lower-prices/ (accessed 12 July 2013).

IEA(2011). Energy for All: Financing Access for the Poor. International Energy Agency, Organisation for Economic Co-operation and Development. Available at http://www.worldenergyoutlook.org/media/weowebsite/2011/weo2011_energy_for_ all.pdf (accessed 12 July 2013).

IEA (2013). Developing a Natural Gas Trading Hub: Obstacles and Opportunities in Asia. International Energy Agency, OECD-IEA. Available at http://www.iea.org/media/freepublications/AsianGasHub_WEB.pdf (accessed 12 July 2013).

Kimura, F. and X. Shi (2010). *Energy Market Integration in the East Asia Summit Region: Review of Initiatives and Estimation of Benefit*, ERIA Research Project Report 2009-13. Available at

www.eria.org/publications/research_project_reports/energy-market-integration-in-the-east-asia-summit-region-review-of-initiatives-and-estimation-of-ben.html (accessed 6 October 2012).

Lee, J. (2010). *Green Growth Korean Initiative for Green Civilization*, Random House Korea Inc., Seoul.

Porter, M. and H. Situmeang (2005). "Preparing for Electricity Trading in ASEAN", REPSF Project No. 03/002.

PT. PLN (Persero) (2012). *Rencana Usaha Penyediaan Tenaga Listrik PT. PLN (Persero) 2012 – 2021* (PT. PLN Business Plan for Electricity Utility 2012-2021). Jakarta.

Sambodo, M.T. (2012). "Mathematical modeling analyses for investigating the future expansion of the electric power system in Indonesia" (unpublished doctoral dissertation). National Graduate Institute for Policy Studies, Tokyo.

Sambodo, M. T. (2013). 'Facilitating the Penetration of Renewable Energy into the Power System' in Kimura, S., H. Phoumin and B. Jacobs (eds.), *Energy Market Integration in East Asia: Renewable Energy and its Deployment into the Power System*, ERIA Research Project Report 2012-26, Jakarta: ERIA. pp.195-225.

Sovacool, B. K. (2012). "The methodological challenges of creating a comprehensive Energy Security Index", *Energy Policy*, vol. 48; pp. 835-840.

Sheng, Y. and X. Shi (2013). "Energy market integration and equitable growth across countries", *Applied Energy*, vol. 104; pp. 319-325.

V. Institutional and governance dimensions of AEMI

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Abstract

Effective governance is a key requirement for multi-lateral energy cooperation and for AEMI. This is because the objectives of AEMI are not only to deliver direct economic efficiency gains but also a range of external benefits that have the character of regional public goods. While some measures such as bilateral energy transmission connections can be undertaken on an *ad hoc* basis, sustained moves towards a regional energy market require the delegation of authority or pooling of sovereignty to an agency charged with implementation in order to overcome the national obstacles. The obstacles to implementing AEMI are numerous. First is the long-standing importance of sovereignty and nationalism to the ASEAN members, which easily translates 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 very high. In the short term, efforts should be directed towards making progress incrementally, either by focusing on a limited number of activities that cover most or all of the ASEAN members or by building closer energy market integration among a sub-set of ASEAN members that are able and willing to participate. In the longer term, it is essential to enhance the authority and capacity of ASEAN's energy leadership and administration (e.g., the ASEAN Secretariat, AMEM, SOME and ACE) if progress towards energy market integration is to be sustained. This will necessarily involve the progressive delegation of authority or pooling of sovereignty. Without this step being taken, progress towards AEMI will be seriously constrained.

A. Introduction

All energy markets require to be governed and this governance is provided by a range of public and private actors and by institutions (e.g., treaties, laws, regulations and contracts). The governance of energy markets at the national level provides many Governments with severe challenges, but the promotion and governance of multi-national regional energy market integration such as the ASEAN energy market integration (AEMI) is an even greater challenge.

The aim of this chapter is to evaluate the current institutions of energy governance in ASEAN for their suitability to promote and govern energy market integration, and to identify steps that need to be taken to address any deficiencies.

Section B provides a general survey of the challenges of energy governance as well as a selection of theoretical approaches that have been employed to understand transnational energy governance. Section C applies a public goods approach to regional energy market integration in order to elaborate on why certain activities are more difficult than others and why they require more rigorous governance. Section D draws lessons from three international case studies. Sections E and F draw on the earlier observations in order to evaluate the governance of energy market integration in ASEAN, and to recommend actions that could be taken to enhance ASEAN's ability to pursue energy market integration.

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B. Energy governance

The aims of this section are to demonstrate and explain the complexity of transnational energy governance and the inadequacy of current governance institutions, and to introduce the main theoretical ideas. Subsection 1 highlights the distinctiveness of energy and subsection 2 presents a selection of theoretical understandings of transnational energy governance today.

1. The distinctiveness of energy

The energy industry is distinct from any other sector of the economy. It is a key input to all economic activity, especially in a modern economy, and is a key determinant of standards of living in all societies. Its distinctiveness as a commercial activity arises from the large capital costs, long-lead times, economies of scale, technical sophistication and the relatively high degree of risk involved. The energy sector may play a very important role in the economy of a nation with regard to: (a) gross domestic product; (b) balance of trade; (c) availability of foreign exchange; (d) whether that country is a net importer or a net exporter of energy; and (e) the alleviation of poverty.

As a consequence of the distinctiveness and importance of the energy sector, a responsible Government cannot avoid becoming involved in the governance of the energy sector, regardless of the nature of the economy and the system of national governance. Markets alone cannot satisfactorily address a number of key challenges. It is difficult to promote competition due to the natural monopoly characteristics of energy networks, the role of potential monopolists and cartels, and the high barriers to entry. The production and use of energy can, and does cause harm both to wider society and to the environment ("negative externalities"). Finally, Governments have the obligation to manage finite national natural resources, and to gather and provide market information. It is also necessary to manage those elements of energy that have aspects of a "public good", such as security of supply, access to basic energy services and energy efficiency.

2. Transnational energy governance

Although the effective governance of energy at the national level continues to be of crucial importance, it is no longer sufficient because the energy industry, the energy markets, and the impacts of energy production and use have become transnational, regional and even global in scale. Energy companies are internationalizing, oil markets are global, gas markets are regional and growing in scale, energy supply networks span great distances, and environmental damage affects whole regions and even the entire globe. Therefore the governance of energy must also take place above the national level, on regional, trans-regional and global scales.

The transnational governance of energy at the regional or global level has to address a wide range of issues, such as investment, trade, technology transfer, the construction and regulation of transboundary infrastructure, the management of transboundary resources, safety, environmental protection and access to energy. Three types of functions of transnational institutions can be identified (Goldthau and Witte, 2010): correcting market failures; lowering transactions costs; and setting standards and rules for market transactions.

Transnational governance can take a number of forms (Kahler and Lake, 2009):

- Ad hoc cooperation between States that are acting in a mainly unilateral manner;
- Supranational governance by pooling or sharing sovereignty in a collective agency that can make authoritative and binding decisions (e.g., the European Community);

- Supranational governance by delegating authority for certain tasks to an agency (e.g., the International Energy Agency and the World Trade Organization);
- Governance through a hierarchy whereby a dominant State sets standards or rules that are followed by others (e.g., dollarization of currency);
- Networks of public and/or private sector actors that lack formal authority.

The nature of the governance institution chosen by a group of nations will, to a great extent, depend on the nature of the national governance institutions in that group of countries as well as on the power of veto actors to prevent the pooling of sovereignty or the delegation of authority (Kahler and Lake, 2009).

The idiosyncratic nature of the creation and evolution of transnational institutions has led to a complex and fragmented system of global energy governance. This complexity has been exacerbated by the proliferation of numbers and types of actors in international energy markets. As a consequence, the framework of global energy governance is characterised by gaps, overlaps, tensions and conflicts that impede effective governance and raise the risks of governance failure (Florini and Sovacool, 2011; Dubash and Florini, 2011; Meyer 2013a and 2013b). Tensions are particularly prominent between the institutions governing energy, environment and trade (Gosh, 2011).

Of particular concern is the need to span different levels of energy governance (global, regional, national, sub-national and local) and to allow the effective participation of the growing range of actors (state, firms and civil society). Such "polycentric governance" is intended to draw on the advantages of global or regional governance and those of national and subnational governance. Of particular importance is the need to match innovation and flexibility at the local level with consistency and equity at the global level (Brown and Sovacool, 2011).

The challenges facing international energy governance are not unique to the sector, and can be found in the wider resources and environment arena as well as in many other areas of activity. In many sectors, the proliferation of the number and types of actors (Abbott and Snidal, 2009) and of international institutions (international regimes and international organizations) has led an increasing degree of "institutional interplay" (Stokke and Oberthur, 2011). Such interactions may be "vertical" between institutions at different levels in a hierarchy, or "horizontal" between institutions at the same level. Both types provide challenges to ensure that the interplay does not create tensions or contradictions, and does not leave important governance gaps (Oberthur and Gehring, 2011).

As the systems of international governance become more diverse and complex, the management of the interactions between institutions is becoming progressively decentralized, while less formal groups, such as expert networks and civil society organisations, are playing an increasingly important role (Jungcurt, 2011; Oberthur and Stokke, 2011). Theories relating to "complexity" and to "complex adaptive systems" have been invoked in order to improve understanding of global governance in general (Jervis, 1997; Hartzog, 2004; Duit and Galaz, 2008) and the governance of natural resources and the environment in particular (Stark, 2009; Hoffmann, 2011). The key implications of these analyses are that: (a) the links between actors in a system are just as important as the actors themselves; (b) governance systems are always potentially unstable and open to change; and (c) the consequences of institutional change are unpredictable.

One theoretical approach that encapsulates elements of all these concepts relating to transnational energy governance is that of regional public goods theory. This theory not only provides a method of identifying the benefits to be derived from regional cooperation, but

also gives insights into the obstacles to cooperation as well as the options for overcoming these constraints. In this way, regional public goods theory forms a useful framework for developing strategies for promoting and developing AEMI. This chapter not only applies a public goods approach as the principal theoretical concept to the analysis of regional energy market integration, in general, and to AEMI in particular, but also draws on the other theoretical approaches.

C. Regional public goods and application to regional energy market integration

The aim of this section is to show how regional public goods theory can provide insights into regional energy governance and regional energy market integration. This account draws heavily on Andrews-Speed (2011). This section begins by explaining the terms "public good" and "regional public good", before examining issues related to the design and delivery of public goods, and the nature of regional organisations.

1. Public goods

A public good is a service or a resource that provides benefits which are non-excludable and non-rival. Non-excludability arises from the impossibility or impracticability of excluding users. This results in over-use, especially by "free-riders" who have not contributed to the production of the public good. Non-rivalry arises from the marginal cost of supplying another user being zero. Additional users do not reduce the quantity of the good available to other users, and thus it is not worth spending the money to exclude these users. The combination of non-excludability and non-rivalry generally results in over-use and under-supply of a public good. In contrast, a private good is fully excludable and fully rival, and supply will, in theory, be efficient.

A range of goods exist that are intermediate between purely public and purely private. Common goods are rival and non-excludable, and these are greatly prone to over-use. Impure public goods may be partially rival or partially excludable. They can take different forms and, like pure public goods, are liable to suffer from under-supply and over-use. Club goods are fully excludable, with a membership fee, and are often supplied efficiently. Although they are usually intended to be non-rival, they can easily become partially rival if the fee is not set sufficiently high or if too many parties are allowed to participate. A joint product is an activity that produces more than one benefit, of which at least one is a public good (Sandler, 2006).

2. Regional public goods

A regional public good is one that can be provided and shared by the countries of a region, and which provides benefits to individual countries and to the region as a whole (Ferroni, 2002; Hettne and Soderbaum, 2006). In principle, collective action by Governments in the region should create positive spill-over effects across the region that are greater than those that could be generated by individual Governments acting alone (Ferroni, 2002; Sandler, 2007).

Most regional public goods fall under one or more of six headings – knowledge, infrastructure, environment, health, security and governance – although a degree of overlap exists between them. Infrastructure is not in itself a public good, but rather it provides services that have elements of a public good (Rufin, 2004). Governance is an intermediate public good that is

essential in order to generate the desired final public goods, and will include: (a) establishing and implementing shared standards; (b) best practices and policy regimes; (c) setting up regimes to address cross-border problems; and (d) creating networks of regulatory agencies. Examples of how elements of regional energy market integration can be classified under these different headings (excluding governance) are shown in table 1.

Table 1. Selected services that have features of regional public goods for a regional integrated energy market, grouped by field of activity

Category	Service	Type of good	Aggregator
Knowledge	Dissemination of research results	Pure PG	Weighted sum
	Joint public pronouncements	Pure PG	Weaker link
	Best practice laws, procedures and rules	Pure PG	Better shot
	Early warning systems	Pure PG	Best shot
	Market and reserves data	Impure PG	Weaker link
	Analysis of data	Impure PG	Better shot
	Technological research and development	Impure PG	Better shot
	Benchmarking data	Impure PG	Threshold
	Capacity-building and training	Club G	Better shot
	Events and meetings	Club G	Weighted sum
Infrastructure	Network construction	Club good	Weighted sum
	Construction of shared infrastructure	Club good	Weighted sum
	Maintaining network integrity, security and access	Pure PG	Weakest link
Environment, natural resources, and health	Providing clean energy to cities and households	Pure PG	Weighted sum
	Effective husbanding of natural resources	Pure PG	Weaker link
	Reducing acid rain	Impure PG	Weighted sum
	Cleaning up after polluting event	Impure PG	Better shot
Peace and security	Construction of emergency stocks	Pure PG	Better shot
	Emergency stock sharing system	Club G	Weighted sum
	Sea-lane security	Pure PG	Better shot
	Network security	Pure PG	Weakest link
	Emergency response team	Club G	Threshold

3. Aggregation technology

For any public good, the key to designing effective delivery of the good is to understand the "aggregation technology". The aggregation technology encapsulates the general nature of the institutions and instruments that must be created in order to deliver the public good, and the nature of the aggregator depends on the nature of the good to be delivered. The purpose of the aggregation technology is to provide the incentives for collective action to ensure sufficient supply of the public good. The challenge for policymakers is to design the institutions and instruments so as to address the weaknesses of the aggregation technology or to manipulate the technology (Barrett, 2006; Sandler, 2006 and 2007; UNIDO, 2008).

Seven types of aggregation technology may be identified for regional public goods (table 1). The most basic one is "summation", by which the total supply of the good is the sum of the

contributions, regardless of how much each party contributes. All contributions are perfectly substitutable. "Weighted summation" resembles summation, except that in this case the relative importance or weighting of the different contributions is variable. For such types of public good, it is very difficult to ensure that all parties contribute. The likelihood of under-provision is high, not least because marginal costs tend to rise as the amount provided by a particular party grows. Examples in the energy sector include the construction of networks and shared infrastructure, some environmental actions and the dissemination of research results.

The supply of a good with "weakest link" aggregation technology depends on the supply of the smallest contributor, just like the weakest link in a chain. Every contribution is important, but the failure by just one country to supply an adequate quantity of the good undermines the collective effort and renders the efforts of others wasted. "Weaker link" technology is similar but implies that there is a gradation of "weakness" among contributors. The risk exists that every country contributes only as much as the weakest country or countries, and that greater effort is expended on addressing the anticipated failure to provide the public good than on providing the good. This outcome can be avoided if the parties share common interests and goals, and if the wealthier or more competent countries help the weaker States through the provision of money, skills or other resources. Examples of weakest and weaker link goods include the maintenance of the security and integrity of infrastructure networks such as pipelines and power grids, and the provision of market and reserves data.

At the other extreme is "best shot" technology, through which the total supply of the public good is determined by the success or actions of just one country. "Better shot" technology is similar to "best shot", except that the impact of each contribution is proportional to the size of that contribution. In principle, such aggregators avoid many of the challenges facing other technologies, but require coordination among the countries in the region to ensure that resources are not wasted by those countries that are unlikely to make the "best shot" contribution. Problems may arise if no country is willing or able to deliver the good, if a country fails to deliver on a promise to deliver to good, or if two or more countries are vying to be the provider. "Best shot" and "better shot" goods in the energy sector include fundamental research, early warning systems, the construction of strategic oil stocks and capacity-building.

The final type of aggregation technology is "threshold", which requires a certain level of contribution to be made from the parties collectively before any benefit is realized. If the total contribution falls below this threshold, no benefit accrues to any party, only costs. Free-riding can only occur once the threshold has been reached. Examples include many forms of emergency response teams and facilities.

4. Incentives for supply

The nature of the incentives that will be required to provide the public goods will depend on the nature of the service and of the aggregator. Coordination and cooperation between nation States is a prerequisite for the provision of all regional public goods. What will vary is the extent to which rights, obligations and sanctions must be embodied in a formal treaty. Certain goods with summation or weighted sum aggregators are likely to require treaties, for example the construction of networks, a sharing system for emergency stocks and the reduction of acid rain. In the case of club goods, those parties who do not wish to participate can easily be excluded, and the agreement can be concluded without excessive difficulty. The provision of "best shot" or "better shot" goods such as early warning systems, research and development, pollution clean-up and the construction of emergency stocks only needs key parties to be willing to provide the service and to cooperate in its provision.

Weakest and weaker link goods are constrained by the inability or unwillingness of parties to collaborate in supplying the good. Inability can be addressed through financial or technical support, for example, in maintaining network integrity. However, unwillingness to provide may be rooted in the political culture or in national attitudes towards sovereignty. The provision of data on national energy markets and energy reserves, and the management of primary energy resources are likely to be liable to such a constraint. Of more fundamental importance will be the inability or unwillingness of certain Governments to open their energy sectors to foreign investment, reform their systems for energy pricing, remove the monopoly rights of the national energy champions and provide third-party access to energy infrastructure. These constraints to AEMI are illustrated in the case of the European Union in section D.

Of particular relevance to regional energy market integration is the need for leadership from one or more nations, and for a common world view relating to economics and politics. This arises from the profound relationship between energy, on the one hand, and national sovereignty and national security, on the other. The full integration of energy markets requires Governments to cede ownership over their state-owned energy enterprises, promote inward investment in the exploitation of primary energy resources, and relax their control over domestic energy markets. Even less ambitious forms of collaboration will require changes to national laws, structures and systems related to energy. Rivalry between those nations that should be providing regional leadership and the need for cross-subsidies between nations may also prove important barriers to progress.

5. Regional organizations for delivering public goods

No regional organization will have the authority of a national Government because sovereignty lies with individual nations (Matthews, 2003). A supra-national approach to regional governance in which the regional body has real authority over member States is only possible if the individual States are willing to cede a significant amount of sovereignty to this body, as is the case with the European Union, or to delegate authority to the body, as is the case with the International Energy Agency. Such an approach to regional cooperation is often not acceptable. Rather, most regional cooperation is relatively ad hoc, with each State retaining veto power, a secretariat and subordinate committees that coordinate but have no authority, and a range of formal and informal networks that help to share information and build trust.

The approach taken in building regional collaboration also depends on the extent of integration envisaged. At one end of the spectrum lies full market integration, which will require a sophisticated system of rules and incentives in order to break down trade barriers, and ensure the free flow of goods and services. At the other extreme, States can agree to cooperate in certain sectors to deliver specific regional public goods. In between these two extreme lies policy coordination, or even policy harmonization, which may accompany either market integration or sectoral cooperation (Matthews, 2003).

As mentioned above, transnational cooperation organizations are designed to fulfil one or more types of function – correcting market failures, lowering transactions costs, and setting standards and rules for market transactions. They may be formal organizations or informal networks, and both types may be either uni-dimensional, focusing on a single function or sector, or multi-dimensional (Hettne and Soderbaum, 2006).

Whatever combination of organizations is developed to promote the supply of public goods across a region, a number of general principles should be kept in mind. First, policy research and operational management should not be considered as separate activities, but should be integrated in the same organizations. Second, the long-term aim of the regional organizations

and institutions should be to encourage the emergence of new behavioural norms that support the delivery of regional public goods, not just to enforce them through rules. Finally, all regional organizations should be linked effectively both horizontally to other regional organizations in the same geographical area, and vertically to global and national organizations providing public goods ("polycentric governance"). It may also be desirable to build links to regional organizations in adjacent regions in order to deliver trans-regional public goods (Hettne and Soderbaum, 2006; Sandler, 2007; UNIDO, 2008).

6. Applying regional public goods theory to ASEAN and AEMI

ASEAN was created to deliver two fundamental regional public goods: regional security and regional economic development. Regional economic development is also the prime objective of the forthcoming ASEAN Economic Community (AEC); thus, AEMI should be a component of AEC. However, energy market integration is not just about promoting the free movement of energy products, services and capital, but should also deliver a range of other benefits that support and complement the free movement of these factors. These benefits have the character of regional public goods.

This account of how regional public goods theory can be applied to regional energy cooperation and market integration provides insights into the benefits to be derived from AEMI, the approaches to building AEMI, and the governance institutions required. Before going on to apply these insights to AEMI, it is useful to examine two international examples of energy market integration.

