Chapter 1

Deepen Understanding and Move Forward: Energy Market Integration in East Asia

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1. Introduction

Energy Market Integration (EMI) in East Asia has been implemented in the past decade with the emergence of cooperation between ASEAN and its dialogue partners. ASEAN is working towards a single market by 2015, under the guideline of AEC (Bali Concord II, 2003). Considerable progress in the EMI was made as a result of cooperation achieved through the ASEAN plus Three (APT) process and, later through the East Asian Summit (EAS) 1 process (Shi and Kimura, 2010).

The main incentives to promote EMI are improving energy security, reducing carbon dioxide emissions, and facilitating regional integration. EMI is also expected to foster

[1] The EAS, which was established in 2005, comprises of the 10 member countries of the Association of Southeast Asian Nations (ASEAN), i.e. Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand, Vietnam, and their 6 dialogue partner countries, i.e. Australia, China, India, Japan, Republic of Korea and New Zealand. The US and Russia will join the EAS in 2011. For the current paper, we are still focusing on the 16 countries.

economic growth through facilitating trade in energy within the region, optimizing resource allocation across countries, improving the productivity of energy consumption in each country, and protecting the environment. It is therefore widely believed that EMI in East Asia is beneficial for both developed and developing countries. This is partly because rapid economic growth of a country in this region always requires steady energy resource supply and EMI can provide a guarantee for the energy resource supply from an institutional perspective and partly because many East Asian countries are less developed but resource abundant and thus EMI can facilitate their development. However, such benefits are more often stated in qualitative ways than in quantitative ways. Since the benefits of EMI are not without questions, it is useful to do further quantitative studies to deepen our understanding on the impact of EMI.

Moreover, even though EMI in the EAS region seems beneficial and promising, the way toward EMI will not be smooth and therefore the implementation of EMI should be carefully studied. East Asia has been pursuing economic integration — an effective instrument proved by the European and North American experience to maintain sustainable regional economic development and poverty reduction across countries, for quite a while. However, the progress on EMI so far is limited. This is not exceptional as EMI is often closely related to national sovereignty, energy security, and other sensitive issues such as subsidy removal. It is therefore necessary to find ways to move EMI forward.

To address these needs, ERIA continued an EMI study project for the second year. A detailed introduction about the background of this project can be found at the report for the previous study (Shi and Kimura, 2010). For the current study, ERIA recalls the EAS Energy Ministers' request in their fourth meeting of "how to reap the benefits from EMI and to assess the collaborative measures to improve the market regulatory framework and to establish a conducive environment for the flourishing of the energy industry" and the Chairman's Statement of the fifth East Asia Summit (EAS) on "emphasising the need for greater regional cooperation on energy, we welcomed the efforts to address market barriers and promote more transparent energy trade and investments, and enhance dialogue and communication between energy producers and consumers……".

In line with these instructions from policy makers and past studies, ERIA sets the topic of the current study as "Energy Market Integration in the East Asia Summit Region—— Deepen Understanding and Move Forward". Part of the studies will further deepen our understanding about the impacts of EMI; while the other part explore ways to move the EMI forward, which echoes the instructions from the leaders and the energy ministers. Considering the debates of shifting away from nuclear energy as a consequent of the triple disasters in Japan, two studies are dedicated to estimate the impact of reducing nuclear energy in national energy mix with Japan as a case study. All these studies attempt to inform member countries and raise their interests to participate in EMI.

The original proposals have been reported to the East Asia Summit Energy Cooperation Taskforce (ECTF) EMI work stream chair, co-chair, and other stakeholders at the early stage. The final research plan, including the study on nuclear energy issues, was reported to the 15th EAS ECTF meeting held on 7 April 2011. A workshop was held to present the results of this study to the ECTF members on 25 August 2011 in Vientiane, Lao PDR. The major policy implications and recommendations were reported to the first EAS Energy Ministers' Meeting (EMM5) held in Brunei on 20 September 2011 and were highly appreciated by the ministers (ASEAN website, 2011).

A variety of qualitative and quantitative methodologies have been employed in these studies. For qualitative methods, public goods theory and comparative study method are two outstanding examples. The quantitative methods includes economic growth theory, principle component approach, input-output table, and econometrics. Both top-down approach such as Computable General Equilibrium (CGE), and bottom-up approach such as TIMES, are applied. Both empirical and simulation approaches are also taken.

