

Chapter 1

The Electricity Sector Leads Energy Market Integration in East Asia: Introduction

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CHAPTER 1

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Electricity market integration in East Asia is an important component of the energy market integration (EMI) initiatives supported by the East Asian Summit (EAS) member countries. It is argued that an integrated East Asian electricity market would allow consumers to have access to competing suppliers within and beyond borders and enable electricity providers in member economies to deal with peak demand and supply security better. Electricity market integration within the EAS area has made some progress with the Greater Sub-Mekong Region (GMS) as the forefront of changes. The proposed ASEAN Power Grid (APG) has also been implemented gradually. However, electricity market integration within the EAS economies remains a challenging task. While physical infrastructure is often expensive and financially demanding, institutional development is more important and complicated since it is closely linked with market liberalization and regulation.

To gain a better understanding of the issues involved and follow two previous ERIA projects, this EMI project focuses on the electricity sector. In this introductory chapter, we first describe the objectives of this study in Section 1. The main findings

in the core chapters are then summarized in Section 2. Some recommendations for policy makers are presented in Section 3.

1. Objectives

Although regional electricity market integration has been promoted by nations in the world, the actual progress in interconnection varies across continents and between countries within different country groups. In terms of interconnectivity and trade in the EAS electricity sector, there is still a long way to go. EAS lags behind Europe's electricity market integration efforts where physical cross-border exchanges have increased considerably. In terms of market development, most EAS members are yet to develop a national electricity market, let alone the pursuit of regional integration. Cross-border trading is still at the early stage of development. In general, the 16 EAS member countries can be broadly divided into several groups in accordance with their market and institutional development. Relatively mature and integrated national markets have emerged in several EAS countries, namely, Australia, New Zealand and Singapore. Some members are at various stages of developing a national electricity market (Brunei, China, Japan, Malaysia, the Philippines, South Korea, Thailand and Vietnam). Others are still trying to improve the level of electrification in their societies (India, Indonesia, Cambodia, Lao PDR and Myanmar). While governments in the EAS countries have moved in the right direction to promote market integration in the electricity sector, much more work is needed.

This project has several objectives. First, we want to explore some general issues associated with EMI particularly electricity market integration and hence contribute to the ongoing debates about regional market integration. These issues include the potential impacts of EMI on economic development, benefits of electricity trading, and domestic and regional policy responses in order to promote market integration. Second, we selected three countries for case studies, namely, Cambodia, China and New Zealand. Cambodia represents relatively less developed EAS members. While domestic electricity markets in those economies are yet to be

developed, they could play a role in supporting regional market integration and contribute to institutional capacity building. As the largest market within the region, China is expected to play a significant role in regional market integration. We examine potential barriers to foreign and domestic private investment in the Chinese electricity sector. New Zealand is selected as a success story of introducing advanced unbundling, whose outcome, however, is still not clear-cut.

The third objective of this project is to deal with the removal of subsidies in the energy sectors within the EAS area. Energy subsidies are prevalent in EAS economies. The removal of those subsidies is a prerequisite for the EMI. In this study we present detailed investigations of energy subsidies in three EAS members, namely Indonesia, Malaysia and Vietnam. Specifically we consider various scenarios of reducing or removing subsidies and hence the possible consequences. In total, nine reports are included in this volume. They can broadly be divided into three categories with three reports in each, namely: the general EMI issues, case studies (of Cambodia, China and New Zealand), and energy sector subsidies (in Indonesia, Malaysia and Vietnam). The main findings in those reports are summarized next.

2. Main Findings

Among the three papers addressing the general EMI issues, Sheng and Shi show that rapid economic growth due to industrialization and urbanization tends to increase the energy consumption per capita, which in turn may generate a surge in the overall demand for energy. The econometric results show that an increase in economic growth may increase 0.6 per cent of energy consumption per capita. Moreover, economic growth also leads to lower price and income elasticities (in absolute terms). However, energy market integration can help to reduce the energy demand pressure and to smooth the demand shock through decreasing the income elasticity and increasing the price elasticity in particular in the long run.