D. Lessons from international experience

The aim of this section is to draw some lessons from the international experience of energy cooperation and market integration in the light of regional public goods theory and other theories. Pineau and others (2004) conceptualized three types of integrative development required to move to regional electricity market integration: (a) infrastructure inter-connection; (b) progression towards regional regulation; and (c) commercial integration (table 2). Although their analysis focused on electricity, it is also relevant to other components of energy market integration. In this analysis of the international experience, two examples have been selected that illustrate different degrees of energy market integration:

(a) The European Union, which displays a high degree of energy market integration, lying somewhere between the third and fourth stages; and

(b) MERCOSUR, where energy market integration lies between the first and second stages.

Table 2. Integration continuum for regional electricity markets along infrastructural, regulatory and commercial integration

	No regional integration		Full regional integration	
	First Stage	Second Stage	Third Stage	Fourth Stage
Infrastructural integration	Isolated national power systems	Cross-border transmission capabilities	Coordinated effort in transmission investment	Fully integrated regional system operation
Regulatory integration	Independent national regulation	Compatible regulation	Coordination of Regulatory agencies	Regional regulatory agency
Commercial integration	National markets with local ownership	Cross-border trade and ownership	Regional spot market	Regional secondary/futures market

Source: Pineau and others, 2004.

These two cases illustrate different approaches to regional energy market integration covering large populations, which were started at different times; both have made more progress than ASEAN.

1. European Union

Formal collaboration between European countries in the field of energy began in the early 1950s with the establishment of the European Coal and Steel Community and the European Atomic Energy Community. The first of these was created with the express ambition of building a common market for coal, then the most important source of energy. The next significant step taken was progressive development, from 1968 onwards, of emergency response mechanisms to react to disruptions to oil supplies, including the construction of oil stocks (Matlary, 1997).

A key feature of the European Union is that the member States cede partial sovereignty to the institutions of the European Union: (a) to the Council of Europe, which comprises the heads of government of each member State; (b) to the European Commission, which is a large and powerful civil service; and (c) to the European Parliament, which has members directly elected from the member States. Of these three bodies, it has been the Commission that has been the most active in promoting the single European energy market.

It was in 1986 that the Council of Europe first agreed on the need for greater integration of national energy markets, and in 1988 it was resolved to introduce a single internal energy market. A decade of proposals, drafting and negotiating then took place, including the Directive on Hydrocarbons Licensing, which was issued in 1994 (Cross and others, 2001). Legally-binding directives related to price transparency as well as electricity and gas transit were issued, and Common Rules were drafted covering the removal of monopoly rights, the unbundling of vertically-integrated utilities and third-party access to transmission infrastructure (Lyons, 1996; Cameron, 2002).

Despite all these formal measures, little was achieved towards building a single energy market until 1996 and 1998, when the Electricity and Gas Directives, respectively, were adopted. This breakthrough was assisted by the progressive emergence of competitive energy markets at

the national level, for example, in the United Kingdom, Germany, the Nordic countries, the Netherlands and Spain (Egenhofer, 1997).

In 2007, the Council of Europe issued an "Energy Policy for Europe" that showed renewed political commitment at the highest level to the single European energy market. A so-called "Third Energy Package" of proposed measures was published in 2009 and took effect from March 2011. The overall aim was to complete the single European energy market by 2014 with particular emphasis on the need to improve economic competiveness. The main components were (Stanic, 2011): (a) unbundling of transmission from production and supply activities; (b) allocating stronger powers and independence to national regulators; (c) issuing new rules to harmonize market and network operations across Europe; (d) setting higher standards of public service obligations and consumer protection; and (e) establishing new institutions to promote cooperation between regulators and between transmission system operators. Now, four years after the package was published, progress is still behind schedule through a combination of delays in passing national legislation, a continuing focus on national policy priorities and a shortfall of investment cross-border infrastructure connections, among other factors (European Commission, 2012 and 2013).

Despite numerous obstacles to achieving a true single European energy market, nearly 60 years of effort have succeeded in building the world's largest integrated electricity and energy markets, and national markets have been liberalized and cross-border connections have been developed (Vasconcelos, 2013). The gradual development of smaller regional energy markets within the European Union has been supported by the European Commission and by the regulators since 2004. These markets take advantage of the proximity between nations and of existing network links. These sub-regional networks have allowed local economic benefit to be realized by the participating States and can provide the building blocks for later integration to form a Europe-wide market once the necessary infrastructure has been built (de Jong, 2008). In addition, a wide range of regional public goods have been provided through shared policy formulation and implementation. Such benefits include information, energy security, energy efficiency, technological development and environmental protection.

A key component of energy market integration is the harmonization and eventual removal of energy subsidies. While energy subsidies in the European Union are low by international standards (International Energy Agency, 2010), they have persisted to the present day. These subsidies take many forms, including direct payments to energy producers and consumers, low-interest loans to producers, research and development subsidies, tax breaks and export credits (European Environmental Agency, 2004; van Gelder and others., 2009). The aims of these subsidies range from the promotion of renewable energy and supporting poor households, to protecting national industries, notably the coal and nuclear power industries. Despite years of rhetoric concerning the need to reduce and abolish energy subsidies, the European Union does not even have a coherent approach to measuring and reporting these subsidies, except in the case of state aid to the coal industry (World Bank, 2010).

However, this brief history shows that much remains to be achieved 25 years after the first formal declaration of the need in 1988 to develop a single energy market. National interests related to the support of national champions and the management of domestic energy markets still act to constrain progress on key issues, as do differing energy policy priorities such as the relative importance given to energy security and emissions reduction. A small number of powerful interests have colluded to block progress for many years, and great determination and persistence have been required on the part of the European Commission to sustain forward movement. In the field of energy, national interests appear to over-ride the collective interest (Eikeland, 2004), despite the relatively high degree of commonality in customs, norms and values across the member States with regard to culture, politics and economics.

2. MERCOSUR

Created in 1991 by the Treaty of Asuncion, MERCOSUR (*Mercado Comun del Sur* or Common Market of the South) is currently the world's fourth-largest trading bloc after the European Union, the North American Free Trade Agreement (NAFTA) area and ASEAN. This regional bloc was initially conceived to be a customs union before evolving into a common market comprising Argentina, Brazil, Uruguay and Paraguay. Venezuela joined as a full member in 2012, and Bolivia, Chile, Colombia, Ecuador and Peru are associate members (Klonsky and others, 2012). In its original conception, MERCOSUR involved a number of defined stages involving elimination of import duties and trade barriers together with the growth of regional trade (Baer and others, 2002). Without the European Union's supra-national role and authority, MERCOSUR has no permanent institutional organization that represents the bloc in external affairs, nor does it have a long-range plan for political integration like the European Union.

An important precedent of energy cooperation among countries in the Southern Cone emerged in 1966 with the signing of the Iguaçu Act by the Governments of Brazil and Paraguay to build the Itaipú dam. Other bilateral (or bi-national) electricity integration projects followed suit in the 1970s with the construction of hydroelectric dams such as Salto Grande connecting Argentina with Uruguay, and Yacyretá linking up Argentina and Paraguay (Lara, 2006). Governed by stable bilateral treaties, these bi-national dams contribute to almost all of the region's electricity trade (Pineau and others, 2004). As a consequence, MERCOSUR is characterized by a high degree of physical electricity interconnection, although market integration has been constrained by national policies and regulations (Burgos, 2007). A number of gas pipelines have also been built (Bailey, 2013).

Concomitant with the spread of free market reforms in MERCOSUR member States was the privatization and deregulation of their electricity, oil and gas markets. The bloc members' varying speed and form of energy reforms, in combination with their different energy resource endowments, have created a complementarity matrix of surplus and deficit countries. This, in turn, creates a natural incentive for energy market integration among MERCOSUR members. Argentina, for example, liberalized its electricity sector to cater to the Chilean energy challenge by setting up a wholesale spot market operator CAMMESA (Hira and Amaya, 2003). Bolivia now is a major exporter of natural gas to Brazil after completing a pipeline more than 2,000 km long.

Nevertheless, these forms of market integration are mainly bi-national and are not truly regional. Institutionally, at the regional level, the MERCOSUR executive body, the GMC (*El Grupo Mercado Comun*), established the *Subgrupo de Trabajo No. 9 de Energia*, a working group that consist of national-level government officials who meet occasionally to deal with energy issues. In October 1999, this group drafted a memorandum on gas integration that was signed by Argentina, Brazil, Paraguay and Uruguay. The memorandum promoted non-interference in the gas markets by States, called for protection against monopolistic practices, and advocated the harmonization of standards and anti-trust measures (Hira and Amaya, 2003). Progress so far in implementing these market-driven solutions has been haphazard at best, due to regional regulatory and infrastructure gaps (Pineau and others, 2004; Hira and Amaya, 2003). For example, in electricity trading, each MERCOSUR country still operates different regulatory mechanisms, which translate in dissimilar ways how transmission is set up, and different systems for establishing contracts and how the wholesale market functions. These are serious impediments to market integration, as are wider political differences within the group and increasingly protectionist policies (Klonsky and others, 2012).

MERCOSUR may also be progressively overshadowed by the continent-wide Union of South-American Nations (UNASUR). Although UNASUR was formally established by treaty in 2008, the member nations had already set up the Initiative for the Integration of Regional Infrastructure in South America (IIRSA) in 2000. In 2010, UNASUR replaced IIRSA with the South American Council on Infrastructure and Planning (COSIPLAN), a ministerial-level body to promote and coordinate continent-wide infrastructure development in energy, transport and communications. COSIPLAN's Strategic Action Plan for 2012-2022 sets out criteria for the selection of projects and methodologies for implementation. It also recognizes the need to harmonize laws and regulations (Editorial Committee, 2012). Despite these initiatives, fiscal, legal, pricing and regulatory differences remain key obstacles to energy market integration in Latin America (de Oliviera, 2010; Bailey, 2013).

3. Lessons from these experiences

This examination of energy market integration in the European Union and MERCOSUR reveal a number of lessons that are relevant to AEMI. While a wide range of benefits from energy market integration are clearly recognized, obstacles to full integration can persist for decades. These obstacles arise principally from national differences in energy mix, energy balance, economic wealth, openness to investment, pricing and fiscal policies, and energy policy priorities. Corporate or political actors may also seek to undermine integration if they see their interests threatened. These factors weaken the political will of national leaders to pursue energy market integration beyond rhetoric, except in cases where short-term economic gains are obvious.

While some measures such bilateral energy transmission connections can be undertaken on an ad hoc basis, sustained moves towards a regional energy market require delegation of authority or pooling of sovereignty to an agency charged with implementation in order to overcome the national obstacles. Such a supra-national body with the capacity and authority to enforce collective policy agreements can greatly accelerate the process of regional energy market integration. Nevertheless, individual countries can still greatly constrain the pace of integration, and the process of full energy market integration can take several decades. The period of gradual integration is marked by the progressive build-up of trust, liberalization of domestic energy markets, and harmonization of polices, regulations and standards.

The case of the European Union shows that energy subsidies can be one of the last issues to be fully addressed. That is not to say that all ASEAN should not continue to reduce the level of energy subsidies, but rather that the existence of subsidies should not form an insurmountable obstacles to pursuing AEMI.

In a region with a large number of countries, especially where there are significant economic disparities as in ASEAN, progress towards energy market integration may best be pursued on a sub-regional basis. In that way, countries with shared interests and policy approaches as well as geographic proximity move ahead with energy market integration without waiting for others.

While bilateral arrangements are relatively easy to implement, in the case of transboundary infrastructure, for example, they form only small steps towards regional market integration. Such interconnections often do not require any regulatory harmonization, but if the energy is sold under long-term contracts then these contracts may actually inhibit the later development of an integrated energy market as the pricing mechanism will have been fixed by the contracts.

While integration with energy markets outside the region is clearly desirable, given the nature of international energy markets, the case of Canada (not described here) illustrates a potential

danger. NAFTA contains a "proportionality clause" specifying that Canada (the clause only applies to Canada) must maintain the share of exports in energy goods as a proportion of total energy supply (Laxer and Dillon, 2008). In other words, Canada cannot reduce its exports of oil or gas to the United States of America unless its total production also declines.

In the case of oil, this prevents the Government from reversing the flow of oil in its pipeline system in order to transport oil from the oil-rich west to the oil-poor east. Instead, it must maintain exports of oil from western Canada to the United States and continue to import oil to eastern Canada. The proportionality clause also constrains the federal Government from pursuing certain policy courses such as retaining more gas in Canada in order to build up a petrochemical industry, or from reducing production and exports in order to conserve resources for the future (Laxer and Dillon, 2008). In these ways NAFTA, a treaty with external parties, is preventing deeper energy market integration between Canada's provinces, and is constraining the available policy choices for resource management and industrialisation.

E. ASEAN energy governance

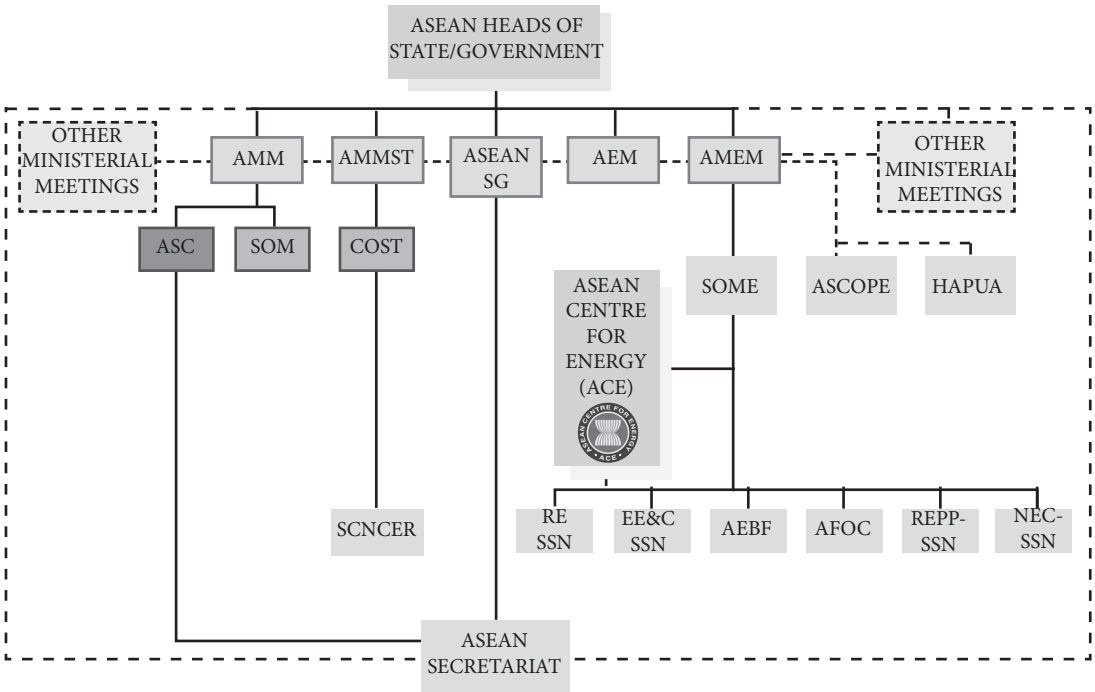
The aim of this section is to assess the adequacy of ASEAN's institutions of governance for energy market integration.

1. General features of governance in ASEAN

The central axis of ASEAN governance is formed by the Heads of State or Government, the ASEAN Secretary-General and the ASEAN Secretariat (figure 1). The ASEAN Chairmanship is rotated on an annual basis among the Heads of State/Government, following the alphabetical order of the English names of member States. The member State assuming the Chairmanship "will chair the ASEAN Summit and related summits, the ASEAN Coordinating Council, the three ASEAN Community Councils, relevant ASEAN Sectoral Ministerial Bodies and senior officials, and the Committee of Permanent Representatives."[3] The arrangement of a rotating Chair sometimes results in a lack of continuity and momentum of policies, when initiatives introduced by the previous Chair are not accorded the same priority by the in-coming Chair.

3 See "ASEAN Chair", available at www.asean.org/asean/asean-chair (accessed 3 July 2013).

Figure 1. ASEAN organizational structure for energy



Energy structures highlighted in light shadow and acronyms:

ASEAN Heads of State/Government
ASEAN Secretariat

ACE	:	ASEAN Centre for Energy
AEBF	:	ASEAN Energy Business Forum
AEM	:	ASEAN Economy Ministers
AFOC	:	ASEAN Forum on Coal
AMEM	:	ASEAN Ministers of Energy Meeting
AMM	:	ASEAN Ministerial Meeting
AMMST	:	ASEAN Ministerial Meeting on Science & Technology
ASC	:	ASEAN Standing Committee
ASCOPE	:	ASEAN Council on Petroleum
COST	:	Committee on Science and Technology
EE&C SSN	:	Energy Efficiency and Conservation Subsector Network
HAPUA	:	Heads of ASEAN Power Utilities/ Authorities
NRSE SSN	:	New and Renewable Energy Sources of Energy Subsector Network
SG	:	Secretary-General
SOM	:	Senior officials Meeting
SOME	:	Senior Officials Meeting on Energy
REPP-SSN	:	Regional Energy Policy and Planning Sub-Sector Network

The actual leadership of ASEAN tends to move around the different members, often depending on the issue. Indonesia can be seen as one country that has been at, or near the forefront of initiatives many times, as have Malaysia and Thailand. Singapore has been a strong player in the push for economic integration (Severino, 2006). Decision-making is by consensus. This does not necessarily mean that all decisions are unanimous, but rather that no one seeks

to block the decision. The "ASEAN Minus X" principle (also referred to as "Two Plus X"), developed in 1992, allows sub-groups of two or more ASEAN members to move ahead with agreed implementation measures on economic integration ahead of others (Severino, 2006).

As a consequence of the principles of non-interference and respect for sovereignty, ASEAN lacks a supra-national administrative organization. It has been argued that the ASEAN Secretariat has been intentionally kept weak as member States have been reluctant to cede any authority to the regional organization (Kurlantzick, 2012). The Secretariat continues to lack the capacity and authority to carry out sophisticated policy analyses and to drive through policy initiatives. The activities of the Secretariat are also constrained by its limited operational budget, which stood at US$ 15.76 million in 2012. This is equally funded by each the 10 ASEAN members (Termsak, 2012). At present, there are about 260 staff members, of whom 70 are professionals openly recruited from member States to work at the ASEAN Secretariat. The limited budget has restricted ASEAN's capacity to employ additional staff and, in turn, has affected its capability to drive the regional integration process.

The Secretary-General is appointed by the Governments of the member States, on an alphabetical rotation. The two Deputy Secretary-Generals are also political appointments. The work of the Secretariat and of ASEAN is overseen by the ASEAN Standing Committee. Proposals to create a Supreme Council of ASEAN, comprising the Heads of Government of the member States, were never followed up (Severino, 2006). The High-Level Task Force on ASEAN Economic Integration recommended that economic integration required the setting up of bodies and procedures to oversee implementation and compliance, and to resolve disputes (Severino, 2006).

2. Energy governance in ASEAN

In the formal hierarchy of governance, the meetings of ministers and official representatives serve as the central forum for ASEAN cooperation. The ASEAN Ministers on Energy Meeting (AMEM) provides the issues and concerns of common interest, and sets policy and programme directions for energy cooperation (figure 1). The Senior Officials Meeting on Energy (SOME) has the overall responsibility for the supervision, coordination and implementation of ASEAN cooperation programmes, projects and activities. The next tier in the hierarchy comprises the Sub-Sector Networks, sub-committees and working groups, and two forums (on coal and energy business). The Sub-Sector Networks cover:

(a) Energy efficiency and conservation;

(b) New and renewable sources of energy;

(c) Nuclear energy cooperation;

(d) Regional energy policy and planning.

These networks and forums provide valuable opportunities for sharing information, policy ideas and plans, and they provide support to SOME. Two other important organizations are the ASEAN Council on Petroleum (ASCOPE) and Heads of ASEAN Power Utilities/ Authorities Council (HAPUA). ASEAN and its member States are also active participants in energy dialogues at a supra-regional level, for example, the APEC Energy Working Group, the ASEAN+3 Natural Gas Forum, and the East Asian Summit-Energy Ministers Meeting.

At the heart of this web of organizations lies the ASEAN Centre for Energy (ACE), which provides administrative, coordinating and technical support to all the various energy-related bodies within ASEAN, and which plays a central role in drawing up the ASEAN Plans of Action for Energy Cooperation. Its operation is supported by generous funding from ASEAN as well

as donor agencies from Japan, the European Union, Germany, Switzerland and Australia. ACE also oversees an ASEAN Energy Endowment created through contributions from member countries, which is now worth more than US$ 5 million.

The energy sector is governed by a number of general economic instruments in addition to the sector-specific institutions described above. Of these, the most important are those associated with the ASEAN Economic Community, notably the ASEAN Trade in Goods Agreement (ATIGA) and the ASEAN Comprehensive Investment Agreement (ACIA).

Both of these Agreements cover energy to certain extent, but the effectiveness of ATIGA is constrained by persistent non-tariff barriers, and ACIA by numerous exceptions and reservations and by a scope of application that excludes utilities (Andrews-Speed and Len, 2013).

Since its inception, ASEAN's energy cooperation has followed the "ASEAN Way", a mode of governance characterized by a largely informal institutional cooperation, decision-making founded on interpersonal consultations and consensus among the member States, and agreements that are largely informal and non-binding in their effects.