The studies are organized as the follows: Chapter 2 to Chapter 7 are dedicated to deepening our understanding about the impact of EMI on the East Asian Region. Chapter 8 to Chapter 12 address some prominent issues during the process of moving the EMI forward. In particular, Chapter 11 and 12 examine policy issues related to the nuclear energy emerging from the March 2011 Japan earth quake and the Fukushima nuclear accident.

This overview report provides an overview of the 11 papers initiated under the current project. The report is organized as follows. Following the introduction, section 2 provides a brief overview of background, and the major findings. Section 3 reports policy implications and Section 4 summarize some policy recommendations.

2. Background and summary of key findings

Considering some of these studies are policy oriented while others are pure academic attempts, the differentiated interests of the ECTF and policy makers on the various issues, the fact that two projects are dedicated to study particularly for nuclear energy policy, we group the findings into three according to the characteristics of the findings where there are generated, that is, findings from policy oriented studies, those from nuclear energy policy studies, and those from academic studies. Due to technical and data limitations, the results from the academic studies, although are interesting and innovative, do not necessary reflect the reality in East Asia.

2.1 Background and findings from policy related studies

Chapter 2 provides an analytical framework addressing the public goods characteristics of EMI. In Chapter 2, Andrews-Speed applies a regional public goods approach to the study of EMI in East Asia, with a view to clarifying the outlook for such integration and the likely obstacles to be encountered. His study focuses on more specific services or actions that need to be delivered in order to achieve the following regional goals: security of energy supply, economic development, poverty alleviation, economic and technical efficiency, and environmental protection.

He adopts the idea of "aggregation technology" to facilitate the analysis. Seven types of "aggregation technology" were identified for regional public goods. 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. The supply of a good with 'weakest link'

aggregation technology, such as pipeline, depends on the supply of the smallest contributor, just like the weakest link in a chain. 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, such as establishment of a new best practice in energy efficiency.

The purpose of the aggregation technology is to provide appropriate incentives for collective action to ensure sufficient supply of the public good. For example, the most efficient way to generate the "best shot" technology is to pool funds together and let one member do all the work. On the other hand, the most efficient way to manage the "weakest link" technology is to coordinate among various countries to make sure to provide capacity on the chain evenly.

The aggregation technology, together with the nature of the good, decides incentives for, the obstacles to, and the institutions needed for the delivery of a regional public good. The challenge for policy-makers is to design the institutions and instruments so as to address the weaknesses of the aggregation technology or to manipulate the technology in order to provide public goods in an efficient way (Barrett, 2006; Sandler, 2004, 2006, 2007; UNIDO, 2008).

In addition to proposing theoretical ideas relating to regional public goods, Chapter 2 also discusses the experience of the European Union in its attempts to develop a single energy market.

It finds that many services needed in order to develop and sustain a regional integrated energy market have the characteristics of a regional public good, though some may also be trans-regional or global in nature as well. Among them, the best management practice in energy efficiency is an example of pure public goods with the "best short" characteristic. Once the knowledge in improving energy efficiency has been generated, other countries do not need to generate their own. Any country can adopt it without competing with others, and it also cannot prevent other countries to adopt it as well. Another example of pure public good is emergency stocks, such as the US oil stock. Once it is used in case of high prices, everybody will be able to benefit because oil price will go down.

Both Chapter 3 and Chapter 4 apply the principal component analysis (PCA) approach to quantify the progress of EMI, but Chapter 4 further examines the impact of EMI on growth convergence. In Chapter 4, Sheng and Shi innovatively construct two indexes, the energy trade index and the energy market competition index, to measure EMI at the country level by applying the PCA approach[2] and use these measurements to examine the impact of EMI on growth convergence by estimating both the σ-convergence and β-convergence. This study addresses the role of EMI in narrowing development gaps (NDG), which is important in facilitating economic integration in East Asia.

Sheng and Shi find that an integrated energy market may significantly help poor countries to catch up with rich countries in economic growth, thus reduce income disparity across countries, and accelerate the step of the catch-up. When EMI has been implemented and the investment and technology progress are well controlled, the poor countries can save at least 10 years when catching up with rich countries that have double income per capita.

