

# Chapter 1

## Introduction

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# CHAPTER 1

## Introduction

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### Background and Objectives

Research on *Energy Market Integration (EMI)* has been the focus of many scholars, researchers, and leaders in the energy field as evidences, particularly in Europe and America, tend to show the benefits from such market integration. The Association of Southeast Asian Nations (ASEAN) community, aiming to achieve the ASEAN Economic Community, will need to address the issue on EMI in a more explicit way as it has been a driving force for economic growth in the region so far. It must be noted that for EMI and energy trade to occur, the basic prerequisite is to have sufficient available connecting infrastructure between markets and the supporting regulatory and political conditions (Han, 2014). A well-coordinated and effective resource allocation could happen only if markets are contestable and fully competitive, and countries may give up their policy on sovereignty from “own-regulation” to “deregulation” in order to join the regional market integration (Kimura, *et al.*, 2013).

The Economic Research Institute for ASEAN and East Asia (ERIA) has conducted the EMI studies for several years, and the studies have been promoted by East Asia governments to deepen understanding on matters impacting on energy trade liberalisation and investment, energy infrastructure, pricing reform, and deregulation of domestic energy markets.

Previous EMI studies focused on the review of the regional commitment of East Asian Summit (EAS) countries, the benefits from EMI, the electricity market, theories, subsidies, and renewable energy (RE). In the EMI 2013-2014, the theme was chosen to provide more focus on the energy trade in the ASEAN and East Asian countries, though other energy-related issues are also covered in this study.

The EMI study was commissioned by ERIA with the participation of scholars, researchers, and government stakeholders in EAS countries. The group met two times during the research process and peer reviews commenced afterwards. The group also took as leverage the 19th Energy Cooperation Task Force (ECTF) meeting held on 12 June 2014 in the heritage city of Luang Prabang, Lao People's Democratic Republic (Lao PDR), to present the study's preliminary findings to the Senior Officers on Energy (SOE) leaders from EAS countries, and to get their comments and feedbacks.

This EMI study provides analytical perspectives on constraints and barriers, and the measures that countries could take to address issues—from institutional, financial, and human resources—to realise the potential benefits from energy trade-related matters, power connectivity, and other EMI-involved mechanisms.

## Outline of the Chapters

There are 12 chapters in this book. Chapters 2-5 provide analyses on the energy trading—either at specific country case or at the regional scale—by looking at various perspectives on energy trade-related commodities and aspects. Chapters 6-7 provide national and regional analyses of power connectivity in the region, and Chapters 8-12 provide analyses of price mechanism in the EMI.

**Chapter 2** by Youngho Chang focuses on “Energy Commodity Trading in Singapore”. The paper examines how Singapore has become successful in energy trading by analysing what can be attributed to the success, and finally, draws some lessons learned from the success story. Singapore has successfully transformed its well-established Centerport center into an energy

trading hub in Asia and the world. The most critical factor in the successful transformation was the firm decision of the Singapore government to strengthen its competitiveness in oil storage and blending in the oil refinery sector. To build its refinery sector, Singapore offered an attractive concessionary tax system and implemented a unique but attractive oil trader program—an approved oil trader program, and later, a global trader program incorporating oil traders as well as other commodity traders. This program helped oil traders and trading companies to do oil trading business in Singapore at lower costs but for higher profits. Along with the entire supply chain of oil products, Singapore has built an integrated oil trading system from refining to storing and tanking, and from trading to financing, which in turn allowed Singapore more flexibility and liquidity in meeting diverse demands and trading various oil products. Apart from the economic costs, Singapore offered a favorable time zone position between North America and Europe, better living conditions, and language options.

**Chapter 3** by Sangeeta Sharma presents the “Energy Trade Practices in India: Review of Tariff and Non-Tariff Barriers in Relation to ASEAN”. The paper reviews the energy sector in India and focuses on the scope of India’s energy trade with other countries in the EAS region, specially the Association of South East Asian Nations (ASEAN); and its barriers and limitations. It suggests that India has the capacity to boost its energy trade in both domestic and international markets. The EAS region has several factors—geographical proximity, gaps in energy supply and demand, and different socioeconomic conditions—which are conducive to energy cooperation between India and its neighbors. Each country in the region has some comparative advantage that could be harnessed for a mutually beneficial energy trade within the region. Presently, India has a weak energy trade network, which could be strengthened for optimal advantage in the utilisation of its energy resources.