3. Key ASEAN energy initiatives

As has been described in the case of global energy governance, ASEAN's institutions of energy governance have multiplied in a largely uncoordinated manner. 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 APSA 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.[4]

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 APAECs for 1999-2004 and 2004-2009, and reiterated in the Plan of Action for 2010-2015.[5] At any one time, the prevailing APAEC is the key point of reference and handbook for ASEAN energy cooperation (ACE, 2013).

The strategy for transboundary energy networks had two main components: the Trans-ASEAN Gas Pipeline (TAGP) and the ASEAN Power Grid (APG). 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

4 See www.aseansec.org/22326.pdf.

5 See http://aseanenergy.org/index.php/about/apaec.

coal, and to encourage investment in gas exploration. Responsibility for implementation lies with TAGP Task Group of ASCOPE. As of the end of 2012, about 3,000 km of bilateral pipelines were in place (ACE, 2013). These are mainly bilateral connections driven by local private and State interests with assistance from the World Bank and the Asian Development Bank (Carroll and Sovacool, 2008). ASEAN itself does not appear to have been a major driving force, on account of diverging interests and goals (Sovacool, 2009 and 2010).

A further 4,500 km of gas pipeline are planned. The key connections that remain 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 will not only add an additional 2,000 km to the network; the central position of the East Natuna field makes them essential to the realization of a truly regional grid. However, the development of this field continues to be delayed by commercial viability concerns (Nicolas, 2009; Doshi, 2013).

The TAGP aims to link the member states in a single network in order to provide access to modern energy to populations throughout the region, and to maximize the efficiency and flexibility of electricity supply. Responsibility for implementation lies with the Power Interconnection Working Group of the Heads of HAPUA which was established in 1981. Several bilateral connections exist, and a number of other projects are to be completed by 2020 (ACE, 2013).

Although considerable progress has been made towards the physical construction both TAGP and APG, the apparent absence of ASEAN as an active player in the planning process will place constraints on the potential for these networks to deliver truly integrated energy supply systems. A number of important technical and regulatory challenges have to be addressed before a truly regional grid can be realized. These include: (a) rules concerning access to the grids by suppliers and buyers; (b) rules governing transit through third States; (c) systems for trading energy; (d) technical standards; and (e) procedures for maintaining system stability in the case of electricity (Nicolas, 2009; ACE, 2013). To expedite the harmonization of regulatory practices and technical standards, AMEM recently established the ASEAN Energy Regulators' Network (AERN), focusing on regulatory issues related to regional power and gas trade. Its first meeting was held in Kuala Lumpur in March 2012 to establish the basis for effective energy regulation that promotes energy sustainability and facilitates the economic development of the region.

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 (ACE, 2013). It is anticipated that the collective share of renewable energy will be 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 (ACE, 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.

4. Assessment of ASEAN energy governance

ASEAN has proved to be strong on visions and plans, but weak on delivery. The most important components of the ASEAN Plans of Work 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 been undertaken (ACE, 2013).

ACE itself has identified a number of challenges that need to be addressed in order to more effectively pursue the objectives defined in APAEC, under the following headings (ACE, 2013):

(a) Policy, institutional and regulatory framework;

(b) Technical standards, labelling, codes and harmonization;

(c) Financing instruments and schemes;

(d) Cross-border: tariffs and taxation; access and transit rights for infrastructure; health, safety and environmental protection; and information sharing;

(e) Capacity-building.

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, even after the recent enlargement of the latter. 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 AEMI lies in the absence within successive versions of APAEC to address trade and investment. These matters are covered instead by the ATIGA and the ACIA, respectively. These two Agreements form vital components of the forthcoming ASEAN Economic Community (AEC). ATIGA appears to successfully seek to remove trade tariffs for energy products by 2015, yet many non-tariff barriers remain. Likewise, ACIA contains many exceptions and exemptions related to energy (Andrews-Speed and Len, 2013).

In the context of regional public goods theory (see section C), these obstacles are typical of constraints to the provision of regional public goods. As a consequence, individual States only undertake activities that have a low cost, such as attending meetings and agreeing plans, or which bring direct short-term benefits, such as promoting renewable energy and energy efficiency in the domestic market. Undertakings that involve substantial short-term costs, or sophisticated harmonization or agreements with partners, are left to the wealthy and willing States. Institutions to implement collective policy decisions are weak, and national priorities nearly always trump aspirations for collective action.

ASEAN's limited success with "hard integration" (such as TAGP and APG infrastructures), is compensated by its accomplishment with "soft integration" vis-à-vis consultative meetings, databases and information sharing. Although many are dismayed by ASEAN's slow pace of energy integration, its approach has allowed the framing of incremental policies that build on past strengths without compromising the "ASEAN Way". The nascent bi-national energy trade,

whether for electricity or gas, is a precursor to the considerably more ambitious aspiration to create a regional infrastructure, one of the stated ASEAN Vision 2020 priorities.

F. The way forward to AEMI

1. Options for future governance structures for AEMI

Currently, AEC is ASEAN's key collective economic objective, and energy should play a more central role in this strategy. While certain forms of energy cooperation and integration can be undertaken within an informal framework, full integration that is intended to lead to a single regional energy market with free movement of commodities, capital and services would require a sophisticated system of rules and incentives, on account of the public good nature of energy. This may, in turn, require a formal supra-national organization with powers of enforcement as is exemplified by the European Union, or at least a formal and wide-ranging treaty such as the Energy Charter Treaty. However, even with such structures, the path to full energy market integration is long and tortuous.

While formal supranational governance structures may be desirable in principle, arrangements that are less formal, and which lack binding commitments and enforceable sanctions, are more consistent with the nature of regionalism which prevails in South-East Asia today (Dent, 2008). In these circumstances, it will prove difficult to move ahead with certain initiatives that involve substantial political and economic commitments from a large numbers of countries in the region.

Instead, efforts may be best directed at making progress incrementally, either by focusing on a limited number of activities that cover most or all ASEAN countries or by building closer energy market integration among a sub-set of ASEAN countries that are able and willing to participate.

ASEAN already has networks and forums that cover many of the key activities related to energy, but they appear to lack the capacity and authority to effectively pursue the implementation of policy decisions. In addition, issues related to the liberalization of trade and investment in the energy sector appear to lie outside the purview of ASEAN energy bodies. If this is the case, then the ability of ASEAN's energy leadership to pursue energy market integration will be severely constrained.

In the longer term, it is essential to enhance the authority and capacity of ASEAN's energy leadership and administration (e.g., the ASEAN Secretariat, AMEM, SOME and ACE) if progress towards energy market integration is to be sustained. This will necessarily involve progressive delegation of authority or pooling of sovereignty. Without this step being taken, progress towards AEMI will be seriously constrained. The exact nature of the organizations and agencies to be enhanced or created will depend, in part, on which integration activities are to be pursued.

Two other requirements should be taken into account. First, the activity of policy research should be placed very close to where policy-making takes place, and the development of Track II - academic networks in the field of energy should be encouraged. Second, the various organizations within ASEAN responsible for different aspects of energy market integration should continue to develop and maintain close links with the relevant supra-regional (e.g., EAS and APEC) and international organizations. However, it is important to ensure that the ASEAN agenda does not get captured or distorted by external actors in a way that promotes external energy market integration at the expense of ASEAN energy market integration.

2. Actions to be taken at the regional and national levels

While APAEC provides a strong foundation for certain forms of energy cooperation, its scope is insufficient to provide a framework for AEMI. In particular, critical issues are addressed by separate agreements, notably ATIGA and ACIA. For AEMI to be pursued in any meaningful way, the energy elements of ATIGA and ACIA need to lie at the heart of ASEAN's energy strategy and be brought under the purview of the body (ACE) responsible for coordination energy strategy.

Legally-binding agreements will almost certainly be required for most of major, transboundary infrastructure projects to proceed, on account of the costs and risks involved. In the early years of energy market integration, it is likely that most legally binding agreements will be concluded at sub-regional, bilateral or trilateral levels, rather than across the entire region.

While the costs and risks related to the construction of transnational infrastructure projects are relatively easily managed, the real challenges emerge once they are commissioned, even if formal agreements are in place. On the one hand, they are open to deficient behaviour on the part of weakest link actors with regard to the operational integrity and security of the network. On the other hand, they are vulnerable to unilateral actions by one or more parties seeking to protect corporate or national interests, for example, by denying access to the network. These difficulties can only be alleviated by the progressive convergence over time between the participating nations with regard to their improved competence in national governance and the openness of their national energy markets.

Indeed, openness and governance at the national level (as well as at the supra-national level) are key pre-requisites for energy market integration to proceed and deliver significant regional benefits. States need to be open in their provision of information on energy resources and energy markets, and in their provision of investment opportunities in their energy sectors. In addition, they need to remove non-tariff barriers to energy trade.

Effective and appropriate governance is needed in two ways. First, the domestic energy resources and industries should be regulated so that the available resources are used in as efficient and clean a manner as possible. Second, the structure and nature of the national energy industries and energy markets should be amenable to effective and efficient energy market integration. In many of the ASEAN members, these attributes will require substantial domestic reforms. Most difficult will be the progressive reduction of energy subsidies. Without such reforms, the progress of energy market integration will be severely constrained.

Other initiatives that should be pursued provided appropriate nations emerge to take the lead (i.e., "best shot" and "better shot" public goods), include sea-lane security, emergency response teams and pollution clean-up capacity.

A number of less tangible actions are already being taken in the ASEAN region, and these will provide long-term support to the progressive energy market integration. They include: (a) technological research and development; (b) the establishment and harmonization of technical standards; (c) the development and dissemination of best practices, for example, in energy efficiency or in nuclear energy safety; (d) data analysis and dissemination, for example, on issues such oil stocks and biofuels; and (e) capacity-building and training in a range of fields including technology, management, policy and governance fields. The relative degree of success of such programmes arises from the fact that much of the cost can be borne by a limited number of nations, whereas the benefits are widespread. Efforts should be made to enhance these programmes.

3. Future research directions

Future research could focus on:

(a) Building on ASEAN's experience as well as on international examples and theoretical considerations in order to draw up more detailed recommendations for enhancing the capability of institutions to promote and govern energy market integration in ASEAN; and
(b) Developing new policy solutions to address seemingly intractable problems such as the different approaches to, and needs for energy subsidies.

G. Summary and conclusion

Effective governance is a key requirement for multi-lateral energy cooperation and for AEMI. This is because the objective of AEMI is to deliver not only direct economic efficiency gains but also a range of external benefits that have the character of regional public goods.

Energy market integration in the European Union and MERCOSUR reveals a number of lessons that are relevant to AEMI. These obstacles to integration arise principally from national differences in energy mix, energy balance, economic wealth, openness to investment, pricing and fiscal policies, and energy policy priorities, which can persist for decades. Corporate or political actors may also seek to undermine integration if they see their interests threatened. These factors weaken the political will of national leaders to pursue energy market integration beyond rhetoric, except in cases where short-term economic gains are obvious.

While some measures such bilateral energy transmission connections can be undertaken on an *ad hoc* basis, sustained moves towards a regional energy market require the delegation of authority or pooling of sovereignty to an agency charged with implementation in order to overcome the national obstacles. The period of gradual integration is marked by the progressive build-up of trust, liberalization of domestic energy markets and harmonization of polices, regulations and standards.

The obstacles to implementing AEMI are numerous. First is the long-standing importance to the member States of sovereignty and nationalism, which easily translates 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, even after the recent enlargement of the latter.

While formal supranational governance structures may be desirable in principle, arrangements that are less formal, and which lack binding commitments and enforceable sanctions, are more consistent with the nature of regionalism which prevails in South-East Asia today. In these circumstances, it will prove difficult to move ahead with certain initiatives that involve substantial political and economic commitments from a large number of countries in the region. Instead, efforts may be best directed at making progress incrementally, either by focusing on a limited number of activities that cover most or all ASEAN countries or by building closer energy market integration among a sub-set of ASEAN countries that are able and willing to participate.

In the longer term, it is essential to enhance the authority and capacity of ASEAN's energy leadership and administration (e.g., the ASEAN Secretariat, AMEM, SOME and ACE) if progress towards energy market integration is to be sustained. This will necessarily involve the progressive delegation of authority or pooling of sovereignty. Without this step being taken, progress towards AEMI will be seriously constrained.

References

Abbott, K. W. and D. Snidal (2009). "The governance triangle: Regulatory standards institutions and the shadow of the State", in W. Mattli and N. Woods (eds.), *The Politics of Global Regulation*, pp. 44-88. Princeton University Press, Princeton, United States.

Andrews-Speed, P. (2011). "Energy market integration in East Asia: A regional public goods approach", ERIA Discussion Paper Series, ERIA-DP-2011-06. Economic Research Institute for ASEAN and East Asia, Jakarta.

Andrews-Speed, P. and C. Len (2013). "The political economy of AEMI", chapter in *ASEAN Energy Market Integration (AEMI): From coordination to integration*. ASEAN Studies Center, Chulalongkorn University. Bangkok.

ACE (2013). *Development of ASEAN Energy Sector.* ASEAN Centre for Energy, Jakarta.

Baer, W., T. Cavalcanti and P. Silva (2002). "Economic integration without policy coordination: The case of Mercosur", *Emerging Markets Review*, vol. 2; pp. 269-291.

Bailey, J. (2013). "Shale and beyond: The next phase of Latin American energy integration", *World Politics Review*, March 2013.

Barrett, S. (2006). "Critical factors for providing transnational public goods in International Task Force on Global Public Goods", Meeting Global Challenges: International Cooperation in the National Interest, Final Report; pp.1-58. Stockholm.

Brown, M. A. and B. K. Sovacool (2011). *Climate Change and Global Energy Security: Technology and Policy Options.* MIT Press, Cambridge, Mass., United States.

Burgos, F. J. (2007). "Regional electricity cooperation and integration in the Americas: Potential environmental, social and economic benefits". Department of Sustainable Development, Organization of American States, Washington, D.C.

Cameron, P. D. (2002). *Competition in Energy Markets: Law and Regulation in the European Union.* Oxford University Press, Oxford, United Kingdom.

Carroll, T. and B. K. Sovacool (2008). "Contested regionalism in Southeast Asia: The politics of the Trans-ASEAN Gas Pipeline Project", Centre on Asia and Globalization Working Paper, National University of Singapore, Singapore.

Cross, E. D, L. Hancher and P. J. Slot (2001). "EC Energy Law", in M. M. Roggenkamp, A. Ronne, C. Redgwell and I. del Guayo (eds.), *Energy Law in Europe: National, EU and International Law and Institutions*. Oxford University Press, Oxford, United Kingdom.

de Jong, J. J. (2008). The third EU energy market package: Are we singing the right song?" Briefing Paper, Clingendael International Energy Programme, The Hague.

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

de Oliviera, A. (2010). *Energy Security in South America*, Series on Trade and Energy Security, International Institute for Sustainable Development, Winnipeg, Manitoba, Canada.

Doshi, T. K. (2013). "ASEAN energy integration: Interconnected power and gas pipeline grids", in S. B. Das (ed.), *Enhancing ASEAN's Connectivity;* pp. 142-162. Institute of Southeast Asian Studies, Singapore.

Dubash, N. K. and A. Florini (2011). "Mapping global energy governance", *Global Policy*, vol. 2; pp. 6-18.

Duit, A. and V. Galaz (2008). "Governance and complexity – emerging issues for governance theory", *Governance: An International Journal of Policy, Administration and Institutions*, vol. 21, No. 3; pp. 311-335.

Editorial Committee (2012). "The COSIPLAN: The Strategic Action Plan (PAE) 2012-2022 and the Integration Priority Project Agenda (API)', Inter-American Development Bank, in *Integration and Trade Journal*, vol. 16, No. 34; pp. 79-85.

Egenhofer, C. (1997). "Understanding the politics of European energy policy: The driving and stopping forces, the politics of European energy, the energy of European politics and Maastricht II", *CEPMLP Online Journal*. University of Dundee, Scotland, United Kingdom. Available at www.dundee.ac.uk/cepmlp/gateway/index.php?news=28128 (accessed 2 June 2011).

Eikeland, P. O. (2004). "The long and winding road to the internal energy market – consistencies and inconsistencies in EU policy", Report No. 8/2004. Fridtjof Nansen Institute, Oslo.

European Commission (2013). "Energy challenges and policy", Commission contribution to the European Council of 22 May 2013. Brussels

——— (2012). *Making the Internal Energy Market Work*, COM(2012) 663 final. Brussels.

European Environmental Agency (2004). "Energy subsidies in the European Union. A brief overview", EEA Technical Report 1/2004. Copenhagen.

Ferroni, M. (2002). "Regional public goods: The comparative edge of regional development banks", paper prepared for conference on "Financing for Development: Regional Challenges and the Regional Development Banks", Institute for International Economics, 19 February 2002, Washington, D.C.

Florini, A. and B. K. Sovacool (2011). "Bridging the gaps in global energy governance", *Global Governance*, vol. 17; pp. 57-74.

Goldthau, A. and J. M. Witte (2010). "The role of rules and institutions in global energy: An introduction", in A. Goldthau and J. M. Witte (eds.), *Global Energy Governance: The New Rules of the Game*; pp. 1-21. Global Public Policy Institute, Berlin.

Gosh, A. (2011). "Seeking coherence in complexity? The governance of energy by trade and investment institutions", *Global Policy*, vol. 2; pp. 106-119.

Harztog, P.B. (2004). "21st century governance as a complex adaptive system", P2P Foundation. Available at www.panarchy.com/Members/PaulBHartzog/Papers/21st%20Century%20 Governance.pdf.

Hettne, B. and F. Soderbaum (2006). "Regional cooperation: A tool for addressing regional and global challenges", in, *Meeting Global Challenges: International Cooperation in the National Interest*, Final Report, International Task Force on Global Public Goods, Stockholm.

Hira, A. and L. Amaya (2003). "Does energy integrate?" *Energy Policy*, vol. 31; pp. 185-199.

Hoffmann, M. J. (2011). *Climate Governance at the Crossroads: Experimenting with a Global Response to Kyoto.* Oxford University Press, Oxford, United Kingdom.

International Energy Agency (2010). *World Energy Outlook 2010*. OECD/IEA, Paris.

Jervis, R. (1997). *System Effects: Complexity in Political and Social Life.* Princeton University Press, Princeton, United States.

Jungcurt, S. (2011). "The role of expert networks in reducing regime conflict: Contrasting cases in the management of plant genetic resources", in S. Oberthur and O. S. Stokke (eds.), *Managing Institutional Complexity: Regime Change and Global Environmental Change.* MIT Press, Cambridge, Mass., United States.

Kahler, M. and D. A. Lake (2009). "Economic integration and global governance: Why so little supra-nationalism?" in W. Mattli and N. Woods (eds.), *The Politics of Global Regulation; pp.* 242-275. Princeton University Press, Princeton, United States.

Klonsky, J., S. Hanson and B. Lee (2012). "Mercosur: South America's fractious trade bloc", Council on Foreign Relations, 31 July 2013.

Kurlantzick, J. (2012). *ASEAN's Future and Asian Integration*, Council on Foreign Relations Working Paper, Washington D.C.

Lara, I. A. (2006). "The development of Mercosur and potentialities of the energy sector", *Crossroads*, vol. 6, No. 1; pp. 46-95.

Laxer, G. and J. Dillon (2008). *Over a Barrel: Exiting from NAFTA's Proportionality Clause*, Parkland Institute and Canadian Centre for Policy Alternatives, Ottawa.

Lyons, P. K. (1996). *EU Energy Policies of the Mid-1990s*, EC Inform. European Commission, Brussels.

Matthews, A. (2003). *Regional Integration and Food Security in Developing Countries.* United Nations Food and Agriculture Organization, Rome.

Matlary, J. H. (1997). *Energy Policy in the European Union*. MacMillan, Basingstoke, United Kingdom.

Meyer, T. (2013a). "Global public goods, governance risk and international energy", *Duke Journal of Comparative and International Law, vol.* 22; pp. 319-348.

——— (2013b). "The architecture of international energy governance*", American Society of International Law Proceedings* No. 106, forthcoming.

Nicolas, F. (2009). "ASEAN energy cooperation: An increasingly daunting challenge", Note de l'IFRI, IFRI, Paris.

Oberthur, S. and T. Gehring (2011). "Institutional interaction: Ten years of scholarly development", in S. Oberthur and O. S. Stokke (eds.), *Managing Institutional Complexity: Regime Change and Global Environmental Change.* MIT Press, Cambridge, Mass., United States.

Oberthur, S. and O. S. Stokke (2011). "Conclusions: Decentralized interplay management in an evolving institutional order", in S. Oberthur and O. S. Stokke (eds.), *Managing Institutional Complexity: Regime Change and Global Environmental Change.* MIT Press, Cambridge, Mass., United States.

Pineau, P-O, A. Hira and K. Froschauer (2004). "Measuring international electricity integration: A comparative study of the power systems under the Nordic Council, MERCOSUR, and NAFTA", *Energy Policy*, vol. 32. pp. 1457-1475.