Chang and Li build a dynamic linear programming model and simulate optimal development paths of power generation capacities in ASEAN countries. They consider three scenarios (no trade, 20% trade and 50% trade in electricity) of

developing optimal power generation capacity and their impacts on market integration in ASEAN (Table 1). Their findings show that a more open power trade regime encourages the development of renewable sources of power generation, and accrues more savings in the total cost of meeting the growing future power demand from 2010 to 2030. Chang and Li argue that with power trade more countries will utilize renewable-based power generation such as hydro and wind and hence the total cost of meeting region-wide electricity demand will be reduced. Because considering unlimited power trade may arouse energy security concern among the high import-dependency countries, the limited power trade in the region seems to be more realistic. Specifically under the scenarios of partial trade (20% and 50% capacity) the present value of cost savings would be USD 20.9 billion (3.0%) and USD 29.0 billion (3.9%), respectively. Thus even with partial integration (cross-border power trading) substantial cost reduction could be realized (Table 1).

Table 1: Key Findings from Different Scenarios of Electricity Trade

| Scenario | Total Cost Savings | Development of Additional Capacity (Top Four in Turn) |
|----------------------------|---------------------------|--|
| No Trade | N.A. | Gas, Coal, Hydro and Geothermal |
| 20% of demand met by trade | 3.0% (USD 20.9 billion) | Gas, Hydro, Coal and Geothermal |
| 50% of demand met by trade | 3.9% (USD 29.0 billion) | Gas, Hydro, Coal and Geothermal |

Sources: *Chang & Li (2012)*.

Wu's report presents a review of the trends of integration in the world's major electricity markets and analyzes the experience and lessons in those markets. Wu shows that the main initiatives in electricity market integration so far share some commonalities. First, interconnections mainly occur among neighbouring countries which have well-developed national markets. Second, bilateral electricity exchanges are often initiated first and then expanded to sub-regional markets. Finally, market integration is accompanied with domestic reforms and international harmonization of regulations standards.

The three case studies cover Cambodia, China and New Zealand. Poch presents an overview of the Cambodian power sector. With a rate of electrification of about

25% in 2009, Cambodia is expected to expand electricity capacity and coverage and requires a large amount of capital for investment in the future. This demand is well beyond the capacity and resources of the Cambodian government. The electricity sector remains underinvested. Barriers to investment include huge capital requirement for large-scale projects, insufficient legal and institutional framework, and high administrative costs. Poch argues that the country's business environment must be enhanced to be conducive to both foreign and local investments.

In the report on China, Sun, Guo and Zheng discuss reform initiatives and barriers to foreign participation in China's electricity sector. They argue that the electricity sector reform alone cannot deliver the expected benefits associated with the participation of the private sector. The barriers to private participation are originated from not only the electricity sector regulation itself, but also the broader institutional arrangement in the economy, such as fragmented regulatory system, unpredictable pricing mechanism, limited access to the transmission, disadvantage of accessing fuel and finance for private sector, and rampant expansion of state-owned sector.

Shen and Yang examine the lessons learned from the New Zealand electricity reform. The Electricity Industry Reform Act 1998 (EIRA) prohibited common ownership of electricity distribution businesses and of either electricity retailing or electricity generation businesses (other than minor cross-ownerships). They argued that the forced ownership unbundling did lead to efficiency and quality improvements, high total factor productivity (TFP) growth, and reduction in retail prices, immediately after the unbundling. However, since 2003, retail prices have been rising, TFP has been falling, and service quality has been falling too. Furthermore, the unbundling does not seem to have facilitated greater competition in the electricity generation sector.

This has however been partly reversed since the enactment of Electricity Industry Act in 2010, which further reduces the extent of ownership separation among distribution, retail and generation by allowing distribution back into retailing and raising the threshold for ownership separation between distribution and generation. This new policy provides incentives for distribution businesses to invest in generation and retail. However, it may also create vertically integrated electricity

utilities, encompassing generation, distribution, and retailing. This practice is against the theoretical preference of competition and unbundling, and its impacts are yet to be assessed. As a reference, the literature suggests that vertical integration is indeed associated with economy of scope; however, allowing competition in retail and wholesale markets tends to improve firm efficiency and service quality and leads to higher productivity and consequently lower prices. The net impacts tend to be positive but moderate.