**Chapter 4** by Anindya Bhattacharya M.S., and Tania Bhattacharya focuses on “ASEAN–India Gas Cooperation: Redefining India’s ‘Look East’ Policy with Myanmar”. This paper demonstrates that India is eventually going to depend more on gas for its energy supply after coal, and that to meet its domestic demand, India’s homegrown gas supply is not sufficient. India currently imports more than 75% of its energy requirement from Qatar. Given future demand growth, the increasing supply volatility of Middle Eastern gas and

increasing gas price (including Asian premium) will make the option of Middle East dependence more expensive and vulnerable for India. Since more than 27% of landed gas price and liquefied natural gas (LNG) in the country is transport cost, it is therefore important to reduce the distance of transporting them. In terms of exploring more energy cooperation with the ASEAN and East Asia, India's "East Look Policy" had not produced any good result so far. However, given the rise of Myanmar in the geopolitical map of this region with its untapped natural resources, which are potentially exportable, and as a border country to India, Myanmar is envisaged to play a strategic role for India to meet its near- to mid-term gas demand more economically. India can procure gas from Myanmar either by direct resource extraction or by using Myanmar as a transit country to bring in gas from other ASEAN countries, especially by linking to the ASEAN Gas Network. This study further reveals that India is lagging far behind China in terms of hard gas infrastructure development in Myanmar, but it also identifies India's potential of soft linkage development within Myanmar's natural gas sector. Existing large-scale infrastructure development brings several environmental and social externalities that are not adequately addressed, but with India's support, Myanmar can overcome such externalities as well.

**Chapter 5** by Tri Widodo emphasises on "The Welfare Impacts of Price Equalisation in Energy Market Integration". The paper examines the pattern of ASEAN countries' comparative advantages in energy products by applying Trade Balance Index (TBI). Comparative advantage indicates what commodity trade of a country can be classified into "net-exporter" or "net-importer". TBI shows that coal, lignite and peat, and gas (natural and manufactured) are the upfront energy commodity line that share positive index. Meanwhile, briquettes, coke and semi-coke, lignite or peat, and retort carbon are the least competitive basket in energy market. Finally, it is suggested that the positive total welfare impact of price equalization (increase) in ASEAN is contributed by energy products such as coal, lignite and peat, and gas—natural and manufactured.

**Chapter 6** by Yu Sheng, Yanrui Wu, Xunpeng Shi, and Dandan Zhang focuses on "Market Integration and Energy Trade Efficiency: An Application of Malmqvist Index to Analyse Multi-products Energy Trade". The paper uses the data envelope analyses—the Malmqvist index methods—to examine

the bilateral trade efficiency in energy products across countries and its determinants between 1995 and 2008. The empirical results showed that, under the assumption of a flexible substitution between coal, petrol, and gas, the efficiency/potential of bilateral energy trade has been increasing, in particular in the EAS region, asymmetrically between different energy products.

**Chapter 7** by Yanfei Li and Youngho Chang focuses on “Infrastructure Investments for Power Trade and Transmission in ASEAN+2: Costs, Benefits, Long-term Contracts and Prioritised Developments”. This paper examines the financial viability of investments on cross-border power transmission capacities by establishing a whole-grid/system simulation model to assess the financial viability, as well as commercial viability, of new transmission projects with optimized pattern of power trade, and if the approach is also suitable for optimizing the planning of new transmission capacities. Results showed that the existing planning of power transmission infrastructure in the region, called ASEAN Power Grid plus China and India (APG+2), stands as a commercially and financially viable plan.