Rufin, C. (2004). "Regional public goods and infrastructure", in A. Estevadeoral, B. Frantz

and T. R. Nguyen (eds.), *Regional Public Goods, From Theory to Practice.* Inter-American Development Bank and Asian Development Bank, Washington, D.C. and Manila.

Sandler, T. (2007). "Regional public goods, aid and development". Asian Development Bank, Manila. Available at www.adbi.org/conf-seminar-papers/2007/11/06/2407.regional.public.goods.aid.development/ (accessed 2 March 2011).

——— (2006). "Regional public goods and regional cooperation" in *Meeting Global Challenges: International Cooperation in the National Interest,* Final Report. International Task Force on Global Public Goods, Stockholm.

Severino, R. (2006). *Southeast Asia in Search of an ASEAN Community. Insights from a Former Secretary-General.* Institute of Southeast Asian Studies, Singapore.

Sovacool, B.K. (2010). "A critical stakeholder analysis of the Trans-ASEAN Gas Pipeline (TAGP) Network", *Land Use Policy*, vol. 27; pp. 788-797.

——— (2009). "Energy policy and cooperation in Southeast Asia: The history, challenges, and implications of the trans-ASEAN gas pipeline (TAGP) network", *Energy Policy*, vol. 37; pp. 2536-2367.

Stanic, A. (2011). "New EU rules on the internal energy market and energy policy", *Oil, Gas and Energy Law Intelligence,* March. Available at www.ogel.org (accessed 4 June 2011).

Stark, B. (2009). "A case study of complex adaptive systems theory. Sustainable global governance: The singular challenge of the twenty-first century", RISC-Research Paper No. 5. University of Ljubljana, Slovenia.

Stokke, O. S. and S. Oberthur (2011). "Introduction: Institutional interaction in global environmental change", in S. Oberthur and O. S. Stokke (eds.), *Managing Institutional Complexity. Regime Change and Global Environmental Change,* pp. 1-23. MIT Press, Cambridge, Mass., United States.

Termsak, C. (2012). "ASEAN-10: meeting the challenges", available at http://www.asean.org/news/item/asean-10-meeting-the-challenges-by-dr-termsak-chalermpalanupap-assistant-director-for-programme-coordination-and-external-relations-asean-secretariat-2 (accessed 10 July 2013)

UNIDO (2008). *Public Goods for Economic Development.* United Nations Industrial Development Organization, Vienna.

Van Gelder, J. W., A. Herder and H. Kroes (2009). "Public money for fossil fuels in the EU and in three member States", *Profundo Economic Research.* Castricum, The Netherlands.

Vasconcelos, J. (2013). "Two decades behind schedule, we need to rethink the single energy market". Available at www.energypost.eu/index.php/two-decades-behind-schedule-we-need-to-rethink-the-single-energy-market/ (accessed 12 August 2013).

World Bank (2010). "Subsidies in the energy sector: An overview", Background Paper for the World Bank Group Energy Sector Strategy. Washington, D.C.

VI. The pathway to AEMI

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Abstract

Global experience in regional energy market integration presents broad elements of integration, i.e., binding agreements, physical infrastructure, standardized or harmonized rules of operation, and governing or coordinating institutions. The pathway to ASEAN Energy Market Integration (AEMI) will also involve creating these elements; however, this activity must be preceded by trust-building activities among ASEAN members. Trust should be built by candidly disclosing mutual gains from, and shared costs and externalities in energy resource development, trading energy products, market adjustments and regulatory reforms. Shared databases and assessments could allow ASEAN members to formulate the building blocks of an AEMI regional accord. ASEAN leaders could then forge a regional accord for AEMI through 2030 with actionable targets and timetables. The targets could include establishing or strengthening institutions for facilitating integration efforts, removing border and behind-the-border barriers to energy trade and investments, harmonizing rules and standards, and building the physical infrastructure for regional energy trading. Since energy market integration takes place not only at the government level but also at the private sector level, ASEAN members must base their preparedness to join AEMI on the business case for integration rather than merely on the availability of energy resources. Moreover, at the minimum, ASEAN members should have independent energy regulators and pursue harmonization of rules and standards.

Keywords: ASEAN; cross-border infrastructure; energy market integration; energy regulatory reforms; energy trading.

A. Introduction

Energy market integration in the East Asia region has been pursued at different levels in the history of East Asia energy cooperation. Thailand and the Lao People's Democratic Republic concluded the first energy agreement in 1966 (Shi and Kimura, 2010). Governments in the Greater Mekong Subregion (GMS) – which consists of Cambodia, the Lao People's Democratic Republic, Myanmar, Thailand, and Viet Nam plus Guangxi Autonomous Region and Yunnan province of China – have signed memoranda of understanding for bilateral power trade agreements from 1990 onwards (Zhai, 2010). The first to third ASEAN Plan of Action for Energy Cooperation (APAEC) also specified regional programme areas for cooperation that could support energy market integration, such as the ASEAN Power Grid (APG) and the Trans-ASEAN Gas Pipeline (TAGP) envisioned in APAEC 2010-2015. In other regions, energy market integration is also at various stages of implementation.

Valuable lessons that may be applicable to ASEAN Energy Market Integration (AEMI) through 2030 can be learned from these experiences. Thus, this chapter extracts lessons from the experiences of other regional energy markets such as those in the European Union, the North

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American Free Trade Agreement (NAFTA) region, the MERCOSUR region (*Mercado Comun del Sur* or Common Market of the South) and the Central Asian region. It also draws on lessons from within East Asia by examining the GMS power market. The chapter also investigates specifically what types of energy markets have been integrated and how the integration has been carried out thus far in those regional markets. Taking off from the assessment of regional markets, it then analyzes the options for pursuing integrative activities as well as the possible alternative approaches by the ASEAN members in joining AEMI, given their domestic constraints. The chapter then presents the summary and conclusion.

B. Analytical framework

A regional public goods approach is helpful in examining the pathway to energy market integration, since such integration involves delivering services that create positive spill-over effects in member countries – effects that are greater than what could be achieved if countries provide the services on their own. Two standard properties are used in characterizing public goods in any market – non-rivalry of benefits and non-excludability of free riders. These properties are also helpful in describing regional public goods. Non-rivalry is present when the consumption of a good or enjoyment of a good's benefits by one country in no way diminishes the consumption or enjoyment of such a good's benefits by other countries. Rivalry occurs when crowding or congestion reduces consumption of a good or enjoyment of its benefit. On the other hand, non-excludability of benefits is present when paying countries and non-paying countries alike gain from the positive spillovers of the regional public good. This happens when it is either impossible or prohibitively expensive to exclude non-paying countries from enjoying that regional public good.

Based on the degree of non-rivalry and non-exclusivity, the standard public goods typology consists of four types of goods: pure public good; impure public good; club good; and joint product. These distinctions are also applicable to regional public goods. Sandler (2004 and 2007) described and gave examples of these four types. According to Sandler, in the provision of regional pure public goods, the dispersion of benefits is both completely non-rival and non-excludable. Adopting sound standards of regulations and practices, for example, provides completely non-rival and non-exclusive benefits. On the other hand, in the provision of regional impure public goods, the enjoyment of benefits is partially rival or partially exclusive, i.e., a country's use of the good reduces the benefits available for other countries, or the good's benefits can be limited to those countries that pay for it. Examples include vigilance in surveillance (because vigilance directed at one area reduces vigilance elsewhere) and research findings that are disseminated exclusively to a specific set of countries.

Regional club goods, in turn, provide benefits that are partially rival but fully exclusive, such as regional power grids, air traffic control networks and waterways. Lastly, in joint products, a single activity gives rise to two or more outputs with "publicness" characteristics. An example is the late 1980s treatment programme for river blindness, a disease that affected Latin America, Africa and the Arabian Peninsula. The programme resulted in joint products: (a) it limited potential disruption in the whole region (a pure public good); and (b) it curtailed the country-specific damage to those countries that experienced the disease outbreak.

The regional public goods framework is applicable to energy market integration because there are specific services in an integrated regional energy market that have public good characteristics. Andrews-Speed (2011) provided a preliminary list and classification of such services (table 1).

Table 1. Selected services that have features of regional public goods for a regional integrated energy market

Category	Service	Type of good
Knowledge	Dissemination of research results	Pure public good
	Joint public pronouncements	Pure public good
	Best practice laws, procedures and rules	Pure public good
	Early warning systems	Pure public good
	Market and reserves data	Impure public good
	Analysis of data	Impure public good
	Technological research and development	Impure public good
	Benchmarking data	Impure public good
	Capacity-building and training	Club good
	Events and meetings	Club good
Infrastructure	Network construction	Club good
	Construction of shared infrastructure	Club good
	Maintaining network integrity, security and access	Pure public good
Environment, natural resources, and health	Providing clean energy to cities and households	Pure public good
	Effective husbanding of natural resources	Pure public good
	Reducing acid rain	Impure public good
	Cleaning up after polluting event	Impure public good
Peace and security	Construction of emergency stocks	Pure public good
	Emergency stock sharing system	Club good
	Sea-lane security	Pure public good
	Network security	Pure public good
	Emergency response team	Club good

Source: Andrews-Speed, 2011.

As mentioned by Andrews-Speed (2011), this preliminary identification is illustrative rather than exhaustive. Nevertheless, it is very useful in the sense that it provides important clues on which services need to be delivered and part of the steps towards building an integrated energy market.

C. Regional energy markets around the world

This section reviews the different pathways that integration took in the energy markets of the European Union, NAFTA, the MERCOSUR region and the Central Asian region. It also examines the embryonic pathway to energy market integration within ASEAN itself by describing the current efforts to deepen electricity trading in the GMS.

1. European Union energy market

The accomplishments in the integration of energy markets of the European Union member States were facilitated by the presence of an advanced legal system for enforcing regional energy laws. The concept of mandatory and comprehensive European energy policies was implemented through this legal system. The system involves: (a) European Union regulations, which are legislative Acts that must be enforced by all member States simultaneously; and (b) European Union directives, which lay down goals and are transposed by member States into national laws and procedures within specified deadlines. Since the European Commission has the power to take legal action against any European Union member State, it can enforce European Union energy regulations and directives, and can refer cases of non-compliance to the European Court of Justice (European Commission, 2013a).

In the case of the European Union, the energy markets that were integrated were the electricity and gas markets. It is generally agreed that the sequencing of steps in energy market integration has so far involved three successive waves of major reforms, called the first to third energy packages. The pathway that is visible in these energy packages is liberalization of the energy market, as described by Rokas (2009).

The first energy package comprised European Union directives of 1996 and 1998 concerning common rules for the internal market in electricity and natural gas, respectively. It pushed for generation and transmission unbundling and established the minimum requirements for it, including the requisite accounting and management activities. Rokas explained that this gave rise to a long and controversial discussion on the theory of monopolies, and spawned clarifications of core principles on free competition, transparency, free access to energy networks and security of supply.

The second energy package, which was adopted in 2004, comprised new rules for the internal market in electricity and natural gas. The rules strengthened the separation of transmission and distribution, mandated the establishment of national energy regulators and allowed consumers to choose their energy supplier. By 2004, industrial consumers had the freedom to choose their energy supplier, and by 2007, domestic consumers were able to exercise this freedom.

The third energy package, which was adopted in 2009 and had a transposition deadline of 2011 for the European Union directives, aimed for "ownership unbundling" or the effective separation of supply and production activities from the operation of transmission and distribution systems. It established the Agency for Cooperation of Energy Regulators and the European Network of Transmission System Operators for electricity and gas. It also set binding rules for cross-border network management and additional rules to ensure the transparency of retail markets.

With regard to interconnectivity of infrastructure, the history of physical integration was highly influenced by the development of power exchanges such as the Nordic Power Exchange (Nordpool), which was formed by Norway, Sweden, Finland and Denmark, and the European Energy Exchange in Central Europe. Moreover, continental Europe has what is called a synchronous grid that includes part or all of Austria, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Denmark (western part), France, Germany, Greece, Hungary, Italy, Luxembourg, Macedonia, Montenegro, the Netherlands, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain and Switzerland (UCTE, 2008).

The Asian Development Bank (ADB, 2013a) described the European Union as already well–interconnected. Moreover, ADB explained that the European Commission recognized early on the importance of infrastructure interconnection in preventing the risk of short supply as interconnection diversified sources and facilitated the conveyance of additional generation capacity from renewable energy. At present, more reforms in the European electricity grid are in the offing. The "European Electricity Grid Initiative Roadmap, 2013-2022", in particular,

proposes increases in research, innovation and investment activities in order to increase network capacity for grid users, and to pave the way for a fully decarbonized pan-European electricity system by 2050 through more renewable energy production (European Commission, 2013b).

However, there are still significant barriers to competition that are hindering the progress of European Union energy market integration, as reported by the European Wind and Energy Association (2012). One stumbling block is the fact that European Union member States are currently at different stages of implementing common electricity rules, despite the adoption of the timetable for transposition of European Union directives. Moreover, nationally-regulated consumer prices currently do not allow a transparent comparison between generation technologies; this presents obstacles to efficient and fair competition. The continuing high concentration in energy markets in European Union member States also persists, resulting in significant market power and difficulties for small and medium-sized companies to compete.

2. Energy trading in the NAFTA region

In the trilateral trade bloc created by Canada, Mexico and the United States of America in NAFTA, energy trade is an important component. In fact, the pathway to energy market integration in the NAFTA region is basically the pathway traversed by free trade efforts.

The sequence of steps in energy market integration in the region was preceded by the gradual growth of bilateral natural gas trading between the United States and Mexico, and electricity trading between the United States and Canada. The United States-Mexico natural gas trading began in 1929 when the United States started exporting gas to Mexico. Natural gas was transmitted through a pipeline constructed by a United States company and distributed through the United States pipeline company's subsidiary in Mexico. Over time, gas flowed in both directions across the border, depending on the need and demand in each country (CBA Energy Institute, 1998). United States-Canada electricity trading, on the other hand, began in 1959 when the Government of Canada came up with a national power policy that enabled the interconnection of provincial transmission systems and the export of its surplus power to the United States (Centre for Energy, 2013). In 1988, liberal energy trading provisions were formalized in the Canada-United States Free Trade Agreement (CUSFTA). Most parts of the energy trade provisions in CUSFTA were then extended to Mexico through the 1994 trilateral NAFTA (Hufbauer and others, 2005).

The free trade agreements (FTAs) have been less influential in harmonizing energy policies and prices, but the necessity of cooperating in electricity regulation led to the creation of the North American Electric Reliability Council (NERC) in 1968 and the gradual convergence of energy policies. NERC created electric reliability standards across North America and relied on peer pressure and mutual self-interests in enforcing regulations. In 2006, NERC ceased to be a council and, instead, became a non-profit corporation, the North American Electric Reliability Corporation (the new NERC). Because Mexico's constitutional ban on foreign exploitation of its subsoil resources constrains its energy policy towards its neighbors, NERC is primarily an exercise between the United States and Canada. Nevertheless, NERC members also include energy suppliers to a portion of Baja California Norte, Mexico (Hufbauer and others, 2005).

3. Infrastructure investments, energy trade in MERCOSUR

In the MERCOSUR region, the pathway to energy market integration was cleared by greater economic openness and liberalization in Latin America in the 1990s. After the politically tumultuous 1980s, the Latin America region slowly stabilized and new instruments for regional cooperation emerged, such as the MERCOSUR in 1991. MERCOSUR, which is an economic and political agreement among six member States – Argentina, Brazil, Paraguay, Uruguay,

Venezuela and Bolivia (which became the newest member in July 2013) – is a customs union or a type of trade bloc that is composed of a free trade area with a common external tariff.

The liberalization in the MERCOSUR region facilitated not only trade but a wave of investments, including investments in natural gas pipelines and electricity transmission lines. According to Bailey (2013), seven natural gas pipelines were built between 1997 and 1999 to connect Argentina's natural gas reserves with resource-poor Chile. In 1999, a massive natural gas pipeline from Bolivia's then newly proven reserves to southern Brazil was also completed. Expansion of electricity transmission grids also occurred during 1997-1999. The grid interconnection between southern Brazil and Argentina, which was built in 1999 and then reinforced with double capacity in 2002, allowed Brazil to access Argentina's thermal power capacity during periods of drought and, in turn, allowed Argentina to access Brazil's cheap hydropower during peak demand periods. Small-scale transmission links between Argentina and Uruguay, and then between Brazil and Uruguay, were also built to insure Uruguay's hydropower-dominated power system against drought.

Power industry restructuring activities in the region also helped, and the transfer of control to private groups as well as capitalization of power companies led to greater investments. Hammons and others (1997) explained that Chile pioneered industry restructuring in Latin America in 1982, as it unbundled the formerly integrated utilities into different business units for generation, transmission and distribution. Argentina also embarked on restructuring in 1991 as it provided for a vertical division of activities and the establishment of a wholesale electricity market. In 1994, Bolivia adopted a structure similar to that of Argentina.

The formulation of guidelines and common energy policies under the market framework of MERCOSUR also facilitated the greater openness to energy trade and infrastructure investments in the region. The Work Subgroup on Energy Policy does most of the work of coordinating information and the points for decision-making by the Common Market Group, the executive body of MERCOSUR, and by the Common Market Council, where the highest level of decision-making in MERCOSUR takes place. Burgos (2007) described the market framework for integration and cooperation in the energy sector as including financial stipulations, energy efficiency, environmental protection and legal harmonization. These are particularly contained in rules such as MERCOSUR Decision No. 1/93, which calls for the definition of basic guidelines for energy policy in the common market, and Resolution GCM No. 57/93, which stipulates the fundamentals for energy cooperation.

Moreover, the Initiative for the Integration of Regional Infrastructure in South America (IIRSA), a forum for the coordination of intergovernmental actions, is helping to strengthen the physical integration of infrastructure through a portfolio of projects financed in part by the Inter-American Development Bank (IADB, 2013). However, IIRSA – which covers a region larger than that of MERCOSUR – not only focuses on energy but also on transportation and communications.

Bilateral agreements are the norm in energy trade and integration in MERCOSUR. However, after the energy rationing crisis in Brazil in 2001-2002, energy supply security became a major concern. It became evident that bilateral agreements limit the scope for energy integration and for preventing opportunistic behavior. At present, a multilateral energy security reserve, which will be provided with multilateral mechanisms and legal agreements, is being proposed to prevent the opportunistic behavior of Governments and energy market agents (de Oliveira, 2010).

4. Integrated power system in Central Asia

In the case of the Central Asian region, generation and transmission were integrated through the joint operation of the Central Asian Power System (CAPS, which comprises the power networks of Uzbekistan, southern Kazakhstan, the Kyrgyz Republic, Tajikistan and Turkmenistan). Mercados Energy Markets International (2010) traced the origins of CAPS to the 1970s when the present national borders of the former Soviet Union republics were not yet defined. The integrated power system has historically relied on hydropower plants for electricity generation and some contribution from fossil fuel-based generation, especially when hydropower generation is low during winter. After the disintegration of the Soviet Union, coordination failures emerged in the operation of the components of the power system, such as water reservoirs and fossil fuel-based generation.

The case of integration in Central Asia is not one where energy market integration has been built from previously non-integrated national markets, but one wherein an integrated energy market has been prevented from collapsing. As in the cases of a gradual build-up of energy market integration in the European Union and the NAFTA and MERCOSUR regions, cementing and strengthening integration in Central Asia required the following steps: (a) forging legal agreements among countries; (b) establishing an entity to take charge of coordinating energy-related transactions; and (c) assessing and taking advantage of trading opportunities.

Mercados Energy Markets International (2010) reported that the legal basis for joint regional power operation was forged in 1998 when senior management officials from the separate national power systems signed the "Agreement on Parallel (Joint) Operations of the Power Systems of the Republic of Kazakhstan, the Kyrgyz Republic, the Republic of Tajikistan, Turkmenistan and the Republic of Uzbekistan." Other agreements were signed in the succeeding years, such as the agreement on energy transit and the agreement on mutual assistance in case of power system failures. The five countries also founded the regional Coordination Dispatch Center located in Tashkent, Uzbekistan. The center, which functions as the first coordination level for Central Asia dispatch, is financed by the five countries on a cost-sharing basis. Each national power system has its own dispatching authority, which functions as a second level for dispatch operations.

Data from the Coordinating Dispatch Centre cited by Omorov and Lynch (2010) show that electricity imports and exports between the countries declined in 2000-2008. During that period, national internal power systems began to fail functionally due to, among other reasons, ageing regional power infrastructure and coordination difficulties. Subsequently, self-sufficiency became the strategy of each country, seemingly unaware that there were lost economic opportunities and foregone mutual benefits from weakening trade. As argued by Omorov and Lynch (2010), regional energy trade in the Central Asia region will result in benefits to the participating countries by ensuring that energy demand is met and surpluses are traded optimally. To carry out trade, infrastructure projects, such as maintaining reservoirs, building substations, rehabilitating transmission lines and improving transmission metering, are crucial; this fact is currently gaining recognition, as is apparent in the project list of the member countries of the integrated CAPS.

Industry restructuring, however, is not yet a major component of the pathway to stronger integration in the Central Asian region. Mercados Energy Markets International (2010) also reported that among the member countries in CAPS, Kazakhstan was the only one that had introduced electricity market restructuring, which is done by separating the transmission system operator from the generation and distribution company. The other countries still maintain vertically integrated generation, transmission and distribution.