Moreover, a comparison among three regions, i.e., EU, NAFTA and EAS, shows that energy market in the EAS region has integrated more quickly than that in the EU or the NAFTA regions in recent years and EAS countries are more likely to achieve economic convergence than the rest of the world. Yet, the impact of the EMI process on economic convergence in the EAS region is relatively smaller than that in EU. The study also finds that investment and capacity building may help to facilitate the catch-up and promote economic convergence across countries.

Considering the fact that intra-regional energy trade has rapidly increased in East Asia in the recent ten years while applicable tariffs have been zero even before FTAs were established, Zhang and Zha examine the reasons behind the booming of trade in Chapter 5. They find that trade facilitation, including energy investment and infrastructure

[2] The PCA is a powerful tool for analyzing data to form a comparable index across countries when no explicit weight is available; the PCA approach allows us to find an appropriate weight for each component.

improvement, while not tariff declining or elimination, has played critical roles in boosting energy trade. Furthermore, they find that for the energy trade, huge energy investment and infrastructure improvement have played critical roles. In addition, the trade facilitation among ASEAN countries, which is initiated to meet with new trade situation, such as ASEAN Trade Repository, have positive impacts on energy trade in the region. In terms of ASEAN gas and electricity cooperation, they find that China has been increasingly involved; and India will also play a more important role in gas cooperation.

They argued that with the growing energy trade among the EAS Region, the improvement of the trade facilitation is one of the key issues towards EMI, and will benefit for both the resource-rich countries and energy-deficit countries in the region.

In Chapter 6, Doshi and D'Souza investigate the "Asia premium", which has caused policymakers in Asia much concern especially in light of the high energy prices in the latter half of the recent decade. They use a new, high-frequency dataset to ascertain whether the Asia premium exists; then evaluate the arguments that fault the current formula-based pricing system with the existence of the premium; and finally address the issue whether EMI would be effective to mitigate the Asia oil premium if it exists.

They find a historical price differential of US$1-1.5 between the Asian and Atlantic markets. However, their analysis reveals that for the three years from 2007–2009 there is no secular Asian premium. On the contrary, in 2007 and 2009, Asia received a *discount* in its crude oil bill relative to the Atlantic markets.

In a summary, Doshi and D 'Souza conclude that the existence of the price differential between markets is a function of the reference price levels. Given that the price differential fluctuates between being a discount and a premium, there is an option value in maintaining the status quo. They thus argue that taking any action to mitigate the so-called premium will rather be premature or inefficient.

Chapter 7 by Kojima and Bhattacharya studies issues with energy pricing reform and investment liberalization in a Computer General Equilibrium (CGE) approach. The common practice of subsidies in East Asia makes the reform of energy pricing a necessary but challenging task. They find that even if a partial removal of energy subsidies can ripe

the benefits of market efficiency improvement. It is estimated that around 500 Million USD of subsidy reduction per annum in the region can improve the regional economic condition in terms of real GDP by around 0.05% and its welfare by around 0.14% compared to the base line scenario of 2020. Energy subsidy reduction also helps to push down the demand for subsidised commodities in the market and also subsequently cuts the sales of subsidised energy commodities in the domestic market.

Energy sector investment liberalisation is another important issue of EMI that has been associated with methodological difficulty in quantitative economic analysis. Chapter 7 also developed a new multi-regional CGE model for conducting a quantitative assessment of electricity sector investment scenario in which the investment demands in the EAS member countries projected by the International Energy Agency are met. The assessment results show that for meeting energy sector investment demands, FDI will play an important role not only to benefit investing and hosting countries but also to increase the regional GDP as the whole. The most interesting finding shows that introduction of FDI increases not only the national GDP of the investing countries but also the regional GDP as the whole EAS region by 0.04%.

Using a qualitative method, Wu in Chapter 8 reviews the trends in global gas market integration and draws policy implication for gas market development in the East Asia. Wu classifies the natural gas markets in the EAS area into three groups, namely, the mature markets (Australia, Japan, New Zealand, and Singapore), the developing markets (China, India, Indonesia, Malaysia, South Korea, and Thailand) and the fledgling markets (Brunei, Cambodia, Laos, Myanmar, the Philippines, and Vietnam), according to the stage of market and regulatory development.