**Chapter 8** by Chea Piseth and Chea Sophearin focuses on “Assessment of Power Trade Benefits from Hydropower Power Projects in Lower Mekong Basin”. Greater Mekong Subregion (GMS) has an enormous potential of hydropower resources, on both a large and small scale, to address the regional energy requirement in significant capacity. GMS also has various experiences in regional power trading with the development of privately owned and financed hydropower projects. This paper outlines the basis for evaluating the benefits of hydropower development and power trade (especially using hydropower-sourced energy) in the GMS region. The research consists of three sections. The first section reviews the experience and current status of the regional power trade and power development in GMS, including hydropower. The second section focuses on determining the benefits (focusing on net economic benefit and carbon dioxide [CO<sub>2</sub>] emission) accruing to each country, explaining the value of avoided generation costs and the annual cost of the hydropower project. The third section explains the key issues as lessons learned in GMS power trade.

**Chapter 9** by Yanrui Wu focuses on “Deregulation, Competition and Market Integration in China’s Electricity Sector”. The paper presents an updated and expanded review about reforms in China’s electricity sector. It aims to examine the impact of reforms on competition, deregulation and electricity market integration in China. For a long time, China’s electricity sector has been heavily regulated with the state-owned company, namely State Power Corporation, being the dominant player in the market. Since 2002, China has undertaken major reform initiative to introduce competition and unbundling and hence raise efficiency in the electricity sector. However, it is argued that restructuring has not delivered its anticipated benefits and further reforms are needed. Given the sheer size and complexity of China’s electricity sector, understanding its development has important implications not only for China’s domestic policies but also for the promotion of EMI in East Asia.

**Chapter 10** by Dandan Zhang, Xunpeng Shi, and Yu Sheng focuses on “Enhanced Measurement of Energy Market Integration in East Asia: An Application of Dynamic Principal Component Analysis”. This paper uses the dynamic principal component analyses to measure the EMI and its change in the EAS region between 1995 and 2010. The proposed measure covers EMI from four important aspects that include (i) energy trade liberalisation, (ii) investment liberalisation, (iii) energy infrastructure development, (iv) domestic market openness, and (v) energy pricing liberalisation. Results show that significant progress has been made for EMI in the EAS region though there are cross-country disparities in different aspects.

**Chapter 11** by Romeo Pacudan focuses on “Electricity Price Impacts of Feed-in Tariff Policies: The Cases of Malaysia, the Philippines and Thailand”. This paper examines the implications of feed-in tariff policies on electricity prices in Malaysia, the Philippines, and Thailand and how these countries have considered measures to minimise impacts on low-income households in their design of feed-in tariff policies. Some ASEAN member countries such as Malaysia, the Philippines, and Thailand have recently introduced feed-in tariff schemes to promote private sector investments on grid-connected renewable energy technologies where feed-in tariff payments are being supported by electricity ratepayers. This paper also reviews existing electricity market structures, electricity pricing policies, and feed-in tariff

policies; and analyses measures introduced by these countries to reduce the financial burden of feed-in tariff to low-income households.

**Chapter 12** by Han Phoumin and Fukunari Kimura focuses on “Trade-off Relationship between Energy Intensity—thus Energy Demand—and Income Level: Empirical Evidence and Policy Implications for ASEAN and East Asia Countries”. This study was motivated by the recent shift of energy demand’s gravity to Asia due to decades of robust and stable economic growth in the region. Such an economic growth has correspondingly led to increases in the per capita income of the emerging economies in ASEAN and East Asia. Past empirical studies showed that energy demand—thus, energy intensity—tends to grow at the early stage of development. However, curbing the energy intensity remains central to green growth policy. This study employs a panel data model, pool-OLS, and historical time-series data of individual countries with Vector Error Correction Model (ECM) for the analyses of the above objectives. The findings have suggested three major implications. One, it finds that energy intensity—thus energy demand—has a trade-off relationship with income level, which contributes to the theory of energy demand. Two, energy intensity has a trade-off relationship with income level, albeit the fact that each country has a different threshold level, implying that whatever the level of per capita income a particular country has, that country can reduce energy intensity if it has the right policies in place. And three, countries with persistently increasing energy intensity will need to look into their energy efficiency policies more aggressively to ensure that structural changes in the economy do keep the energy efficiency policy to its core.