5. GMS electricity trading

Electricity trading in the GMS reached its current state through a sequence of steps that involved, for the most part, forging bilateral agreements. The first energy agreement between Thailand and the Lao PDR was signed in 1966, one year before the first ASEAN Declaration in 1967. From 1990 onwards, more bilateral agreements were signed between various Governments in the subregion (Zhai, 2010).

Building the physical infrastructure to allow more trading was also a significant step. Beginning in 1992, projects for forging greater energy cooperation and constructing transmission interconnection were implemented with private sector participation and ADB assistance. Prior to this, the only significant transmission links in the subregion were those between the Lao PDR and Thailand. As a result of the infrastructure investments, major high voltage power interconnections now exist through the following links: Lao PDR-Thailand, Myanmar-Yunnan Province of China, Viet Nam-Cambodia, and Yunnan Province of China-Viet Nam. Medium- to low-voltage interconnections also exist through the following links: Lao PDR-Cambodia, Lao PDR-Thailand, Lao PDR-Yunnan Province of China, Lao PDR-Viet Nam, Yunnan Province of China-Viet Nam, Thailand-Cambodia and Viet Nam-Cambodia. These interconnections allow the following electricity trade flows: Cambodia has been importing from southern Lao PDR since 2010, Thailand since 2009 and southern Viet Nam since 2008; northern Lao PDR has been importing from Thailand since the late 1990s and Yunnan Province of China since 2009; Thailand has been importing from the Lao PDR since 1971; northern Viet Nam has been importing from Yunnan Province of China since 2004; Yunnan Province of China has been importing from Myanmar since 2008 (ADB, 2012).

The path that GMS interconnection pursued also involved a series of calculated steps to institute a governance mechanism for energy cooperation and trading. First, as a result of an energy sector study assisted by ADB, a subregional Electric Power Forum (EPF) was formed in 1995 and henceforth has been meeting at least once a year. Next, EPF facilitated the adoption of a policy statement on regional power trade in the GMS in 1999, which then led to the formulation of an intergovernmental agreement to implement the policy statement. This agreement served as the legal authority to implement electric power trading and was signed by all GMS countries during the first GMS summit in 2002. In the agreement, the GMS countries also agreed to create a Regional Power Trade Coordination Committee (RPTCC) to provide strategic direction and overall management of GMS power trade. The RPTCC's major accomplishment thus far is the completion of the initial Regional Power Trade Operating Agreement, which is a set of technical and commercial guidelines to support the establishment of a regional power market in the GMS (ADB, 2012).

Zhai (2010) explained that the GMS countries committed, through successive memoranda of understanding (MoU), to embark on a road map towards a regional power market. In one MoU, the road map is described as comprising the following four stages:

- Stage 1 – The first cross-border transactions are developed; transactions between pairs of neighboring countries exist and are linked to power purchase agreements (PPAs);
- Stage 2 – Trading becomes possible through bilateral PPAs between any pair of GMS countries using the transmission facilities of a third regional country;
- Stage 3 – Multiple buyers-sellers are allowed to enter into cross-border transactions;
- Stage 4 – Most of the GMS countries change to the multiple sellers-buyers regulatory framework; a regional wholly competitive market exists.

ADB (2012) reported that the subregion is currently in Stage 1, wherein GMS regional power trade is characterized mainly by bilateral trade via PPAs involving independent power producers.

D. Different options for a pathway to AEMI

An examination of the experience in energy market integration in different regions of the world shows that common elements have emerged. Broadly, these are: (a) binding agreements; (b) physical infrastructure; (c) standardized or harmonized rules of operation; and (d) governing or coordinating institutions.

With regard to binding agreements, all the energy markets studied in the previous section feature regional agreements with different levels of strength in binding the member States. It can also be seen that investing in physical infrastructure, either to connect existing infrastructure networks in neighboring countries or to create new networks that cut across countries, is a significant activity in these markets. This is to be expected because such infrastructure is the main vehicle in physically carrying out energy trade. Moreover, the formulation of new rules, such as cross-border dispatch rules to which each generator, supplier, or distributor in participating countries must adhere, is closely tied to the operation of the infrastructure. In addition, all the scrutinized energy markets have regional institutions with varying degrees of governing powers – some can directly govern the energy market and some can only coordinate and provide guidance to bilateral agreements.

It is also apparent that the common elements mentioned above are major building blocks of an integrated energy market; the sequencing of steps towards energy market integration can be guided by the desire to prioritize the building blocks. There are certainly other building blocks, but the discussion here is not meant to exhaust the listing of all of them; the aim is only to identify the major ones that emerged in the specific review of literature that has been conducted in the preceding section. For example, restructuring and unbundling of the energy industry has been a building block in some cases, but has not been a crucial factor in cases wherein a country's vertically integrated energy industries are still able to participate in regional energy market integration.

The features of these regional markets that hold promise for the ASEAN members' appreciation of the need for energy market integration are those features that resonate well with them and which are gradually emerging as sources of their vulnerabilities as a region and as individual countries. The two most prominent features are energy security and adaptability of regulations to dynamic global conditions. ASEAN's growing demand for energy juxtaposed with internal and external (i.e., outside ASEAN) competition for energy use brings to the fore the need to secure energy supply, not only unilaterally but also as a region and in a coordinated way. The energy security objective, however, need not be pursued in a protectionist manner nor equated with advancing regional energy self-sufficiency.

The flexibility of regulations to allow countries to efficiently trade in energy products not only within ASEAN but also with countries outside the region, especially during energy crises, is very important. Within ASEAN, the responsiveness of energy regulations to dynamic global conditions is a serious challenge that must be acknowledged by leaders of the member States. It is crucial to note that some ASEAN members do not even have independent regulators for energy (as discussed in the next section). The realization that there is a need to address these two interrelated sources of vulnerabilities – energy security and regulatory flexibility – could rouse awareness among ASEAN leaders of the positive spill-over effects of, and mutual benefits from providing regional public goods in an integrated energy market. The decision to take advantage of mutual gains could then lead to them pursuing steps to supply the regional public goods and examining the appropriate way of sequencing those steps.

1. Varying emphasis on steps towards integration in other regional markets

The sequencing of steps towards energy market integration in other regions, however, has not been a clear-cut sequencing. Rather, it is an interrelation of big steps and small steps with varying emphasis, i.e., with some steps gaining more prominence than the others simply because that is what is required by the region's environment and historical context. The options for pursuing AEMI based on other regions' experiences can therefore be presented as options for placing emphasis on, or for prioritizing the building blocks of an integrated regional energy market. The emphases, as interpreted in this chapter, are:

(a) Integration of the legal structures (European Union experience);

(b) Free trade in energy (NAFTA experience);

(c) Liberalization of infrastructure investments (MERCOSUR experience);

(d) Operation of physical infrastructure (Central Asian experience); and

(e) Bilateral agreements (GMS experience).

The European Union pathway took advantage of the rule-making process set by the European Commission to liberalize energy markets and facilitate integration. In the regional legal system of the European Union, member States agreed to be bound by European Union regulations and transpose their national laws or regulations to conform to European Union directives. In addition to the mutual pursuit of energy market integration objectives, the existence of a regional court to enforce legal agreements also prompts member States to adhere to action plans and targets. Given the legal structure, there is a relatively commodious support for creating institutions with powers rather than institutions that merely facilitate information flow and cooperation agreements. The Agency for Cooperation of Energy Regulators (ACER) is one such institution. ACER is created not only to promote cooperation among national energy regulatory authorities in the European Union but also, and more importantly, to provide the European Union-level authorities with a means of monitoring the activities of national energy regulatory authorities. The ACER also has decision-making powers on cross-border issues (ACER, 2013).

ASEAN, however, is far from having a regional legal system similar to that of the European Union. Tracing the successive treaties that led to the current regional legal system in the European Union will reveal an evolution that was initially motivated by a desire to temper extreme nationalism and intolerance witnessed during World War II. Such strong impetus for having supra-national legal entities is missing in the ASEAN historical context and it may take a while before a similar legal structure evolves in ASEAN.

The NAFTA pathway, which puts emphasis on free trade in energy products and services, may be feasible for ASEAN. The ease of implementation, however, may not be comparable, given that the NAFTA case started with only two countries and then three later. Coordination in quickly implementing free trade in energy may be more difficult to handle in ASEAN wherein 10 member States are involved in a free trade area. Moreover, the removal of tariff and non-tariff barriers in ASEAN, one of the primary objectives of the ASEAN Free Trade Agreement when it was signed in 1992, is still a work in progress. This is quite apparent in the efforts to have an ASEAN Economic Community (AEC) in place by 2015. The AEC is envisioned as an integrated economic region characterized by four pillars: (a) a single market and production base; (b) a highly competitive economic region; (c) a region of equitable economic development; and (d) a region that is fully integrated with the global economy (ASEAN Secretariat, 2012a). At present, it appears that the full achievement of AEC in 2015 is unlikely, given that a significant number of the various AEC measures agreed upon in 2007 have not yet been achieved. For example, the ASEAN Secretariat (2012a) reports that in the AEC Scorecard for Pillar 1, that is, a single

market and production base (which involves the free flow of goods, services, investment and capital), the implementation rate was only 65.9 per cent as of 2012, just three years before the AEC target.

The same can be said about the option wherein the liberalization of infrastructure investments is emphasized in the steps towards energy market integration, as was done in the MERCOSUR region. This option may be feasible in ASEAN, but significant barriers to the free flow of capital and investments still exist and removing them is turning out to be a long process. For example, measures to implement the free flow of capital and investments within ASEAN are difficult to ratify because some of them are not aligned with national domestic laws, such as restrictions on foreign equity ownership in domestic firms or limits to the land tenure of foreigners.

The emphasis on the operation of physical infrastructure, as was done in the Central Asian region, is not a practical pathway at present. This is obvious because the prerequisites to such an operation are not yet in place. In the GMS grid interconnection, for example, transmission regulation is the more practical objective (at least, at present) than joint operation. Even in the GMS case, the prerequisites for undertaking transmission regulation have yet to be attained, i.e., performance standards, transmission regulation rules, metering guidelines and a GMS Grid Code (ADB, 2013b).

Moreover, even in the pursuit of the envisioned ASEAN power grid, challenges remain. The planned interconnection projects will require significant investments in marine or undersea cable interconnections as well as inland interconnections involving the participating countries' transmission grids. Although interconnection was deemed technically feasible in the 2011 Master Plan on ASEAN Connectivity (ASEAN Secretariat, 2011), the economic viability of the planned projects have yet to be established and accepted by the participating ASEAN members. It should be noted, however, that the Central Asian experience provides a critical lesson that is relevant to ASEAN, i.e., a breakdown in infrastructure operation could lead to energy insecurity and a desire to pursue self-sufficiency, which could then lead members to be blind to the mutual gains from trade.

2. Possible emphasis on, and sequencing of steps in AEMI

The emphasis on bilateral agreements on trade and cross-border infrastructure, as currently being followed in the GMS experience, may be viewed as a natural recourse in the absence of governance mechanisms at the regional level. However, the option for AEMI should strive for something higher than this. ASEAN members should strive to forge multilateral agreements on energy trade and investments. Multilateral trade relationships could provide a stronger compulsion for the removal of energy tariff and non-tariff barriers across the ASEAN region than what could be provided by bilateral trade relationships.

Energy market integration should also go beyond trading of electricity that can be transported over the wires. There are still other energy products that can be traded aside from electricity including, for example, petroleum products, natural gas, biomass resources and renewable energy technological equipment. The GMS experience, nonetheless, opened up opportunities for testing the building blocks of an integrated energy market in one corner of ASEAN. Given this experience, expanding the energy market integration effort in scale and scope from one subregion to the whole ASEAN region is a promising option.

In the literature, there is no estimation yet of the benefits that will accrue to ASEAN from pursuing this option of expanding the GMS regional energy market integration to cover the whole ASEAN. However, the benefits in the GMS region itself provide helpful leads to the potential benefits for ASEAN. In a study by Economic Consulting Associates (2010) of the

potential of regional power sector integration in the GMS, the benefits include lower tariffs for countries that have high tariffs and are dependent on high-cost generation. Countries that could benefit include Cambodia, which has extremely high tariffs due to its dependence on oil-fired generation, and Thailand, which has relatively high tariffs partly due to its dependence on gas-fired generation. Moreover, trade in an integrated energy market is driven not only by the benefits in the form of lower tariffs for end-users in importing countries but also by revenue-generating opportunities for exporting countries. In this regard, Economic Consulting Associates explained that the demand for power exports from hydro-power produced by the Lao PDR and Myanmar has provided these countries with opportunities to earn revenue through independent power producers. There are also potential benefits in terms of carbon emissions reduction. ADB (2009) estimated that around 3 per cent savings in carbon emissions could be realized in a fully integrated GMS regional energy market scenario, relative to the business-as-usual base scenario.

The practicable approach for expanding the energy market integration effort in scale and scope within ASEAN is "the ASEAN Way", which is the succinct description being used by ASEAN members in their approach to unifying the region on various matters. As encapsulated in the Treaty of Amity and Cooperation in Southeast Asia (ASEAN Secretariat, 2013), the ASEAN Way can be characterized as being guided by non-interference, discreteness, informality, consensus building, non-use of force and non-confrontational bargaining. It contrasts with the majority votes, legalistic decision-making, litigation and confrontational methods such as sanctions and economic embargoes.

Given that the ASEAN Way emphasizes building trust, the desirable first step towards AEMI is to conduct:

(a) A candid evaluation of the opportunities for investments in energy resource development, with full disclosure of benefits and costs (including costs related to the environment or health);
(b) A reliable assessment of energy trading potential in the region, with emphasis on mutual gains from trade; and
(c) Comparative surveys of domestic energy market structures as well as regulatory institutions, frameworks, rules and plans, with emphasis on areas for technical cooperation rather than weakness points.

Of course, an important prerequisite is an agreement among senior leaders of ASEAN that conducting these assessments and surveys is worth undertaking. The buildup of databases and assessments of resources, investment, trade, market structures and regulations is meant to bring out the elements of an AEMI regional accord, or a set of AEMI regional accords if necessary, that balances the interests of ASEAN members. The next step is to forge an ASEAN regional accord for AEMI with actionable targets and timetables.

A general timetable of up to 2030 may emerge, given that in the vision for ASEAN 2030, the remaining barriers to the free flow of goods, services and factors of production will be eliminated in the years up to 2030. Creating a regional institution or strengthening an existing regional institution to be the repository of information and monitor accomplishments is an important next step. The existing institution that may be strengthened in order to coordinate and monitor integration efforts is the ASEAN Centre for Energy, an entity established in 1999 and provided with core funding from an energy endowment fund consisting of equal contributions from the 10 ASEAN members. The existing group that may be strengthened in order to facilitate regulatory reforms is the ASEAN Energy Regulators' Network (AERN). AERN is a network of regulators that has been meeting since March 2012 and was recognized in the 30th ASEAN Ministers of Energy Meeting in September 2012, wherein the network was asked to strengthen

communication channels in order to promote mutual understanding of energy regulations among member States (ASEAN Secretariat, 2012b).

After making the case for more liberal trade and investments in the energy sector, ASEAN members could agree to remove border and behind-the-border barriers to trading of energy products and investing in energy infrastructure. As a consequence, energy provisions could be written in future FTAs in a more tangible and explicit manner. Harmonization of rules, standards and procedures (for example, rules for resource exploration, standards for power purchase contracts, procedures for dispatch in interconnected grids, and customs clearance along borders), could also augment the removal of barriers to trade and investment. The shape of the physical interconnectivity through such infrastructures as power grid interconnection, gas pipeline network, liquefied gas shipping ports, petroleum transportation points, and regasification terminals, will be guided by resource availability, feasibility of investments, and trading opportunities.

Later, the question of joint operation of physical connections or infrastructures with on and off switches will emerge and ASEAN could be confronted with two choices: (a) to create a separate institution that has decision-making powers on cross-border operational issues; or (b) agree on protocols for operations and conflict management with which each national authority for infrastructure operations has to comply. The ASEAN Way that emphasizes building trust and disfavors sanctions will not necessarily be in conflict with global standards on punitive actions for operational non-compliance as long as protocols are approved by a high-level ASEAN governing body.

3. Electricity market interconnection

With respect to electricity market interconnection, which is a subset of energy market integration, Porter and Situmeang (2005) discussed the stages of reform towards an ASEAN Electricity Market. Table 2 clearly indicates that to obtain a sound investment climate in the sector, separating transmission and generation, and distinguishing between transmissions and generating price must be prioritized. A road map to clearly address the reform targets needs to be formulated for each country. Further, as table 3 shows, there can be three road maps for cross border interconnections: (a) point-to-point interconnection; (b) limited network-to-network interconnection; and (c) full system interconnection.

Based on electrical distances or regions, Porter and Situmeang (2005) divided the region into three electrical systems: (a) system 1 – part of the GMS that comprises Cambodia, the Lao PDR, Myanmar, Thailand and Viet Nam; (b) system 2 – peninsular Malaysia, Singapore, Sumatera (Indonesia) and Thailand; and (c) system 3 – Brunei Darussalam, Sabah, Sarawak and West Kalimantan (Indonesia). Moving towards interconnected systems will increase not only the complexity of the institutional arrangements but also the level of investment. In order to make the transition smooth, studies need to be conducted in order to prepare for all possible difficulties that need to be hurdled at the regional and national levels.

Table 2. Stages of reform – transition to the ASEAN electricity marke

Reform Target	Timing rationale	Priority	Country issues
Separation of transmission from generation	Early step - to facilitate separate and better informed investment decisions on transmission and then generation	Very high	Completed in the Philippines and Singapore - plans elsewhere in differing stages
Separate pricing of transmission and generation (energy) charges	Until prices are separate, there will be a tendency to get unsound investment decisions	Very high	
Passage of electricity and competition laws, including laws re. transmission and access regimes	Existing laws may not be adequate to cover what is needed	High	Need to get details right - can progress some issues contractually before law is passed
Development of code for electricity trading and contracting	Need to do structural separations and pricing reforms first	Medium	Singapore well developed - some good role models
Remove supply subsidies - e.g., on oil and gas	Politically difficult, but in varying degrees; need clear communications as to why subsidies are not effective in helping those in poverty; need to use other strategies	Medium - delay will cause poor decisions and fiscal problems	Problems in Indonesia, Malaysia and Brunei Darussalam
Restructuring stranded generation assets, new PPA	Sunk costs need to be written off and charged to general revenues. Allow optimal use of all assets at current valuations	High	Problems in a few ASEAN countries

Source: Porter and Situmeang, 2005.

Table 3. Choice of road map

Gradual change - continued point-to-point interconnection *(Option 1 or Road Map 1)*	**Ring-fenced changes - unbundling of transmission prices and limited point and network to network interconnection** *(Option 2 or Road Map 3)*	**Full system interconnection - ASEAN Electricity Market** *(Option 3 or Road Map 3)*
Steps Required • No change from current situation, but with selective evolution of pricing and ring-fencing of transmission and generation, with a view to long-term goals • Institutions 1. No need for regional institutional body 2. Negotiations on bilateral basis 3. Joint system operation; coordination with other countries system control if it couples operationally with the national grid, to assure the agreed cross-border electricity transfers • Commercial arrangements 1. Mostly long-term contracts and emergency exchange agreements 2. Information asymmetry – no disclosure of cost basis	Steps Required • Step-by-step advances from current situation, notably in the separation of pricing on transmission and generation, and ring-fencing of the respective businesses • Formation of transmission system operator (TSO) for each system – can initially be more than one in some countries with separated systems • Set up of region-wide institution – ASEAN Committee on Transmission and Interconnection 1. Management committee of TSOs, with three regional subcommittees 2. Financial, regulatory and planning expertise, usable by Member Countries 3. Coordination centre for system operation (2 levels for system operation management), or at minimum requirement joint system operation coordination with other countries system controls	Steps Required • Regional institutions as for Option 2 – ASEAN Committee on Transmission and Interconnection PLUS • Regulation 1. Increasing harmonization across countries, common rules 2. Unbundled pricing and competition on price (not cost) – desirable but not required • Commercial arrangements 1. Loose trading pool with longer-term contracts still available • Conventions 1. On accounting, dispute resolution, disclosure requirements so information is symmetric

Source: Porter and Situmeang, 2005.

E. Influence of national constraints

The ASEAN member states have different national constraints that could influence the pace at which they would be able to join AEMI. These include, but are not limited to, preparedness in exploring their own resources, subsidy policies, national laws limiting their participation, and regulatory inflexibility.

With regard to energy resources, Nicolas (2009) states that eight of the ASEAN members have proven oil and gas reserves (Brunei Darussalam, Cambodia, Indonesia, Malaysia, Myanmar, the Philippines, Thailand and Viet Nam,) and five have substantial coal resources (Indonesia, Malaysia, the Philippines, Thailand and Viet Nam); moreover, the countries in the northern region (the Lao PDR, Myanmar and Viet Nam) are rich in hydropower resources. Singapore, in contrast, does not have any natural energy resources and is heavily dependent on energy imports. Given the mapping of resource availability, the temptation is strong to formulate a blueprint for integration based on such mapping. This is apparent in the vision for a trans-ASEAN natural gas network. The activities towards achieving this vision have been pushed back due to delays in developing the Indonesian East Natuna field that has total proven reserves of 46 trillion ft^3 of gas (Global Association of Risk Professionals, 2013). It has turned out that the delays are due to commercial viability issues arising from the huge cost of developing the gas field, which contains high carbon dioxide levels, without government incentives.