Wu finds that the experience of the two leading groups in the promotion of market liberalization and integration, the United States (US) and European Union (EU), shows that gas market integration has undergone through a common trajectory that consists of several steps including the creation of intra-country regional markets, formation of a national regulated market, deregulation, and international integration. For the implementation of the last step, namely international integration, it involves the standardization of the gas sector,

harmonization of members' regulatory systems, and removal of cross-border trade barriers. EAS members can learn from the experience and lessons in the US and EU and work out a plan for gas market integration in the coming decades.

He argues that in terms of gas market integration in the region, LNG market will play an important role. With expanded capacities in terms of both pipelines and LNG terminals, a gas-to-gas competing market may appear in the EAS region. Traditionally the price of natural gas is tied with the price of oil. This is still the case in Asia. However, the gas pricing mechanism has changed in other parts of the world. In the US, due to gas-to-gas competition, the gas price is determined by the domestic gas market price, and imported gas is also linked to the domestic gas price (Fukushima, 2009). Similar market-oriented pricing mechanism also emerges in Europe.

2.2. Background and Findings from Studies of Nuclear Energy Policy in Japan

One emerging issue in the energy industry is about future policy on nuclear energy. Following Japan's nuclear accident at the Fukushima power plant after the Great East Japan Earthquake followed by an unprecedented tsunami, not only Japan but Asia as a whole is expected to learn a lesson on the risks and costs involved in the civilian nuclear energy program. The current Japanese nuclear crisis has revealed plethora of uncertainties over the future direction of Japanese energy policy as well as Asian energy policy which are integrated indeed, via the technological, financial, and nuclear energy knowledge sharing activities within the region.

As an aftermath of the devastating nuclear fallouts in Japan, many discussions and actions have been taken against nuclear energy. The shift of electric power sources will have economic impacts as well as environmental impact. Two studies were initiated to study this real policy issues.

Itakura in Chapter 11 uses a global CGE model to estimate economic impacts on production, consumption, and international trade. He shows what would be the economic impact of shifting the electric power generation away from nuclear by two simulations:

a) Reducing the electric power generation by nuclear in Japan and b) replacing nuclear power generation by fossil fuels.

The simulations show as Japan reduces the power generation by nuclear, the real GDP in Japan would be negatively affected and the deeper the cut, the larger the negative impact. If the use of nuclear in Japan was reduced by 20 per cent without any replacement, then the real GDP is decreased by about 40 billion US dollars, and this amount is almost equivalent to one per cent of GDP evaluated in 2004. He finds that even with the substituting role of fossil fuels being placed, it is not effective enough to mitigate the negative impacts.

From the energy system perspective, Bhattacharya and Kojima in Chapter 12 use a bottom-up method, the TIMES Integrated Assessment Model (TIAM-WORLD)[3] model to demonstrate feasibility of f meeting future energy demand with certain emission reductions without nuclear in Japan, China and India. They first establish the reference energy scenario (REF) that represents the business-as-usual situations of energy supply and demand before the Great Tohoku Earthquake and the Fukushima nuclear accident in March 2011. Based on this scenario, they assess the impacts of two alternative energy scenarios with gradual nuclear phase-out in Japan, China and India in terms of energy system costs, technology choice, and CO_2 emission. Both scenarios assume that nuclear power supply gradually goes off from the supply mix by 2050 with a three-step reduction target. Based on this assumption, the Fossil Fuel-Long Run (SFF-LR) scenario assumes that fossil fuels mainly substitute reduced nuclear energy supply while the Renewable Energy Scenario (REN) scenario assumes much higher dependence on renewable energy which is reflected through imposing minimum renewable energy share of 40% (15% from wind and 25% from solar) by 2050 with gradual escalation from the current share of less than 1%. To

[3] The TIAM-WORLD model integrates the entire energy/emission system of the World, divided in 16 regions, including the extraction, transformation, trade, and consumption of a large number of energy forms. India, along with Japan and China are represented as individual regions in this model. The model contains explicit descriptions of more than 1500 technologies and several hundreds of commodities in each region. TIMES' economic paradigm is the computation of a inter-temporal partial equilibrium on energy and emission markets based on the maximization of total surplus, defined as the sum of suppliers and consumers surpluses.

compare these two alternative scenarios with equal footing in terms of emission reduction, the CO_2 emissions from the REN scenario are imposed on the SFF-LR scenarios as the upper limits of CO_2 emissions.

