Chapter 1

Introduction

December 2015

This chapter should be cited as

Fukawasa, K., I. Kutani, Y. Li (2015), 'Introduction', in *Study on Effective Power Infrastructure Investment through Power Grid Interconnections in East Asia*. ERIA Research Project Report 2014-30, Jakarta: ERIA, pp.1-5.

CHAPTER 1

Introduction

The demand for electricity is steadily increasing in East Asia Summit (EAS) countries due to population increase and economic growth. Improving electrification rate is an important policy task in many countries as demand for electricity is certain to increase in line with rise in living standards. Meanwhile, as income remains relatively low for most, it is necessary to supply electricity at the minimal cost possible. For EAS countries, large-scale power source development in a steady and economically efficient way is an urgent task. In addition, such development should lower emissions, waste water, and greenhouse gases.

A country basically develops power source on the premise of self-sufficiency. From the perspective of energy security, such approach is rational when a country has enough capability to develop the necessary number and desirable types of power stations with its resources. However, when demand growth outstrips the capacity to supply manufacturing, human, and financial resources or when it becomes difficult to develop economically efficient power stations due to constraints such as high costs of fuel transportation and power loss during transmission, importing electricity from neighbouring countries should be an option. In the light of the above, it may be possible to optimise or improve the efficiency of power infrastructure investments in terms of supply stability, economic efficiency, and reduction of environmental burden if we consider ways of developing power infrastructure on a pan-regional basis.

In the ASEAN region, the Heads of ASEAN Power Utilities/Authorities (HAPUA) and the Asian Development Bank (ADB) are initiating intra-regional power grid interconnections, while bilateral power imports–exports are ongoing. However, individual countries are still prioritising optimisation of investments at the domestic level. Besides, power imports and exports are not brisk enough to contribute to ‘power grid interconnections’, and moves toward pan-regional optimisation have been slow.

1. Rationale

The rationale of this study is derived from the 17th ECTF[1] meeting held in Phnom Penh, Cambodia, on 5 July 2012. During this meeting, the Economic Research Institute for ASEAN and East Asia (ERIA) explained and proposed new ideas and initiatives for energy cooperation, including strategic usage of coal, optimum electric power infrastructure, nuclear power safety management, and smart urban traffic.

The participants of the ECTF meeting exchanged views on the above proposals and agreed to endorse them.

As a result, ERIA formed the working group for the 'Study on Effective Power Infrastructure Investment Through Power Grid Interconnections in East Asia'. Members from EAS countries were represented in the working group, with the Institute of Energy Economics, Japan (IEEJ) as the secretariat.

2. Objective

This study will quantify the possibility and benefits of pan-regional optimisation of power infrastructure development in the EAS region. It is expected to provide clues for improving efficiency of investment for power stations and cross-border grid interconnections. It should be noted that since this study has been developed by referencing the Greater Mekong Subregion (GMS) program of ADB and the ASEAN Power Grid (APG) program of HAPUA, it is consistent with these existing initiatives.

3. Work Stream

3.1. Fiscal Year 2012– 2013

In the past two years of the study, the following work streams were conducted.

(A) Collection and compilation of information relating to power infrastructure;
(B) Identification of challenges and discussion points;
(C) Development of a broad-area power infrastructure simulation model and evaluation of the simulation results;
(D) Analysis and examination of optimal power infrastructure;

[1] Energy Cooperation Task Force under the Energy Ministers' Meeting of East Asia Summit (EAS) countries.

(E) Selection of possible interconnection lines and preliminary economical evaluation; and
(F) Drawing out policy recommendations.

The study first developed a simulation model that analysed the least-cost mix of power generation and grid interconnection. A second part of the study estimated the cost of possible interconnection lines based on the above-mentioned simulation analysis. By comparing these outcomes, i.e. cost and benefit of enhanced grid interconnection, the report selected priority projects that seem to provide greater benefits for the region and, at the same time, are perceived to be economically viable.

In the fiscal year 2013 (FY2013) study, costs and net economic benefits of possible interconnection lines—which imply feasibility and priority of the proposed new transmission capacities—are estimated.

Table 1-1. Case Setting for Power Generation Mix and Trade Flow Analysis*

Case	Additional capacity of international grid connection	Additional development of hydro power potential
0 (reference)	no	no
1	yes (certain limit exist)	no
2a	yes (certain limit exist)	yes
2b	yes (certain limit exist)	yes (export purpose only)
3	yes (no limit exist)	yes (export purpose only)

* For details, please refer to Economic Research Institute for ASEAN and East Asia (2014), 'Investing in Power Grid Interconnection in East Asia', September.
Source: Author.

A positive net economic benefit indicates economic feasibility of the project, and thus should be prioritised. Amongst the listed projects, a Viet Nam–Lao PDR–Thailand–Malaysia–Singapore interconnection route could be the most beneficial, and a Cambodia–Thailand linkage or a Malaysia–Indonesia linkage could be the second most beneficial interconnection.

Table 1-2. Possible Interconnection Lines and their Priority

Line	Possible cumulative net cost benefit range [Million USD]	Estimated cost of trasmission line [Million USD]	
A: THA—KHM	4,560—5,470	162—1,009	second priority
B: THA—LAO	19,282—20,604	728—1,957	first priority
C: THA—MYA	(4,607)—(2,766)	2,244—3,956	need careful assess.
D: MYA—THA—MYS—SGP	(1,118)—3,064	2,384—6,272	need careful assess.
E: VNM—LAO—THA	21,604—23,715	922—2,885	first priority
F: MYS—IDN	3,968—4,087	1,790—1,901	second priority
G: LAO—THA—MYS—SGP	23,217—26,557	868—4,273	first priority

IDN = Indonesia, KHM = Cambodia, LAO = Lao People's Democratic Republic, MYA = Myanmar, MYS = Malaysia, SGP = Singapore, THA = Thailand, VNM = Viet Nam.
* Numbers in brackets are negative.
** For details, please refer to 'Study on Effective Investment of Power Infrastructure in East Asia Through Grid Interconnection', Economic Research Institute for ASEAN and East Asia, 2014.

Source: Author.

3.2. Fiscal Year 2014

Based on the above described achievements, the following work streams were conducted on the third year of the study.

(G) Selecting priority routes

From candidate international interconnection lines extracted in the FY2013 study, the working group selected specific routes for further examination.

(H) Preliminary planning and cost estimation

Based on the specific routes considered in (G) above, the working group carried out preliminary planning work and cost estimation for the selected interconnection routes. Then, it estimated unit power transmission costs based on projected transmission demand for the lines. In doing so, the following key elements are accounted in the model: connecting points to existing grids, preliminary route selection, basic design of transmission line, and cost estimation.

(I) Policy and institutional challenges

The working group analysed the institutional and policy challenges for realising the selected interconnection lines, especially the regulatory/coordination framework and the technical issues related to multi-regional power trade.

(J) Drawing policy recommendations

Based on analyses (G) to (I) above, the working group drew policy recommendations to accelerate interconnection build-up which benefits the entire ASEAN region.