**Chapter 13** by Dayong Zhang and David C. Broadstock focuses on “Impacts of International Oil Price Shocks on Consumption Expenditure in ASEAN and East Asia”. This paper examines the impact of international oil shocks upon consumption expenditure in selected ASEAN and East Asian economies. Including oil shocks into a standard macroeconomic model of consumption clearly revealed the reaction of consumption to oil price changes. After the 2008 global financial crisis, government investment and export trade, which are traditionally the two main driving forces behind economic growth in the region, have dropped significantly. This gives governments in the region additional incentive to boost domestic consumption. Therefore, policy makers need to understand how international



oil shocks can affect consumption expenditure. A theory-based empirical consumption function is extended by adding oil prices in order to show where and how consumption in this region responds to international oil shocks.

## Policy Implications

### Energy Trade-related Policy Recommendations

- a. Taking lessons from Singapore's successful experiences in the trading hub of energy products, this study offers some policy recommendations that could harness the benefits from the free trade of energy-related products among the ASEAN and EAS countries. The key finding was that Singapore had undertaken policies to provide strong economic incentives to investors by having well-established trading programs as an impetus for energy commodity trading to occur in a country. This successful experience points to recommendations where the government will need to have an assertive role in economic development by investing in infrastructure and education, implementing economic planning, having a control over key macroeconomic variables, coordinating public sector investment, and attracting private sector investment. All these will need coordinated actions and serious commitment to plan and implement them.
  
- b. With the emerging development of Myanmar and its resource surplus, particularly on oil and gas, coupled with its strategic location to bridge the ASEAN countries to India, the study suggests that a cooperation with Myanmar using India's "Look East Policy" is beneficial for both countries in the long run. The study also suggests that India's proactive and positive movement toward a joint gas field development, along with relatively aggressive measures to acquire new fields for gas exploration, can provide India better energy security in terms of having cheaper gas supply. At the same time, India should provide Myanmar with technical knowledge by developing domestic skill sets, and by helping in the energy market reform of Myanmar. India can also help Myanmar in developing its road, rail, and port facilities that can be used as transit channels. This will not only help Myanmar financially but will also help India to explore the ASEAN energy market in a

bigger way. Such connectivity between India and Myanmar could result in realising their trade potential.

- c. Since resources in the ASEAN and East Asian countries are abundant but unevenly distributed, the promotion of energy free trade is seen as vital for their economic growth and energy security. The study on energy product trades suggests that intra-regional ASEAN trade in energy product must be prioritised, and in this case, the first priority among the energy products to be integrated in ASEAN is coal, lignite and peat, and gas—both natural and manufactured—in order to contribute to positive welfare impacts on the ASEAN society. Therefore, to realise the full potential of these resources for the ASEAN and East Asian countries, establishing the “ASEAN Coal and Gas Community” needs to be seriously considered.
- d. The study on EMI using gravity model of trade in the EAS region demonstrates that the increase of bilateral energy trade is mainly due to the increase in trade potential (due to economic growth) rather than trade efficiency (due to institutional reform). Therefore, the study sees a large room for improvement in the institutional reforms in order to facilitate the trade of energy and energy-related products in the region. It further notes and recommends that energy trade outside of the EAS region provides an important complement to the intra-regional trade.

### **Power Connectivity-related Policy Recommendations**

- e. The study on power connectivity for the ASEAN Power Grid plus China and India (APG+2) demonstrates that if an 80% trade shall be allowed, there will be US\$12.1 billion of net saving from system costs. In this sense, to ensure that financial viability becomes a reality, policies should be designed and implemented to relieve non-financial barriers to keep investment risks low and, therefore, ensure financial viability. The study also recommends that there is a need to optimize the routes and timing of the power interconnectivity in the region to reduce system costs, and enhance the commercial and financial viability of the connectivity projects.