The study shows that electricity price is expected to increase under both the scenarios, but renewable energy dependent path will have lesser increase than fossil fuel dependent path. Compared to the renewable energy dependent path, fossil fuel dependent path appears costly in the long term scenario for all the three countries given the same level of CO2 emissions reduction. Benefits of renewable energy are multifarious and observed in terms of total system cost, electricity generation cost and also in terms of reduced import.

2.3. Background and Findings from Academic Studies

The studies reported at this section are academically significant but may not be able to generate robust results due to limitation of data and methodology. Therefore, findings and policy implications from this subsection should be carefully interpreted.

In Chapter 3, Yu measures EMI with the PCA approach from those aspects that have been identified in the previous year's EMI study (Shi and Kimura, 2010), namely, (1) energy trade and investment liberalization; (2) trans-boundary energy infrastructure development; (3) domestic energy market liberalization; and (4) energy pricing liberalization. Yu's estimation shows that countries like Japan and New Zealand have the highest extents to EMI. By contrast, China has the lowest score of EMI (-2.67), followed by Malaysia, India and Indonesia. The rest of the countries, which basically are the CLMV group, is located in between.

Chang and Li in Chapter 9 use a competitive equilibrium model to analyse the implications of an integrated and competitive natural gas market in the region. Apart from thwarting the monopolistic pricing behavior, they also seek the possibility to decouple prices of natural gas from that crude oil and thus add to the price advantage of natural gas. They raise two issues in their study: first, what would be the trade pattern of natural gas in the region when an integrated and competitive market of natural gas is introduced in the

region? And second, what would be the impacts of additional infrastructure including pipelines and LNG terminals in the region?

Chang and Li show that by adopting an integrated and competitive natural gas market in the region, overall welfare of countries involved in natural gas trade in the region improves by 5.5%. In general, their study shows that the supply of natural gas from the region, which has cheaper transportation costs, increases its portion in the total supply of natural gas. By introducing new natural gas infrastructure in the region, Chang and Li observe that welfare of countries involved in natural gas trade in the region further increases by 0.3%.

Since many ASEAN countries are agricultural exporters, they may be vulnerable to an increase in energy price particularly to crude oil price hike because energy costs may play an important part in the food industry. Therefore, in Chapter 10, Khalid, Zakariah, and Zarina apply three different approaches, which are primarily based on the input-output (I-O) table methodology, to selected East Asian countries to evaluate whether there exist any potential benefits of the food industry from EMI. This study uses secondary data that are sourced but not exhaustive from the OECD and various selected EA countries' statistical agencies, particularly the DOS in Malaysia, Singapore etc.

Khalid, Zakariah, and Zarina find that resilient economies, especially developed EA countries, have consistent performance in terms of value added creation and imported inputs during the period of energy price surge. In addition, the price spread model implies that a doubling of crude oil price will cause CPI for food to rise by approximately 22%.

3. Policy Implications

A significant amount of policy implications is proposed by these studies. It shows that EMI should be promoted actively, but in a gradual incremental manner; interregional governance is necessary and a regional coordinating agency is desirable; Cross-border cooperation in energy projects should be promoted and financed with proper funds; and gas market can lead the EMI. The following is detailed discussion.

3.1 Determinated but Gradual Promotion of EMI

One clear message from this report is that EMI is beneficial theoretically and empirically and thus it should be promoted in a continuous and confident manner. Chapter 7 concludes that an integrated energy market can expedite both the process of pricing reform where the benefits and costs can be shared among the countries and the private sector investments in the forms of FDI to energy sector.

Chapter 3, 4 and 5 suggest that EMI should be promoted more confidently and positively not only among developed countries but also involving developing countries. The demonstrated benefits of EMI in facilitating NDG in Chapter 4 calls for deeper EMI within the East Asia and more active participation of less developed countries (LDCs). They also suggest that developed countries can play an important role by helping LDCs to overcome the difficulty through capacity building programs. Even though LDCs may need more time to make preparation, a workable roadmap toward EMI is valuable (Chapter 4).