The last three reports deal with subsidies in the energy sector (fuel, oil and electricity) in Indonesia, Malaysia and Vietnam. In the Indonesian case Widodo and his three colleagues consider several scenarios of the removal of fuel subsidies (Table 2). It is found that the removal of fuel subsidies has economy-wide effects on many factors such as output, employment and income in Indonesia. Specifically the removal of fuel subsidies of IDR1 billion would reduce production output, GDP, and labour income by approximately IDR0.164 billion, IDR0.088 billion and IDR0.112 billion, respectively.

Table 2: Multiplier Analysis of Social Accounting Matrix (SAM) on Output, GDP, and Income

| Simulation | Output | GDP | Income |
|----------------------------------|---------|---------|---------|
| Baseline (A) | -2.5459 | -1.6093 | -2.0895 |
| Scenario (B) | -2.7098 | -1.6973 | -2.2014 |
| Impact (IDR billion) (C = B – A) | -0.1639 | -0.0880 | -0.1119 |

Source: Widodo, *et al.* (2012).

Note: The negative sign (-) shows that the removal of subsidy will have negative impacts. The impact (C) corresponds to the impacts of the removal of the fuel subsidy by IDR1 billion.

At the sector level, it is found that the removal of fuel subsidy of IDR1 billion would reduce the output of chemical and cement industry and electricity, gas, and drinking water sector the most by approximately IDR 0.045 billion and IDR 0.026 billion, respectively. The simulation results also show that the impact on labour income is higher than that on capital returns. A more detailed analysis shows that the lowest income group will be affected most. Workers in administration, sales, and service sectors as well as production and unskilled workers would be affected the most. In contrast, high-income earners as well as workers in agriculture sector would be the least affected by the removal of the fuel subsidy.

With regards to income distribution of different types of households, firms, and the government, households in non-agriculture sector would be affected the most. Specifically, urban households, particularly managers, military personnel, professionals, and technicians, would experience the highest impact of the removal.

If this amount of subsidy is reallocated to four targeted sectors- i.e. Agriculture; Trade; Food, Beverage, and Tobacco Industry; and Education and Health, the gains would be smaller than the negative effect of fuel subsidy removal. While reallocation to Food, Beverage, and Tobacco industry provides the biggest impact on the economy, the impact is relatively lower than that of fuel subsidy removal shown in Table 2, which implies a total negative impact of subsidy removal. These findings are however subjected to qualifications. For example, their multiplier exercise is based on a fixed economic structure and does not take into account of the dynamics over time. It does not allow for substitution effect either as prices are fixed.

In the paper on Malaysia, Hamid and Rashid investigate the effects of subsidy removal on the Malaysian economy using the Malaysian input-output table supplemented by a static CGE model. Their findings imply that phasing out oil subsidy would initially increase the general prices that will especially affect the heavily oil-dependent sectors such as the petroleum refinery, wholesale and retail trade, and motor vehicles. The authors also argue that there are significant variations across industries since different proportions of energy inputs are employed in the production process. In general, the less energy intensive industries and domestic resources-based industries are less affected by the removal of subsidies. The authors' I-O table analysis illustrates that the removal of subsidy of a ringgit will increase the output by six cents and GDP by eight cents at the final demand. The most effect is on workers' income that experiences an increase of 34 cents due to the removal of subsidies. The authors further argue that delaying the removal of subsidies will primarily increase costs for the government and leave little room for policy space in case market prices are higher than expected.