- f. The study on power connectivity in the GMS took a close look into the power trade and development in the future. In the 2030 scenario where GMS could realise its large potential of hydropower capacity, such development will result in both economic and environmental benefits. The region at large will benefit by about US\$40 billion, and gain further by cutting down on CO<sub>2</sub> emission by almost 70 metric tons/year. This study suggests that in order to attract more investments while reducing risk in hydropower development, there is a need to refine the investment cost, and the hydrological data acquisition and mitigation of social/environmental impact of these hydropower projects. Inter-government joint investments and international financial institutions (IFIs) can play important roles in fostering the necessary legal and legislative framework and in ensuring a continuous investment flow into the energy export market. Some lessons can be learned from the Lao PDR in its hydropower development. A clear basis for regional market rules comprising agreed rules and agreed indicative planning (priority) of interconnection among GMS countries should be in place.
- g. The reform of China's electricity sector offers some experiences for electricity market integration. For a long time, China's electricity sector has been heavily regulated with the state-owned company, State Power Corporation (SPC), being the dominant player in the market. Since reform started in 2002, China has made significant progress in institutional development in the electricity sector. However, three government bodies—the National Development and Reform Commission (NDRC), National Energy Administration (NEA), and State-owned Asset Supervision and Administration Commission (SASAC)—are all involved to some extent in the affairs of the electricity sector. This situation calls for the establishment of a single, independent regulatory institution in the sector. The physical interconnection of several grids in China is completed but is yet to be converted into a force for electricity market integration. The Chinese electricity market is still fragmented. Cross-regional as well as cross-border power transmission is not guided by the market. Therefore, China will need to speed up the reform for an integrated electricity

market that could offer potential benefits such as price stability, better response to emergencies, and a more efficient use of resources.

### **Price Mechanism-related Policy Recommendations**

- h. The continued study on the measurement of EMI is a useful mechanism for checking if policy components are being improved. Results show that significant progress has been made for the EMI in the EAS region, though there are cross-country disparities in different areas. Further efforts toward EMI in general should focus on liberalising national markets, followed by phasing out of fossil fuel subsidies, and liberalising investment regime. Certain countries that are lagging behind in EMI may have to catch up and learn from their past experience or from others and put more emphasis on their relatively weak dimensions.
- i. The review on the feed-in tariff policy in Malaysia, the Philippines, and Thailand offers important lessons learned for other EAS countries to look into. In Malaysia, the government deliberately exempted lower-income households in the coverage of the feed-in tariff levy. Domestic customers with consumption levels below 300 kilowatt-hour (kWh) per month are not required to contribute to the RE Fund. In the case of the Philippines, no special considerations for lower-income households were included in the feed-in tariff rules and guidelines. Basically, the only consideration that is relevant to the feed-in tariff allowance payments is the lifeline rate. Philippine households that consume within or less than the defined lifeline rate are exempted from paying all other utility charges. Thailand has also a similar uniform charge rate for feed-in adder. The adder obligations are being passed on to consumers via the fuel adjustment tariff (Ft) charge. With the regulatory reset in July 2011, the adder charges were moved to the base tariff and only the adder charges from this period to the present are reflected in the Ft charge. For 2013, the estimated equivalent uniform adder charge is THB 0.053 per kWh. Thus, a key policy recommendation is for countries to implement their own feed-in tariff

policies with their own designs to protect the poor who need access to commercial electricity.

- j. The study on energy intensity, in association with income level in each of the EAS countries, offers encouragement for countries to pursue policies in curbing the growth of energy intensity. The findings suggest that it does not matter what level of per capita income a country has; as long as the country has the right policies in place, it can reduce energy intensity. Therefore, it is very important for each country to revisit its energy efficiency policies in different sectors to ensure that structural changes in the economy will maintain energy efficiency as the core of its policy. Thus, a few countries in the EAS region may need to speed up their policies to reduce energy intensity so that in the long run, this could bring in the negative growth of energy intensity. The study suggests that aggressive energy efficiency policies will need to be considered by countries with positive energy intensity.
- k. The study on oil price shocks offers some suggestion for the EMI. The lead author suggests that EMI can offer benefits in terms of risk sharing and optimal resource allocation.

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