Chapter 5 argues that Asian oil market mechanisms by trade and investment facilitation should be developed and enhancing dialogue between Asian oil consumers and producers is also very important.

Chapter 3 suggests that countries that have lagged behind the progress of EMI should work harder to catch up. Chapter 5 suggests that all countries should promote EMI by trade facilitation and take the advantage of existing RTA platforms to promote EMI.

In terms of implementation strategy, EMI in East Asia should be pursued in an incremental manner. Chapter 2 suggests EMI starts mainly at a sub-regional scale and the specific steps taken towards EMI should be chosen on the basis of their likely positive economic impacts and their likely ease of delivery. In this respect, proposals for sub-regional energy networks in Northeast Asia are to be encouraged and actively pursued. CJK could cooperate with other countries in the region and develop cross-border new energy projects aiming to renewable EMI, low carbon, and green economy (Chapter 5). Other initiatives that should be pursued at a sub-regional scale include: sea-lane security, emergency response teams, and pollution clean-up capacity.

Recognizing the importance of gradual approach, Chapter 10 recommends that the governments must step-up efforts to reduce market distortion with improvement in energy efficiency by means of scaling up chains of interconnectedness and integration to a point where efficiency could be enhanced.

3.2. Interregional Governance and Regulatory Framework

Chapter 2 suggests that governments or public bodies should take responsibility for managing or stimulating EMI based on the findings that EMI has public goods characteristics. Because of the special nature of energy, the development of an integrated energy market requires relatively sophisticated systems of energy governance, some of which will need to be legally-binding and will require states to yield a certain degree of authority to a supra-national institution (Chapter 2).

Chapter 2 and Chapter 5 propose that a single high level organisation or an energy policy cooperation framework, similar to IEA, should be established. Chapter 2 thinks the organization could be tasked of coordinating (1) the delivery of certain services and activities which are delivered across the whole region and (2) the various sub-regional initiatives. Sub-regional organisations can be established to oversee the delivery of services at this level.

Different legal and institutional systems among the countries should be harmonized, and transparency of laws and regulations must be improved so as to support the expansion of energy trade in the region. All countries need to improve the quality and timeliness of energy data and statistics, aiming at improving transparency in the energy market (Chapter 5).

3.3. Infrastructure, Investment and Subsidy

Cross-border cooperation in energy projects should be promoted and financed with proper funds (Chapter 5). Chapter 9 shows that new infrastructure clearly increases the general social welfare and brings new trade opportunities to specific countries in the region.

Relevant countries thus find supports for their investment in the expansion of the supply network for natural gas in the region, including both pipeline and LNG.

Chapter 5 suggests that infrastructure such as pipelines and LNG facilities should be built based on sound fund-raising structure that allows cooperation among governments and the private sector. Chapter 2 recommends that infrastructure projects could be developed jointly by neighbouring states, for example LNG terminals. Both Chapter 2 and Chapter 8 highlight a strategy to develop TAGP and APG as an immediate step toward the EMI.

Chapter 7 suggests energy sector investment liberalisation is needed to boost FDI flows and its potential benefit not only in economic terms but also for environmental considerations, which can be attained if some policy for encouraging FDI to target cleaner energy is implemented.

In addressing the shortage of investment, it is recommended to explore and establish multilateral and applicable financing approaches urgently. The first approach could be a regional infrastructure fund, such as ASEAN infrastructure fund from ADB and ASEAN-China Investment Cooperation Fund. The second approach could be regional development banks as proposed in Chapter 5, such as Northeast Asia Bank of Cooperation and Development and Southeast Asia Bank of Cooperation and Development.

As for domestic investment, Chapter 10 recommends regional governments to adopt sectoral energy investment plans in their respective countries to bolster their economic growth and consumption of more efficient and cleaner fuels.

Removal of energy subsidies is demonstrated to have multiple benefits and thus should be implemented even if it is a sensitive issue (Chapter 7). Chapter 7 also demonstrates that the common perception of subsidy removal that will affect the welfare and national GDP due to inflationary effect of energy price increase, may not be correct for this region.