From this experience, it is apparent that energy market integration does not only take place at the government level but also at the private sector level. Thus, an alternative approach to basing integration plans on resource mapping is planning integration based on an indicative business case test as well as the preparedness of countries to develop their energy resources (through their own investments or jointly with foreign partners).

The high subsidies in other ASEAN members could also influence their pace in joining AEMI. According to an IMF (2013) report on energy subsidies, most ASEAN members provide energy subsidies. The IMF report also shows that in the case of pre-tax subsidies, Indonesia provides the highest subsidy for petroleum products (2.58 per cent of GDP) while Thailand provides the highest subsidies for electricity and coal (1.64 per cent and 0.25 per cent of GDP, respectively) and Malaysia provides the highest subsidy for natural gas (0.31 per cent of GDP).

Energy market integration aims to enforce market-based pricing and energy-use efficiency, but the subsidy policies of some ASEAN members may run counter to these goals since subsidies understate the true price of energy and encourage over-consumption. Thus, the AEMI efforts must also include agreements to implement a gradual and coordinated phasing-out of subsidies or the replacement of subsidies with energy programmes that directly target the poorest of the poor.

National laws may also present limitations to the pace and level of integration. For example, in the Philippines, the liberalization of investments in energy will be limited by the 40 per cent ceiling on foreign equity ownership of companies operating domestically. Another example is Indonesia, which has stricter criteria for electricity imports relative to exports. Government Regulation of Indonesia No. 42, 2012 provides that the following six criteria be fulfilled before contracting electricity imports: (a) local demand cannot be fulfilled (i.e., reserve capacity is less than 30 per cent of peak load); (b) imports complement local need; (c) no negative impact on national interest such as sovereignty, security and economic development; (d) imports will improve the quality of local supply; (e) development of national capacity should come first; and (f) the country will not be trapped in energy dependency. On the other hand, there are three criteria for contracting exports: (a) local need has been fulfilled; (b) there is no subsidy on price; and (c) exports do not have a negative impact on the quality of local supply. These criteria

imposed by Indonesia imply that trade flows will be guided less by cost advantages and price differentials, and more by the need to prioritize the national generation capacity in dispatch even if the priority dispatch is costlier than imports.

The amendment of national laws will likely be a delicate issue among ASEAN members; at the start, as the harmonization of laws is being worked out, the potential gains from energy trade and investments must still be explored while recognizing the limits set by national laws.

With regard to regulatory reforms in order to aid trade and investment liberalization, the alternatives could be to proceed with a common goal of market restructuring and private-led competition or to proceed despite the presence of vertically integrated industries and state-owned monopolies. Regulatory reform is a serious challenge, given that some ASEAN members do not even have independent regulators (table 4).

Table 4. State of energy regulation in ASEAN members

Country	Regulator	Independence	Structure
Brunei Darussalam	Department of Electrical Services	Not independent; under the Ministry of Energy	Single Buyer
Cambodia	Electricity Authority of Cambodia	Independent; set up in 2001	Single Buyer
Indonesia	Department of Energy and Mineral Resources	Not independent; under the Ministry of Energy and Mineral Resources	Single Buyer[a]
Lao PDR	Department of Electricity	Not independent; under the Ministry of Energy and Mines	Single Buyer
Malaysia	Energy Commission	Independent; set up in 2001	Single Buyer
Myanmar	Ministries of Electric Power 1 and 2	Not independent; under the Ministries of Electric Power 1 and 2	Single Buyer
Philippines	Energy Regulatory Commission	Independent; set up in 2001[b]	Price Pool
Singapore	Energy Market Authority	Not independent; under the Ministry of Trade and Industry	Price Pool
Thailand	Energy Regulatory Commission	Independent; set up in 2007	Single Buyer
Viet Nam	Electricity Regulatory Authority	Not independent; under the Ministry of Industry	Cost-based Pool

Source: Ruangrong, 2013.

Notes: [a] Partial liberalization is achieved by allowing power plants to sell capacity directly to end-users rather than to Perusahaan Listrik Negara alone.

[b] However, even before 2001, a regulator existed – the Energy Regulatory Board under the Department of Energy.

Admittedly, although more work is needed in liberalizing energy markets domestically, ASEAN members should not wait until energy industries are restructured and domestic power exchanges are established before joining AEMI. The establishment of competitive domestic energy markets should still be set as a long-term goal. However, participation in AEMI efforts

could proceed in gradual steps, even though the domestic markets in some ASEAN members are still dominated by state-owned enterprises or by vertically integrated industries.

What is crucial in the immediate future is building trust between importers and exporters, regardless of whether the importing or exporting entities are state-owned or private, or whether these are domestic monopolies or not. Nevertheless, the establishment of independent regulators in each ASEAN member as well as the harmonization of rules and standards should be minimum prerequisites. This is important in formulating regional regulatory agreements that ensure the sanctity of contracts is respected, supply interruption is avoided when political problems occur and ownership of cross-border infrastructure or control over a resource is not used for opportunistic trade.

6. Summary and conclusion

This chapter shows that countries choosing to join a regional integrated energy market can enjoy regional public goods produced in the integration process. These regional public goods create positive spill-over effects for the member countries that are greater than what could be achieved if the countries produce the goods on their own. Examples of regional public goods in regional integrated energy markets include (a) knowledge-related services such as best practices in regulating the energy market, (b) infrastructure such as electricity transmission network, and (c) security services such as emergency energy reserve sharing system.

In the review of the experiences of selected regional energy markets around the world, broad elements or building blocks of integration that have "publicness" characteristics emerged. These are binding agreements, physical infrastructure, standardized or harmonized rules of operation, and governing or coordinating institutions. The decision to take advantage of the positive spill-over effects and mutual benefits from regional energy market integration can lead the ASEAN members to take steps to supply these regional public goods through AEMI.

The sequencing of steps towards energy market integration is not clear-cut, as shown in the experience of other regional energy markets; rather, the steps are interrelated and could be given varying emphasis, depending on the regional market's environment and history. As interpreted in this chapter, the highlight of the European Union experience is the integration of legal structures. The NAFTA experience highlighted free trade in energy. The emphasis in the MERCOSUR experience is on liberalization of investments that made infrastructure build-up possible. The highlight of the Central Asian experience is the operation of infrastructure interconnection. Finally, the highlight of the GMS experience is the forging of bilateral agreements.

In the case of AEMI, it is recommended that the practicable option is to expand the initiated GMS integration effort in scale and scope within ASEAN, through "the ASEAN Way", which emphasizes building trust among the member States. Trust should be built by candidly disclosing mutual gains from, and shared costs and externalities in energy resource development as well as trading energy products, market adjustments and regulatory reforms. There is also a need to accumulate shared databases on, and assessments of resource, trading, investment, market structures and regulations in order to uncover the elements that should be part of an AEMI regional accord. ASEAN leaders could then forge a regional accord for AEMI through 2030 with actionable targets and timetables, such as establishing or strengthening institutions for facilitating integration efforts, removing border and behind-the-border barriers to energy trading and investments, harmonizing rules and standards, and building the physical infrastructure for regional energy trading.

The ASEAN members are currently confronted with national constraints of varying intensities and these could have an impact on their motivation to join AEMI. One sticking point is the

lack of independent regulators for the energy sector in some ASEAN members. Thus, this chapter recommends that, at the minimum, the ASEAN members should have independent energy regulators and should pursue harmonization of rules and standards.

Finally, the ASEAN members should note that energy supply and demand imbalances that drive integration and create mutual gains from trade are never permanent. It is also possible that the ever-changing supply and demand outlook could lead to one or several ASEAN members being either overconfident or insecure, both of which could result in less reliance on energy market integration, the pursuit of energy self-sufficiency domestically, or more inclination to look outside the region for trading and investments. However, ASEAN members must recognize that the future will always be uncertain. Moreover, it is this same dynamic nature of supply and demand within and outside ASEAN that should motivate the pursuit of energy security through an integrated energy market that has the flexibility to adjust to changing global conditions.

References

ACER (2013). *Agency for the Cooperation of Energy Regulators* Available at www.acer.europa.eu/The_agency/Pages/default.aspx (accessed 6 July 2013).

ADB (2013a). *Asian Development Outlook 2013: Asia's Energy Challenge*. Asian Development Bank, Manila.

——— (2013b). "Proceedings of the Meetings of the GMS Regional Power Trade Coordination Committee – Third Meeting of the Working Group on Performance Standards and Grid Code". Available at www.adb.org/sites/default/files/pub/2013/gms-wgpg3-meeting-summary-discussions.pdf (accessed 10 July 2013).

——— (2012). *Greater Mekong Subregion Power Trade and Interconnection*. Asian Development Bank, Manila.

——— (2009). *Building a Sustainable Energy Future: The Greater Mekong Subregion*. Asian Development Bank, Manila.

Andrews-Speed, P. (2011). "Energy market integration in East Asia: A regional public goods approach", ERIA Discussion Paper Series 2011-06. Economic Research Institute for ASEAN and East Asia. Jakarta.

ASEAN Secretariat (2013). Treaty of Amity and Cooperation in Southeast Asia, 1976 and amended in 1987, 1998, 2003 and 2009. Jakarta.

——— (2012a). *ASEAN Economic Community Scorecard 2012*. Available at www.asean.org/resources/publications/asean-publications/item/asean-economic-community-scorecard-3 (accessed 10 July 2013).

——— (2012b). "Joint Ministerial Statement of the 30th ASEAN Ministers of Energy Meeting, 12 September 2012." Available at www.asean.org/news/asean-statement-communiques/item/joint-ministerial-statement-of-the-30thasean-ministers-of-energy-meeting-amem (accessed 4 July 2013). Jakarta.

——— (2011). "Master Plan on ASEAN Connectivity". Jakarta.

Bailey, J. (2013). "Shale and beyond: The next phase of Latin American energy integration", *World Politics Review*. Available at www.worldpoliticsreview.com/articles/12761/shale-and-beyond-the-next-phase-of-latin-american-energy-integration (accessed 5 June 2013).

Burgos, F. (2007). "Regional electricity cooperation and integration in the Americas: Potential environmental, social and economic benefits", report to the Department of Sustainable Development Organization of the American States. Available at www.oas.org/dsd/Documents/RegionalElectricityCooperationandIntegration.pdf (accessed 17 July 2013).

CBA Energy Institute (1998). *North American Energy Integration: The Prospects for Regulatory Coordination and Seamless Cross-Border Transactions*. Available at http://www.beg.utexas.edu/energyecon/documents/naep.pdf (accessed 2 July 2013).

Centre for Energy (2013). *Electricity transmission timeline.* Available at www.centreforenergy.com/AboutEnergy/Electricity/Transmission/History.asp (accessed 17 July 2013).

de Oliveira, A. (2010). *Energy Security in South America: The Role of Brazil*. International Institute for Sustainable Development, Winnipeg, Canada.

Economic Consulting Associates (2010). "The potential of regional power sector integration: Greater Mekong Subregion (GMS) transmission and trading case study", Energy Sector Management Assistance Program (ESMAP) Briefing Note. World Bank, Washington, D.C.

European Commission (2013a). "Enforcing EU energy law". Available at http://ec.europa.eu/energy/infringements/index_en.htm (accessed 2 July 2013).

——— (2013b). "European electricity grid initiative: Research and innovation roadmap, 2013-2022". Available at www.eranet-smartgrids.eu/files/20130228_EEGI%20Roadmap%202013-2022.pdf (accessed 17 July 2013).

European Wind Energy Association (2012). "Creating the internal energy market in Europe". Brussels.

Global Association of Risk Professionals (2013). "Indonesian Government seeks to give contract for gas field in South China Sea". Available at www.garp.org/risk-news-and-resources/risk-headlines/story.aspx?newsId=56958 (accessed 10 July 2013).

Hammons, T., N. de Franco, L. Sbertoli, C. Khelil, H. Rudnick, A. Clerici and A. Longhi (1997). "Energy market integration in South America", *IEEE Power Engineering Review*, August 1997. Available at http://web.ing.puc.cl/~power/paperspdf/integration.pdf (accessed 6 June 2013).

Hufbauer, G., J. Schott, P. Griego and Y. Wong (2005). "NAFTA revisited: Achievements and challenges". Institute for International Economics, Washington, D.C.

IADB (2013). "What is the IIRSA Initiative?" Inter-American Development Bank, Washington, D.C. Available at www.iadb.org/en/topics/regional-integration/iirsa/the-idb-a-strategic-partner-of-the-iirsa,1414.html (accessed 17 July 2013).

IMF (2013). "Energy subsidy reform: Lessons and implications". International Monetary Fund, Washington, D.C.

Mercados Energy Markets International (2010). "Load dispatch and system operation study

for Central Asian power system", reference document of the ninth Ministerial Conference on Central Asia Regional Economic Cooperation (CAREC), 31 October-2 November 2010, Cebu, the Philippines. Available at www.carecprogram.org/uploads/events/2010/SOM-Oct/Diagnostic-Study-CAREC-Energy-Strategy-Pillar2-Full-Report.pdf (accessed 4 July 2013).

Nicolas, F. (2009). *ASEAN Energy Cooperation: An Increasingly Daunting Challenge*. Institut Francais des Relations Internationales. Paris.

Omorov, J. and T. Lynch (2010). "Energy demand/supply balance and infrastructure constraints diagnostics study", reference document of the ninth Ministerial Conference on Central Asia Regional Economic Cooperation (CAREC), 31 October-2 November 2010, Cebu, the Philippines. Available at www.carecprogram.org/uploads/events/2010/SOM-Oct/Diagnostic-Study-CAREC-Energy-Strategy-Pillar1-Full-Report.pdf (accessed 4 July 2013).

Porter, M. and H. Situmeang (2005). "Preparing for electricity trading in ASEAN", Regional Economic Policy Support Facility Project Report No. 03/002, Australian Agency for International Development.

Rokas, I. (2009). "Towards a truly open European Energy Market". Available at http://www.rokas.com/en/articles-and-publications/energy-and-environment/61 (accessed 5 June 2013).

Ruangrong, P. (2013). "Overview of recent regulatory developments", presentation to the High-Level Meeting of Regional Energy Regulatory Associations of Emerging Markets. Available at http://www.erranet.org/OtherActivities/high-level_meetings (accessed 10 July 2013].

Sandler, T. (2004). "Demand and institutions for regional public goods" in A. Estevadeordal, B. Frantz and T. R. Nguyen (eds.), *Regional Public Goods: From Theory to Practice*. Inter-American Development Bank. Washington, D.C.

_____ (2007). "Regional public goods, aid, and development". Available at www.adbi.org/files/cpp.sandler.regional.public.goods.aid.development.pdf (accessed 2 July 2013).

Shi, X. and F. Kimura (2010). "Overview report: Review of initiatives towards and estimated benefits from integrating energy market in the East Asia Summit region", in X. Shi and F. Kimura (eds.), *Energy Market Integration in the East Asia Summit Region: Review of Initiatives and Estimation of Benefits*, ERIA Research Project Report 2009-2013; pp.1-39. Economic Research Centre for ASEAN and East Asia, Jakarta. Available at www.eria.org/publications/research_project_reports/images/pdf/y2009/no13/Overview_Report.pdf (accessed 4 June 2013).

UCTE (2008). *UCTE on the Move*, Union for the Coordination of Transmission of Electricity Annual Report 2008. Brussels. Available at https://www.entsoe.eu/index.php?id=66 (accessed 20 June 2013).

Zhai, Y. (2010). "Energy sector integration for low carbon development in Greater Mekong Subregion: Towards a model of south-south cooperation". Available at www.worldenergy.org/documents/congresspapers/52.pdf (accessed 4 June 2013).

VII. The political economy of AEMI

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Abstract

To date, concerted collective action related to energy has generally been limited to activities where the costs to the individual Governments are either negligible or do not outweigh the short-term benefits. In the meantime, the preference of ASEAN members appears to be for bilateral initiatives, either with other member States or with States outside ASEAN. In order to move forward with energy market integration, ASEAN needs to undertake two separate sets of tasks. The first is to identify which elements of AEMI should be feasible in the current political and economic situation, and then to rank further elements in order of difficulty and importance. The second, and more important, task is to identify what political, economic and institutional changes may be required within ASEAN members, and within the organization of ASEAN itself, in order to allow the more difficult and important elements of energy market integration to be provided. The approach to implementing AEMI is likely to be multi-track – different programmes and speeds for different fuels or types of activity – and involve initiatives by different sub-sets of member States ("2 + X"). Regardless of the approach to be taken to energy market integration, committed and sustained leadership will be required from two or more ASEAN members in order to overcome inertia and maintain momentum.

A. Introduction

The preceding chapters in this publication have systematically reviewed the benefits and opportunities offered by ASEAN Energy Market Integration (AEMI), and have identified national constraints, examined the governance and institutional requirements, and mapped a pathway to AEMI.

The aim of this chapter is to examine the political economy context of energy market integration in ASEAN in order to build a better understanding of the political dynamics at work, both at the ASEAN level and beyond. Such considerations are necessary in order to align the economic principles and objectives of AEMI with the political reality of energy in ASEAN.

Section B starts with a general analysis of the political economy of energy market integration and ASEAN's capacity for collective action, before examining the progress of ASEAN energy market integration to date in section D. Section E outlines the principles that could underpin strategies and pathways to achieve AEMI. Section F provides the summary and conclusion.

B. The political economy of regional energy market integration

The aim of this section is to outline the key political economy factors that may assist or constrain energy market integration anywhere in the world. First, the importance of collective action in energy market integration is highlighted, followed by an examination of the role of actors and institutions, and the importance of trust.

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1. Need for collective action

Energy market integration is a process through which a range of infrastructure and services related to energy are provided across a region through collective action. As explained by Andrews-Speed and Hezri (2013) through the lens of regional public goods, the provision of some goods requires a higher level of collective action than that needed for other goods. Those goods that require a lower level of collective action, such as research and development or the construction of emergency oil storage, can be left to those parties that have the greatest desire for, and capacity to deliver the good.

In contrast, those goods that require a high degree of collective action, such as the operation of a regional energy grid or of an oil stock sharing system, can only be delivered reliably if organizations and rules are established to oversee and ensure implementation. This is likely to require the delegation of authority of some elements of energy governance, which in turn may be perceived as a loss of sovereignty.

Many Governments, including those in South-East Asia, tend to regard energy security within the narrow context of national security, thus justifying heavy government control. Such a highly politicized nature of energy constrains the willingness of many Governments to engage in such collective action, or market liberalization of the national energy sectors, however beneficial it may be in principle. This politicization arises from the perceived and actual links between energy supply, on the one hand, and economic development, industrial policy, employment, social stability and national security, on the other hand. For this reason, the national constraints to energy market integration can take on a highly political form, especially those related to the governance of the energy sector and energy supply, both of which can shape the influence and interests of key actors in the sector.

2. Role of actors and institutions

Collective action to deliver a regional public good requires a convergence of interests between different actors (state, corporate and societal). Given the importance of the interests of the different actors, stakeholder analysis can provide a useful tool for identifying the important actors and their perceptions and interests, the resources they have at their disposal and the relationships between them (Reed and others, 2009). However, a focus on actors should not detract from understanding the nature of the environment in which they operate. This environment includes the nature of the resource and technology applied to exploit and use it, and the formal and informal rules of the community within which the actors operate (Aligica, 2006).

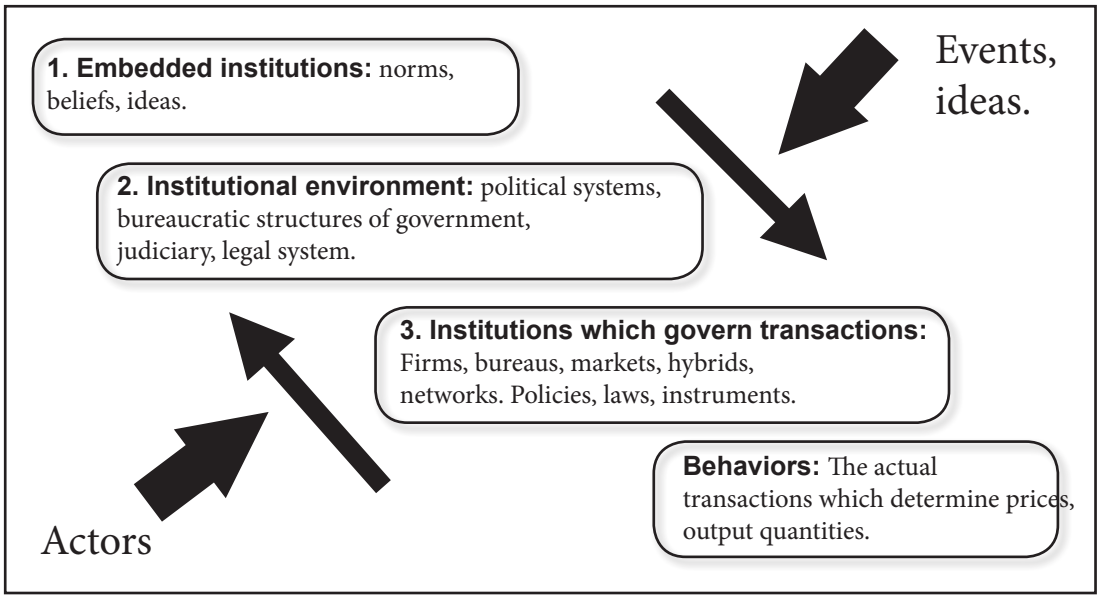
These formal and informal rules are referred to as "institutions" in the terminology of New Institutional Economics (North, 1990 and 2005; Williamson, 2000). Analysis of these institutions can provide insights into the barriers to collective action beyond those identified by applying public goods theory.