In the last paper on subsidy Nguyen explores the impacts of an increase in the electricity tariff from 6.0 US cents/kWh (domestic price) to 9.5 US cents/kWh (international rate) (a rise of 58.3% in the electricity tariff) in Vietnam. He shows that prices in the five most affected sectors would in turn increase by 11.15% (water),

7.36% (gas), 4.82% (paper & paper products), 4.73% (chemicals and chemical products) and 4.30% (sports and entertainment). The price increase in all other sectors would be less than 4%. These increases in prices would lead to an increase in the CPI (Consumer Price Index) of 4.2%. Lower income earners suffer more from an electricity tariff increase because their payment for electricity represents a bigger share in their annual expenditure than the rich's. Nguyen argues that though the impacts of subsidy removal on the economy are not very large, a one-shot increase in electricity tariffs would be socially unacceptable. He thus proposes a gradual approach towards subsidy removal and separate implementation in each sector. Nguyen further argues that an improvement in efficiency in the power sector would help reduce the repercussions of subsidy removal.

3. Implications and Policy Recommendations

Major policy implications are summarized as follows:

- ✓ Less developed countries should be prepared for faster growing energy demand when their industrialization process commences.
- ✓ Countries can gain from sub-regional cooperation, investment and electricity trading on the one hand and will benefit from a resilient, competitive and effective energy market on the other hand.
- ✓ Full-scale power trade tends to lead to full utilization of hydro power, which produces the lowest cost option of power mix to meet the electricity demand.
- ✓ Deregulation and unbundling, prevalent measures in electricity market reform, may have unintended consequences, such as a rise of tariff and a deterioration of service quality, without proper designing of policy package.
- ✓ Market integration is often accompanied with domestic reforms and international harmonization of regulations standards.
- ✓ The lower income group and the energy intensive industries would be disadvantaged by subsidy removal unless proper backups.

Given these findings and implications, the following policy options may be considered by the EAS member countries:

1. Continuously work toward a closer integrated energy market, which can lead to a less volatile, more flexible and resilient market (against price shocks) through regional cooperation such as infrastructure connectivity, trade and investment arrangement, and the harmonization of regulatory and technological framework. The current development of the GMS power market and construction of APG are the right directions to go. Immediately, initiatives could include the establishment of small-scaled power exchanges in border areas, and cross-border grids with synchronized operations to exploit peak loads in different time.
2. Move toward a freer trade of electricity and more coordinated development of energy projects. This requires a fundamental review of energy security policies. The energy security policies should shift their weights from the national level to the regional level since EMI takes care of energy demand in an open regional market, which requires overcoming concerns over regional energy security. When it is technically advantageous, it is certainly appropriate to electrify rural communities with electricity imports rather than own grid extension. Domestic projects near border areas could be developed for the purpose of meeting both domestic demand and cross-border trading.
3. Continue efforts to build open, competitive and effective domestic energy markets. Paths towards such a competitive market, however, may be different across countries since costs and benefits for vertical integration and unbundling may vary. Equal access to energy infrastructure and finance for private investors is also important. In addition, it is necessary to enact necessary regulations, such as competition law, to protect both consumers and investors.
4. Gradually remove subsidies with necessary compensation directed to lower income groups. A gradual and incremental approach of subsidy removal should be adopted to minimize interruptions in member economies concerned, such as economic, social and political instability. While low income people should be compensated, reallocating this saved budget to targeted sectors, the so-called

“sectoral approach”, should be carefully designed. The subsidy removal may also need to be implemented sector by sector to reduce shocks.

5. Infrastructure should be at the core of EMI. EAS Members with low electrification should focus on infrastructure development and hence ensure equity in electricity access. To tackle the issue of investment shortage, more transparent governance can be helpful in attracting investment. For other EAS members with almost universal access, and the region at a whole, their policy priority is to achieve regional and nationwide interconnectivity, which will also help to generate economies of scale and reduce electricity costs.
6. Gradually harmonize regulations and technical standards in the electricity sector. An integrated regional electricity market needs harmonized regulations and standards associated with consumer protection and safety standards; legal and tax issues; contract forms; tariff-setting mechanism; and trading systems. Members could initially identify the best practice or whatever most suits the conditions within the region. Subsequently members can act together to catch up with the global best practice.

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