Chapter 9's finding also suggests the need for removing subsidies. An integrated and competitive market will remove excess demand through removal of distortions such as subsidies, and increase the social welfare.

3.4. Gas Market Integration

Chapter 8 and Chapter 9 suggest that East Asia should develop a formal program to boost cross-border connectivity and trading for gas within the area and eventually achieve regional gas market integration. This goal could be achieved through the evolution of the current schemes such as TAGP and GMS or new initiatives such as the establishment of regional gas storage or gas exchanges. Chapter 2 also recommends that steps should be taken to construct emergency gas stocks to support the effective operation of the growing trans-boundary gas networks.

Chapter 8 suggests that several institutions in the EAS areas should coordinate better to promote their "gas" sector. One example is that the "gas" sections of these institutions could be merged to form an EAS Gas Agency (EGA).

Chapter 8 also suggests that the EAS states to set targets to gradually harmonise regulatory and technical standards in the gas sector through multilateral agreements. A set of mutually agreed and harmonised standards, or the EAS Best Practice (EBP) standards, can be implemented initially in the relatively more developed markets and then extended to other markets over time.

3.5. Nuclear Energy Policy

The two studies addresses nuclear energy issues from different perspectives. From macroeconomic perspective based on top-down methodology, shifting away from nuclear energy will incur significant damage on national economy (Chapter 11). From energy system perspective, nuclear phase-out is feasible and if nuclear is mainly replaced by renewable energy the total energy cost could reduce, even though electricity retail price is expected to increase whenever nuclear energy is replaced by fossil fuel or renewable energy (Chapter 12).

Both studies show that completely shifting away from nuclear energy in the short run is not advisable. It is therefore desirable to design appropriate mix of electric generation types based on the existing facilities and the feasibly planned future investment.

More aggressive renewable energy policy is required. The renewable energy dependent scenario is expected to have much lesser financial impact than the fossil fuel dependent scenario when nuclear energy will be phased out with reduced CO2 emission (Chapter 12).

4. Recommendations

ERIA has recommended to following policy to the EAS policy makers:

EMI in East Asia should be pursued in an incremental manner since an regional wide overall structure cannot be established at this moment. It can start at a sub-regional scale and from any small steps. Some concrete cooperation activities can be proceeded now, such as emergency gas stocks, sea-lane security, emergency response teams, and pollution clean-up capacity.

East Asian countries may consider to institutionalize an energy policy cooperation framework, or establishing a single high level regional organisation, similar to IEA, to coordinating activities in the energy sector and the delivery of certain services across the whole region. ASEAN can form the basis of such organisations in Southeast Asia, but steps need to be taken to establish a coordinating organisation for Northeast Asia and the whole East Asia .

Different technical, legal, and institutional systems among the member countries should be harmonized, and transparency of laws and regulations must be improved so as to support the EMI. The quality and timeliness of energy data and statistics need to be improved to enable transparency in the energy market.

It is recommended to explore and establish multilateral and applicable financing approaches, such as regional infrastructure fund and regional development banks.

Promote and nurture the development of gas markets in member states and phased sectoral reforms in relatively mature markets through multilateral agreements.

Although having a systematic and well planned subsidy reduction policy is a big challenge for the countries in this region, the time has come to act prudently to reduce such slow poising destructive policies to make the countries prosperous in the future.

Countries with interests on nuclear energy need to carefully review nuclear energy policy considering the revealed additional risks and uncertainties, as well as the costs and benefits that have been identified in these studies. Individual and cooperative actions on improving safety operation and dealing with accidents should be considered. Meanwhile, East Asia needs to focus more towards its indigenous energy resources like renewable energy rather than looking for something which is not of its own like nuclear energy and or fossil fuel based technologies.

References

ASEAN website. 2011. *Joint Ministerial Statement of the Fifth East Asian Summit Energy Ministers Meeting* [Online]. Available: http://www.asean.org/26627.htm [Accessed 26 Septermber 2011].

Bali Concord II. 2003. *Declaration of ASEAN Concord II* [Online]. ASEAN. Available: http://www.aseansec.org/15159.htm [Accessed 16 June 2011].

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