Figure 1 shows that within a particular country or society it is possible to identify the different levels of institution (Williamson, 2000). At the highest level are the "embedded institutions", which include beliefs, traditions and behavioral norms. These tend to change quite slowly, over many decades or centuries.

The next level of institution is known as the "institutional environment" wherein lie the general systems by which the economy, polity, society and the law operate. The institutional environment can change over a few decades or several years, but the pace and nature of such changes may be constrained by the embedded institutions.

At the lowest level are the institutions that directly shape actor behavior and individual economic or political transactions. These include individual laws, regulations and contracts as well as prices set by markets or governments. Institutional change at this level is constrained, to a certain extent, by the institutional environment. If change at this lower level of institution greatly outpaces change in the institutional environment, then the institutional framework may become unstable, and open to sudden and unpredictable change. Stability is maintained by implementing change incrementally and in a coordinated manner.

Figure 1. Schematic representation of the three levels of institution



Source: Adapted from Williamson, 2000.

In the context of AEMI, the study of institutions can provide insights in a number of ways:

(a) The perceptions, preferences and motivations of an actor (whether government, corporate or individual) will be shaped to a great extent by the embedded institutions and institutional environment within which the actor operates. Given the varied histories of the ASEAN members, the nature of the embedded institutions and the institutional environments differ between countries. It is therefore quite understandable that their approaches to economic development, energy policy and energy market integration are highly varied;

(b) Sudden and radical reform of the institutions that govern a country's national energy sector is unlikely to yield the desired outcomes if the wider national institutional environment remains unchanged. Such a step runs the risk of a collapse of the energy sector and is likely to be resisted by responsible Governments;

(c) In a system comprising several layers of governance ("polycentric governance") there must be a reasonably good degree of fit between higher and lower levels of governance. In other words, in order to gain the support of key actors and to maximize effectiveness, institutions created to govern AEMI should have a reasonably good fit with the relevant institutions at the national level across the relevant countries.

Ostrom (2005) combined the analysis of actors and the wider environment in an institutional analysis and development (IAD) framework in order to illuminate the motivations for collective action. This approach distinguishes an "action arena", which comprises the actors and the

specific "action situation", from the exogenous variables, consisting of the material conditions, the attributes of the community and the rules. Vatn (2005) developed a similar framework but integrated "attributes of the community" and "rules – in use" into a single factor "institutions". Such frameworks provide a systematic basis for analyzing actor choices, the interactions between these choices, the outcomes of these interactions and the feedback to actor choices and the wider institutional environment.

3. Importance of trust

It has long been recognized that trust is an important requirement for collective action and this led to the development of the concept of social capital (Coleman, 1988; Collier, 1998). Ostrom (2010) emphasized the importance of trust in managing the global environment, and identified the need for trust in two dimensions – between actors at the level of collective action, and between these actors and the government at a higher level. While the concept of social capital has no direct analogue in international relations, neo-liberalism emphases the potential for building trust between nations, and places great hope on international institutions' ability to create such trust and resolve conflicts. In contrast, neo-realists argue that there are limits to the potential for trust building and cooperation because of the anarchic character of the international system. They therefore focus on self-help to ensure their own survival as well as the primary means to manage and resolve conflicts they encounter (Waltz, 1979).

In the context of the governance of energy and natural resources, neo-realists identify the State as the key actor and place great importance on the need for States to control the access to energy and natural resources for strategic reasons. The liberal perspective highlights the important role of international markets in the production and flow of energy and natural resources, and the need for international cooperation to promote good governance (Dannreuther, 2013).

C. ASEAN's progressive integration

The aim of this section is to provide the general political economy background for the analysis of the political economy of AEMI. Integration within ASEAN and then integration by ASEAN with external actors and regimes are examined, followed by an assessment of the constraints to integration.

1. Internal ASEAN integration

Founded in 1967, ASEAN is a formal regional organization with a secretariat that was established through the ASEAN Declaration (or Bangkok Declaration) in 1967, by five States: Indonesia, Malaysia, the Philippines, Singapore and Thailand (Acharya, 2012). The founding principles were nation-building, economic development, solidarity against communism and collective security.

Today, ASEAN has a much wider political and economic agenda that reflects both internal and external concerns, including trade and investment, and it has grown to include 10 nations. In succession, Brunei Darussalam, Viet Nam, Myanmar, the Lao People's Democratic Republic and Cambodia joined ASEAN, the last only in 1999. In the South-East Asian archipelago, only Timor-Leste and Papua New Guinea remain outside ASEAN, though they have observer status.

The Treaty of Amity and Cooperation in Southeast Asia, signed in 1976, laid down fundamental

norms that have subsequently underpinned the behavior of the ASEAN members. These include respect for the independence, sovereignty and territorial integrity of all nations, and non-interference in the internal affairs of one another (Acharya, 2012). These ideas were reiterated in the ASEAN Charter that was adopted in November 2007 and came into force in December 2008. The Charter included a number of other principles, notably Article 2.2., noting "adherence to … ASEAN's rules-based regimes for effective implementation of economic commitments and progressive reduction towards the elimination of all barriers to regional economic integration, in a market-driven economy". The key factors driving the creation of the Charter are: (a) for ASEAN to enhance its "regional resilience"; (b) "for ASEAN to be more competitive as an economic unit" in response to the rapid economic rise of China and India; and (c) for ASEAN members to "maintain and indeed gain political influence in the wider region" (Tay, 2008).

The economic agenda started to appear from the mid-1970s, after the end of the Vietnam War. However, the agenda only really gathered pace after the end of the Cold War and the Asian financial crisis in 1997-1998 as the ASEAN members realized the need for greater regional economic integration and closer integration with world markets. Today, the formally agreed objectives of ASEAN are wider ranging, covering security, trade, investment and cultural goals. In 2003, the 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".[3] They also agreed to pursue closer economic integration by 2020 through the creation of an ASEAN Economic Community (AEC).

Key components of AEC that are relevant to energy are the ASEAN Trade in Goods Agreement and the ASEAN Comprehensive Investment Agreement, both signed in 2009. Together, these two Agreements seek to promote the free flow of trade and investment within ASEAN.

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). Where firms have the capital and find the opportunity and incentive they, with support from banks, are likely to be the main actors in trade and investment. In some cases, state-owned enterprises may have some advantages over privately-owned companies through their lower cost of capital and preferential access to funds from their home country banks. There is also a "political" dimension in doing business in key sectors within ASEAN countries whereby local businesses lobby their politicians to keep overseas competitors out of their local markets.[4]

Before the start of the Asian economic crisis in 1997, civil society engagement with ASEAN was mainly through academic and business networks and associations. Since the economic crisis,

3 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).

4 "DBS Acquisition plan 'political' ", *Jakarta Post*, 2 April 2012. Available at www.thejakartapost.com/ news/2012/12/01/dbs-acquisition-plan-political.html (accessed 1 December 2013).

civil society organizations and non-governmental organizations have increasingly appreciated the value of engaging with ASEAN. During the same period, ASEAN itself has created a number of forums for engaging with civil society, such as the ASEAN People's Assembly, the ASEAN Civil Society Conference and the Solidarity for Asian People's Advocacy (Chandra, 2006). However, despite these steps, active engagement of civil society with ASEAN policy-making remains limited, both by the limited capacity of ASEAN itself and by the general unwillingness of some member country Governments (Chandra, 2006; Acharya, 2012).

2. Integration with external partners

In addition to taking internal initiatives, ASEAN has become a key actor in building institutions to promote wider regional and supra-regional cooperation. Openness to international trade and investment have long been important priorities for ASEAN members, and this external engagement was further enhanced after the Asian financial crisis in 1997-1998, which drew attention to the need to build external economic cooperation, especially with North-East Asia. In the following years, ASEAN concluded a number of Free Trade Agreements with North-East Asian States (China, Japan, Republic of Korea and Taiwan), as well as with Australia, New Zealand and India.

The 10 ASEAN members and their Free Trade Agreement partners – Australia, China, India, Japan, Republic of Korea and New Zealand – also launched a new economic initiative called the Regional Comprehensive Economic Partnership (RCEP). This is a 16-party Free Trade Agreement first announced in November 2011 as an ASEAN-led initiative aimed at broadening and deepening economic engagements with its FTA partners; negotiations to be completed by the end of 2015.

ASEAN's growing interest in North-East Asia stimulated the formation in 1997 of ASEAN+3 (Japan, China and the Republic of Korea). This grouping started with its focus on financial and economic recovery, but later expanded to cover many fields, including infrastructure, energy, the environment, food, disease control and maritime piracy. Economic links between ASEAN and North-East Asia are deeper than those within ASEAN, with intraregional trade across ASEAN+3 amounting to 55 per cent by 2005. However, this economic integration had been driven by businesses rather than by Governments, especially through the means of international production networks (Dent, 2008).

ASEAN+3 soon led to the creation of yet another, even larger cluster that became known as the East Asian Summit (EAS) with the objectives of (a) facilitating confidence-building and discussions on broad strategic issues that concern the region and (b) developing East Asian regionalism in an inclusive manner (Desker, 2005). At its first meeting in 2005, EAS comprised the 13 members of ASEAN+3 and Australia, New Zealand and India. The United States of America and the Russian Federation joined in 2011. The agenda is mainly to promote strategic dialogue and cooperation in East Asia, including energy issues, but concrete progress is constrained by differences of opinion on the membership, role and objectives of EAS, and on its relationship with ASEAN+3 (Dent, 2008)

In addition, ASEAN participates in the Asia Cooperation Dialogue Pacific Economic Cooperation Council and in the Asia Pacific Economic Cooperation (APEC). It also has bilateral arrangements with other regional organizations such as the Gulf Cooperation Council, MERCOSUR, the Southern African Development Community, the Shanghai Cooperation Organization, and the Organisation for Economic Co-operation and Development as well as a number of United Nations organizations.

3. Constraints on ASEAN integration

The conscious efforts of the past 46 years to enhance regional security, promote economic development and build a sense of regional identity have met with a significant degree of success despite many obstacles, not least of which has been the high degree of diversity among the member nations. The deliberate focus on shared interests, priorities and norms has allowed a shared and distinctive sense of regionalism to emerge. This regionalism is not just inward looking, but explicitly supports external economic and political links (Severino, 2006; Acharya, 2012).

Despite this important achievement, ASEAN has fallen short of expectations in a number of ways. It shown the ability to manage or defuse disputes but not to resolve them. Its capacity for building institutions remains weak and the implementation of policy initiatives is generally slow, except at times of crisis (Severino, 2006; Acharya, 2012).

These apparent defects are understandable for a number of reasons. Most ASEAN members are young nations that only emerged from their colonial past after the Second World War or after the Cold War. Several have weak state capacity and are very sensitive about sovereignty. In such cases, regime survival is more important than collective action with neighbors (Nathan, 2010) and state-building more important than governance (Yu and He, 2011). Decision-making has become more difficult after enlargement from seven to 10 members, not least because of the low state of economic development of the new members and their differing political heritage. The result is a preference for informality and loose arrangements that are not compensated by the provision of sustained leadership by one or two countries (Severino, 2006)

The capacity for collective action is further weakened by longstanding distrust, sometimes dating back hundreds of years, sometimes to the Cold War. Current aggravating factors include unresolved disputes over land borders and maritime demarcation, ethnic unrest in border areas, and illegal migration and smuggling. Relations with major powers outside ASEAN continue to be a source of irritation. China and the Soviet Union played an important unifying role in the early years of ASEAN as the organization was essentially anti-communist at that stage, but at the same time ASEAN did not want to get too close to the United States and the West in general. In recent years, both the United States (with its "Pivot and rebalancing to Asia") and China have been deepening their engagement in South-East Asia, moves that have the potential to undermine ASEAN unity, especially in the context of the South China Sea.

Although bilateral relations between most States have improved over the past 20 years (Ganesan and Amer, 2010), tensions sometimes come to the surface during a crisis (e.g., the Asian financial crisis in 1997/1998. Yet such crises often provide the incentive for renewed efforts to build an economic community (Acharya, 2012).

In addition to these largely political dimensions of inter-State relations, a number of important economic factors act to weaken the desire for, or to constrain, the implementation of economic integration. These include differences in levels of economic development, economic development models and priorities, and attitudes to environmental protection. Uneven development within the ASEAN region is likely to impede regional economic cooperation initiatives due to the variable governance levels among the different member States. Multilateral economic integration may also be undermined by the preference of some member States to develop bilateral economic ties (internal and external to ASEAN) rather than wait on ASEAN's multilateral arrangements (Dent, 2008; Solingen, 2010).

Applying the terminology of international relations, most ASEAN Governments appear to take a realist or neo-realist view of international political and economic relations, and look

to ASEAN as a means of safeguarding their sovereignty and preventing external interference in their domestic affairs. This constrains the pace of implementation of ASEAN economic initiatives, and prevents any significant pooling of sovereignty or delegation of authority.

These factors, among others, have contributed to the relatively slow progress towards implementing the AEC. Although the ASEAN Secretariat (2010 and 2012) provides a strongly positive view of progress, other analysts have asserted that these reports exaggerate the speed of implementation, and that progress has been much slower than hoped in a wide variety of fields such as free trade utilization, competition policy and law, customs regimes, investment trade in services and non-tariff barriers to trade (e.g., Dosch, 2013).

D. ASEAN energy market integration to date

The aim of this section is to examine the progress of selected components of energy market integration across ASEAN and at smaller scales within ASEAN, and to identify the obstacles to progress. This account starts with the two most important elements of energy market integration, trade and investment, before examining in turn gas and electricity networks, unresolved maritime disputes, oil stocks, renewable energy and energy efficiency, and energy market integration across the wider region of East Asia.

1. Trade and investment

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. The two key agreements in this regard 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.[5] 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.[6]

Many of these barriers persist today including, for example, state import monopolies and complex procedures for obtaining certificates of origin (Yulisman, 2013). 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.[7]

5 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).

6 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).

7 "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).

At first sight, ACIA appears to be, as it says, 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).

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. A number of countries with oil and gas resources have listed the oil and gas industry among their reservations, and the general exceptions are wider than what is generally seen in international investment agreements. Finally, special exemption is given to the new member states, Myanmar, Cambodia and the Lao PDR, Myanmar and Viet Nam. In general, ACIA is a very cautious document (Desierto, 2013) that provides little support for the free flow of investment in the energy sector.

In summary, ATIGA and, to a greater extent, ACIA make only a limited contribution to supporting the development of the AEC in the energy sector and thus to the promotion of AEMI.

2. Gas and electricity networks

The story for network-bound energy also reveals constraints to integration. The ASEAN Power Grid (APG) and the Trans-ASEAN Gas Pipeline (TAGP) have long been seen as fundamental elements for AEMI,[8] and they are also elements of the Master Plan on ASEAN Connectivity (Das, 2013). Progress has been made on both projects, but most implementation has been pursued on a bilateral basis (Doshi, 2013). Little progress has been made to harmonize policies and standards across ASEAN, or to address third-party access or tariff and taxation issues (Nicolas, 2009; Sovacool, 2009; ACE, 2013). One obstacle specific to TAGP is the continued failure to develop the giant East Natuna gas field for technical reasons. This factor, combined with (a) the stated preference of the Governments of Malaysia and Indonesia to save more of their gas production for domestic use, and (b) the rise of LNG trade, act together to steadily diminish the short-term economic necessity for TAGP (Doshi, 2013).

The TAPG project has been further undermined by a divergence of political and economic interests among key actors such as national Governments, national and international energy companies, and international agencies (Sovacool, 2010). The study by Sovacool (2010) revealed that some parties saw TAPG as a source of revenue, while others viewed it as the provider of energy services. For some, the project would promote integration within ASEAN; for others the priority was integration with external markets. Most importantly, national economic and energy interests appeared to outweigh regional public good considerations (ACE, 2013).

Funding is the ultimate constraint faced by both APG and TAGP. The combination of low end-user tariffs, unpredictable legal regimes and divergent interests provide a strong disincentive to private investors to commit funds to large, transboundary infrastructure projects in the

8 ASEAN Medium-Term Programme of Action on Energy Cooperation, 1995-1999, available at www.asean.org/communities/asean-economic-community/item/asean-medium-term-programme-of-action-on-energy-cooperation-1995-1999 (accessed 12 June 2013).

region (Sovacool, 2009; Nguyen, 2013). To assist in addressing this challenge, the ASEAN Infrastructure Fund was established in 2011. More work is needed to build public-private partnerships and to develop national and regional capital markets (Pipoppinyo, 2013).

3. Unresolved maritime disputes within ASEAN

An important component of any regional energy market is that primary energy resources are available for exploitation, subject to national laws and policies as well as international law. This requirement is of particular relevance to ASEAN as the region is importing progressively larger quantities of primary energy (Institute of Energy Economics, Japan, 2011). A major obstacle to this exploitation continues to be the inability of a number of ASEAN members to resolve their maritime delineation disputes or, in the absence of such resolution, establish operational joint development zones. The South China Sea, which is believed to contain abundant oil and gas reserves, is such an example. Having said that, it should be noted that the notion of joint development is not new to the South-East Asian region. There are already joint development agreements in the Gulf of Thailand signed in 1979 between Malaysia and Thailand, and in 2009 between Malaysia and Brunei Darussalam (Schofield, 2011).

4. Oil stocks

Another policy element that has reappeared on the agenda for collective action is the establishment of some form of strategic oil storage and sharing system. According to the United States Energy Information Administration, the Government of Singapore maintains about 32 million barrels of crude oil and 65 million barrels of refined petroleum products in strategic petroleum reserves (Energy Information Administration, 2013). Indonesia, the Philippines and Thailand hold more modest level of stocks, while other ASEAN Governments such as Viet Nam are drawing up plans to build stocks (Risk and Policy Analysts Ltd, 2012).

A revised ASEAN Petroleum Security Agreement was signed in 2009 and ratified in March 2013. 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 oil stockpiles either individually or jointly. ASEAN+3 provides a wider framework for joint studies and information-sharing related to oil stockpiles. The sharing mechanism has never been implemented as supply problems have been solved bilaterally between ASEAN members, with non-ASEAN oil producers or through oil traders (Nicolas, 2009).

5. Renewable energy and energy efficiency

The ASEAN Plan of Action for Energy Cooperation (APAEC) 2004-2009 set a 2010 target of 10 per cent for renewable energy as a share of installed power generation capacity.[9] This target was met and a new target of 15 per cent was set for 2015. National target setting for renewable energy is left in the hands of the member States, and coordination is provided through the Renewable Energy Sub-Sector Network. ASEAN has provided support for the deployment of renewable energy across the region through its ability to attract funding from the European Union, Germany and the Republic of Korea (ACE, 2013).

In the field of energy efficiency, ASEAN has set an "aspirational target" of reducing regional energy intensity by 8 per cent between 2005 and 2015. The main mechanisms it deploys in support of this goal are training, information sharing and sharing of best practice. Japan provides

9 ASEAN Plan of Action for Energy Cooperation, 2004-2009, available at www.eppo.go.th/inter/phil2004/ASEAN-apaec2004-2009.html (accessed 3 July 2013).

support technology transfer workshops and energy audits. As is the case with renewable energy, national target-setting for energy efficiency is left in the hands of the member States, and coordination is provided through the Energy Efficiency Sub-Sector Network (ACE, 2013).

One of the objectives shared by the strategies for renewable energy and energy efficiency is to promote the development of manufacturing capacity and trade across ASEAN in the relevant technologies and appliances. Progress in this regard has been hampered by a number of factors, such as weak technological capabilities and the lack of national technical standards (ACE, 2013).

6. Energy market integration across East Asia

Energy market integration is also on the policy agenda of EAS. Through the Economic Research Centre for ASEAN and East Asia (ERIA), EAS has supported an intensive research programme on the benefits and opportunities for energy market integration across the region (Wu and others, 2013).[10]

One important initiative within a subregion of EAS is the proposal to enhance energy cooperation in the Greater Mekong Subregion (GMS). The participating States include Cambodia, the Lao PDR, Myanmar, Thailand and Viet Nam, plus Guangxi Autonomous Region and Yunnan province of China. Specific objectives include (ADB, 2009):

(a) Improving access to energy;
(b) Increasing the use of indigenous low-carbon energy and reducing dependence on imported fossil fuels;
(c) Enhancing cross-border trade in energy, notably gas and electricity; and
(d) Enhancing energy efficiency and conservation.

As is the case with ASEAN, one of the core projects for GMS energy cooperation is the development of an integrated regional electricity grid. Following the signing of the Intergovernmental Agreement on Power Interconnection and Trade in September 2003, a Regional Power Trade Coordination Committee was established with the first meeting held in 2004. While significant progress continues to be made in connecting national grids, this has tended to be on a bilateral rather than a regional basis (Zhai, 2010). As a consequence, transboundary grid connections are often tied to specific individual power plants with power purchase agreements. Although these allow for inter-State trading of electricity, such arrangements undermine the concept of an integrated regional power market (ADB, 2013). In addition, the Memorandum of Understanding to establish a regional power coordination centre had not been signed by all parties as of June 2013. Despite these deficiencies, the active participation of the Asian Development Bank has ensured that the programme of grid interconnection is being supported by capacity-building, feasibility studies and financing.

Cooperation among such a subset of ASEAN members has the potential advantage that challenges and interests are more likely to be shared than across a larger grouping. The inclusion of China in a GMS regional power grid also provides the first concrete energy link between ASEAN and the northern part of the EAS region, together with the new oil and gas pipelines from Myanmar to China. Notwithstanding these limited successes, considerable differences exist between the actors in the GMS, not least in political, cultural and economic development. As a consequence of these and other factors discussed above, progress towards achieving the stated objectives has been slower than hoped (ADB, 2013).

10 See also www.eria.org/research/energy/.

E. The way forward

1. Constraints to AEMI

The overall lesson from the analysis presented in this chapter is simple. The general political and economic constraints on ASEAN integration (see section B) are exacerbated by factors specific to the energy sector (see section C), and together these act to constrain progress towards energy market integration. Concerted collective action is generally limited to activities where the costs to the individual Governments are either negligible or do not outweigh the short-term benefits. Such costs may be political or economic. Self-evidently, a supply of external funding can ease participation in certain circumstances. However, such funding will be restricted to public sources unless there are profits to be made. In the meantime, the preference of member States appears to be for bilateral initiatives, either with other member States or with States outside ASEAN.

In the vocabulary of international relations, the core of the problem lies in the tension between the neo-realist outlook of many national Governments and the neo-liberal aspirations and rhetoric of ASEAN energy market integration.

In the vocabulary of economics, tensions exist between the liberal market ideology that underpins the concept of energy market integration and the state capitalist or state corporatist approach of many ASEAN Governments to the governance of their energy sectors. With regard to the latter, the interests of the national Governments and the interests of the state-owned energy enterprises are of critical importance. Relevant state interests include reluctance to pool sovereignty or to delegate authority to a regional supra-national organ, coupled with the view that energy is a national security matter.

State control over, and ownership of the energy sector may be part of the political ideology. Such control also allows a Government to use the energy sector to support other policies related to industrialization, employment, the redistribution of rents and social equity (through subsidized energy prices). There may also be a preference for enhancing the degree of self-reliance in energy supply rather than relying on imports. In some ASEAN members, these state priorities outweigh the incentives for energy market integration.

The state-owned energy enterprises, both national oil companies and energy utilities, form a core part of this policy approach. However, these enterprises have their own interests, and in many countries they have the power to obstruct moves by the Government to reform the sector.

These issues related to state interests and to state-owned energy enterprises are not restricted to ASEAN members, but prevail in all countries where the State has dominated the energy sector.

2. Looking ahead

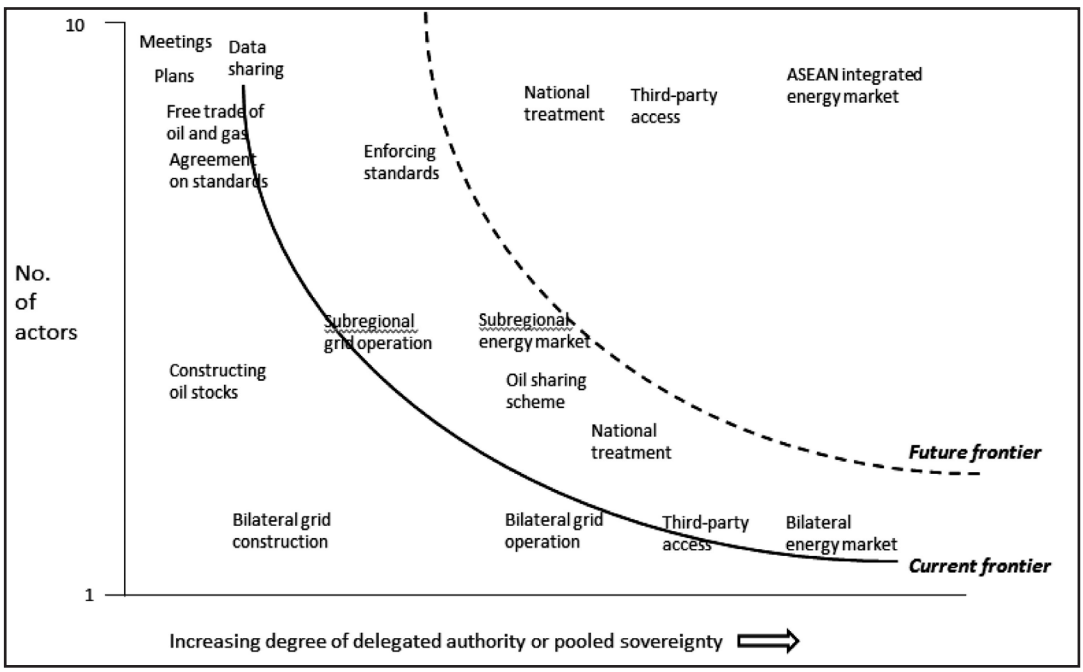
The analysis presented in this chapter and in preceding chapters (e.g. Andrews-Speed and Hezri, 2013; Navarro and Sambodo, 2013) allows two different sets of questions to be addressed:

(a) Identification of which elements of AEMI should be feasible in the current political and economic situation, and then the ranking of further elements in order of difficulty and importance;

(b) Identification of what political, economic and institutional changes may be required within ASEAN members and within the organization of ASEAN itself in order to allow the more difficult elements to be provided.

These two concerns are conceptualized in a single diagram (figure 2), which takes its approach from the diagrammatic tool of production possibility frontier theory. In figure 2, the vertical axis shows the number of actors (Governments) that are required to provide a given element of energy market integration, while the horizontal axis shows, in very general terms, the degree of pooled sovereignty or delegated authority needed to provide a particular element of energy market integration.

Figure 2. Schematic representation of the current and potential future possibility frontier elements of AEMI



The selection of individual elements of energy market integration shown is illustrative, not comprehensive. The solid curve shows the possibility frontier today, while the dashed curve shows the possibility frontier at some time in the future. Those elements that lie to the left of, or below the solid curve are in place today or should be possible today. Those elements that lie to the right or above the solid curve are judged to be too difficult today, and the further they lie to the right or above the curve, the more difficult they are judged to be. Pure energy market integration across the whole of ASEAN will only be achieved when all elements are in place and functioning well.

The examples of market elements show in figure 2 have been selected to illustrate a number of points:

(a) It is relatively easy for all 10 ASEAN members to hold a conference or issue a non-binding plan;

(b) It is easier for a sub-set of ASEAN than for the whole group of 10 to cooperate;

(c) The trade of crude oil, oil products and gas between ASEAN members will soon be free of tariffs, but the trade through networks of these energy products as well as electricity is severely constrained by the shortage of network infrastructure;

(d) It is relatively easy for a group of two or three neighboring countries to construct a transboundary network, but it becomes progressively more difficult to (i) jointly operate the network efficiently and safely, and (ii) create an integrated energy market around that network; and

(e) It is easy for a small number of countries to individually build strategic oil stocks, but it is much more difficult to create and implement an oil-sharing scheme.

The main challenge is to move the possibility frontier to the right in order to allow more elements of energy market integration to be implemented. In some countries, a combination of low-level economic development, limited energy infrastructure, shortage of funds and weak governance capacity are important constraints on their ability to participate in some elements of energy market integration. However, the more intractable constraints are to be found in the political economy factors summarized in section E of this chapter, i.e., the priorities and perspectives of national Governments and the influence and interests of state-owned energy enterprises. These factors constrain the willingness and ability of Governments to undertake significant reform of their energy industries and the liberalization of their domestic energy markets and energy prices, all prerequisites for substantial energy market integration to proceed.

While the full privatization of energy industries and the full liberalization of energy markets are unrealistic objectives for most ASEAN members in the next 10-20 years, steps can be taken to increase the flow of energy investment, commodities and services across the region.

Policy directions for the future are:

(a) Continue with the design and implementation of those elements of market integration across ASEAN that need little or no pooling of sovereignty or delegation of authority, such as sharing of energy data and best practice, capacity-building, constructing cross-border infrastructure, and promoting free trade in oil, gas and coal;

(b) Encourage "Two plus X" actions to implement elements that require significant pooling of sovereignty or delegation of authority. The membership of each can vary depending on the element of the market being addressed. These small groupings can then be enlarged as and when other member States are ready to join. Such groups will need to be able to agree and adhere to technical and regulatory standards, among other requirements, and to have trust in the other parties in the group;

(c) Follow a multi-track "approach". The nature and pace of implementation of the selected collective actions vary between different fuels and different types of activity, and would most likely build on existing subregional cooperative initiatives;

(d) Continue to build an understanding of the need for, and benefits to be derived from energy market integration in order to move the possibility frontier to the right, particularly for trade, investment and infrastructure.

In order to pursue these policy approaches, it will be necessary for ASEAN to enhance its central capacity for research, technical support and administration (Andrews-Speed and Hezri, 2013).

More important is the need for two or more member States to provide sustained and visible leadership and commitment to AEMI.

3. Directions for future research

Future research could focus on:

(a) Improving the empirical understanding of the political economy constraints to energy market integration in ASEAN;

(b) Drawing more detailed lessons from other examples of regional energy market integration; and

(c) Applying a selection of theoretical frameworks to interpret (a) and (b), and to develop a more sophisticated road map for AEMI.

F. Summary and conclusion

Conscious efforts by the ASEAN members during the past 46 years to enhance regional security, promote economic development and build a sense of regional identity have met with a significant degree of success, despite many obstacles. However, notwithstanding this important achievement, ASEAN has fallen short of expectations in a number of ways. It shown the ability to manage or defuse disputes but not to resolve them. Its capacity for building institutions remains weak and the implementation of policy initiatives is generally slow, except during times of crisis. In particular, the reluctance of member States to pool sovereignty or to delegate authority has hampered the development of multilateral binding agreements and the formation of an authoritative supra-national agency. As a result, progress towards the achievement of specific integration programmes such as AEC is much slower than hoped for.

Energy market integration is a process through which a range of infrastructure and services related to energy are provided across a region through collective action. The aims of such integration are not limited to enhancing economic efficiency, but include the delivery of external benefits that have the nature of a regional public good. Collective action to deliver a regional public good requires a convergence of interests and a high degree of trust between different actors.

The general political and economic constraints to ASEAN integration are exacerbated by factors specific to the energy sector, such as the role of state-owned energy companies, energy subsidies and the treatment of energy as national security issue. To date, concerted collective action related to energy has generally limited to activities where the costs to the individual Governments are either negligible or do not outweigh the short-term benefits. Such costs may be political or economic. Self-evidently, a supply of external funding can ease participation in certain circumstances. However, such funding will be restricted to public sources unless there are profits to be made. In the meantime, the preference of member States appears to be for bilateral initiatives, either with other member States or with States outside ASEAN.

In order to move forward with energy market integration, ASEAN needs to undertake two separate sets of tasks. The first is to identify which elements of AEMI should be feasible in the current political and economic situation, and then to rank further elements in order of difficulty and importance. The second, and more important, task is to identify what political, economic and institutional changes may be required within member States, and within the organization of ASEAN itself, in order to allow the more difficult and important elements of energy market integration to be provided.

The approach to implementing AEMI is likely to be multi-track – different programmes and speeds for different fuels or types of activity – and involve initiatives by different sub-sets of member States ("Two + X"). Regardless of the approach to be taken to energy market integration, committed and sustained leadership will be required from two or more member States in order to overcome inertia and maintain momentum.

References

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

Algica, P. D. (2006). "Institutional stakeholder mapping: Frameworks for policy analysis and institutional change", *Public Organization Review*, vol. 6; pp. 79-90.

Andrews-Speed, P. and A. Hezri (2013). "Institutional and governance dimensions of AEMI", chapter in *ASEAN Energy Market Integration (AEMI): From coordination to integration*. ASEAN Studies Center, Chulalongkorn University. Bangkok.

ASEAN Secretariat (2012). *Charting Progress towards Regional Economic Integration*, ASEAN Economic Community Scorecard 2012. ASEAN Secretariat, Jakarta.

——— (2010). *Charting Progress towards Regional Economic Integration*, ASEAN Economic Community Scorecard 2010. ASEAN Secretariat, Jakarta.

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

——— (2009). *Building a Sustainable Energy Future*: *The Greater Mekong Subregion*. Asian Development Bank, Manila.

Chandra, A. C. (2006). "The role of non-State actors in ASEAN", in *Revisiting Southeast Asian Regionalism*. Focus on the Global South, Bangkok.

Coleman, J. S. (1988). "Social capital in the creation of human wealth", *American Journal of Sociology*, vol. 94, S95-S120.

Collier, P. (1998). "Social capital and poverty, social capital initiative", Working Paper No. 4. World Bank, Washington, D.C.

Das, S. B. (2013). "Understanding the MPAC", in S.B. Das (ed.), *Enhancing ASEAN's Connectivity.*. Institute of Southeast Asian Studies, Singapore.

Dannreuther, R. (2013). "Geopolitics and international relations of resources", in R. Dannreuther and W.Ostrowski (eds.) *Global resources. Conflict and Cooperation*, Palgrave Macmillan, Basingstoke, pp. 79-97.

Dent, C. (2008). *East Asian Regionalism*. Routledge, London.

Desierto, D. A. (2013). "Investment treaty regulation under the new ASEAN Charter regime", in *Sustaining Asia's Growth and Investment in a Changing World* (forthcoming). Edward Elgar, Cheltenham, United Kingdom.

Desker B. (2005). "Why the East Asian Summit matters", *Asia Times*, 13 December. Available at www.atimes.com/atimes/Southeast_Asia/GL13Ae02.html (accessed 3 July 2013).

Dosch, J. (2013). *The ASEAN Economic Community Scorecard: The Status of Implementation, Challenges and Bottlenecks*. CIMB ASEAN Research Institute, Kuala Lumpur.

Doshi, T. K. (2013). "ASEAN energy integration: Interconnected power and gas pipeline grids", in S. B. Das (ed.), *Enhancing ASEAN's Connectivity*. Institute of Southeast Asian Studies, Singapore.

Energy Information Administration (2013). "Singapore". Available at www.eia.gov/countries/cab.cfm?fips=SN (accessed 3 July 2013).

Ganesan, N. and R. Amer (2010). "Introduction", in N. Ganesan and R. Amer (eds.), *International Relations in Southeast Asia: Between Bilateralism and Multilateralism*, xv-xix. Institute of Southeast Asian Studies, Singapore.

Kurlantzick, J. (2012). "Why ASEAN will stay weak", Council on Foreign Relations, Washington D.C. 4 September. Available at http://blogs.cfr.org/asia/2012/09/04/why-asean-will-stay-weak/ (accessed 3 July 2013).

Institute of Energy Economics Japan (2011). *The 3rd ASEAN Energy Outlook*. ASEAN Centre for Energy, Jakarta.

Nathan, K.S. (2010). "Malaysia-Singapore relations: a bilateral relationship defying ASEAN-style mulitilateralist approaches to conflict resolution", in N. Ganesan and R. Amer (eds.), *International Relations in Southeast Asia: Between Bilateralism and Multilateralism*, xv-xix. Institute of Southeast Asian Studies, Singapore, pp.254-286.

Navarro, A. and M. T. Sambodo (2013). "The pathway to AEMI", chapter in *ASEAN Energy Market Integration (AEMI): From coordination to integration*. ASEAN Studies Center, Chulalongkorn University. Bangkok.

Nicolas, F. (2009). *ASEAN Energy Cooperation: An Increasingly Daunting Challenge*, Note de l'IFRI. International Forestry Resources and Institutions, Paris.

Nguyen, T. P (2013). "Current state of ASEAN infrastructure", in S. B. Das (ed.), *Enhancing ASEAN's Connectivity*. Institute of Southeast Asian Studies, Singapore.

North, D.C. (2005). *Understanding the Process of Economics Change*. Princeton University Press, Princeton, United States.

——— (1990). *Institutions, Institutional Change and Economic Performance*. Cambridge University Press, Cambridge United Kingdom.

Ostrom, E. (2010). "Polycentric systems for coping with collective action and global environmental change", *Global Environmental Change*, vol. 20; pp. 550-557.

——— (2005). *Understanding Institutional Diversity*. Princeton University Press, Princeton, United States.

Pipoppinyo, S. (2013). "Master Plan on ASEAN Connectivity: 'From plan to implementation' ", in S. B. Das (ed.), *Enhancing ASEAN's Connectivity*. Institute of Southeast Asian Studies, Singapore.

Reed, M. S., A. Graves, N. Dandy, H. Posthumus, K. Hubacek, J. Morris, C. Prell, C. H. Quinn and L. C. Stringer (2009). "Who's in and why? A typology of stakeholder analysis methods for natural resource management", *Journal of Environmental Management*, vol. 90; pp. 1933-1949.

Risk and Policy Analysts Ltd. (2012). *Stockpilingof Non-energy Raw Materials*, Report prepared for DG Enterprise and Industry. Risk and Policy Analysts Ltd., Norfolk, UK.

Schofield, C. (ed.) (2011). "Maritime energy resources in Asia: Energy and geopolitics", NBR Special Report No. 35. National Bureau of Asian Research, Seattle, Washington, D.C.

Severino, R. (2006). *Southeast Asia in Search of an ASEAN Community: Insights from a Former Secretary-General*. Institute of Southeast Asian Studies, Singapore.

Solingen, E. (2010). "Multilateralism, regionalism, and bilateralism: Conceptual overview from international relations theory", in N. Ganesan and R. Amer (eds.), *International Relations in Southeast Asia: Between Bilateralism and Multilateralism*. Institute of Southeast Asian Studies, Singapore.

Sovacool, B.K. (2010). "A critical stakeholder analysis of the Trans-ASEAN Gas Pipeline (TAGP) Network", *Land Use Policy, vol.* 27; pp. 788-797.

——— (2009). "Energy policy and cooperation in Southeast Asia: The history, challenges, and implications of the trans-ASEAN gas pipeline (TAGP) network", *Energy Policy*, vol. 37; pp. 2536-2367.

Tay, S. (2008). "The ASEAN Charter: Between national sovereignty and the region's constitutional moment", *Sybil*, vol. 12; pp. 151-170.

Vatn, A. (2005). *Institutions and the Environment*. Edward Elgar, Cheltenham, United Kingdom.

Waltz, K. (1979). *Theory of International Politics*. Addison-Wesley, Reading, Mass., United States.

Williamson, O. E. (2000). "The new institutional economics: Taking stock and looking ahead", *Journal of Economic Literature*, vol. 37; pp. 595-613.

Wu, Y., F. Kimura and X. Shi (eds.) (2013). *Energy Market Integration in East Asia: Deepening Understanding and Moving Forward.* Routledge, London.

Yu, J. and Z. He (2011). "The tension between governance and State building", *Journal of Chinese Political Science*, vol. 16; pp. 1-17.

Yulisman, L. (2013). "New govt system to oil wheels of trade in ASEAN". Available at www.thejakartapost.com/news/2013/02/01/new-govt-system-oil-wheels-trade-asean.html (accessed 12 July 2013).

Zhai, Y. P. (2010). "Energy sector integration for low carbon development in Greater Mekong Subregion: Towards a model of South-South cooperation", paper presented at World Energy Congress 2010. Available at www.worldenergy.org/documents/congresspapers/52.pdf (accessed 11 June 2013).

Zhong, Z. (2011). "The ASEAN Comprehensive Investment Agreement: Realizing a regional community", *Asian Journal of Comparative Law*, vol. 6, No. 1, Article 4.

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The AEMI Group is a network of academics from universities and research institutes across ASEAN, making the case for the free flow of energy products, services, investments and skilled labor across ASEAN through 2030, within the framework of the ASEAN Economic Community (AEC).

This book includes the seven AEMI papers prepared by members of the AEMI Group as a first step towards providing the analytical underpinnings for the rationale for AEMI, its building blocks and its implementation. It also includes the Forum Conclusions, as well as a Discussion Paper circulated to Forum participants to serve as a guide for the discussions during the AEMI Forum. Forum participants included the AEMI Group members, seven Senior Officials of Energy (SOEs) or their delegate, the ASEAN Secretariat, ACE, two ASEAN specialized bodies (ASCOPE and HAPUA), one sub-sector network (RE-SSN), as well as a number of government officials, international organizations and research institutes.

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