

Key Issues:

1. Selected power grid interconnections in ASEAN are proven to be economically feasible.
2. Preliminary project planning of these interconnections enabled close-to-reality cost estimation in this study.
3. Investment in these interconnection projects can generate benefits more than 10 times the costs in just 10 years.
4. Despite the economic feasibility, institutional barriers remain to be concerns.

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Power Grid Interconnections in East Asia: Investment in Several Key Projects Are Well Justified

By YANFEI LI

The recent ERIA report on 'Effective Power Infrastructure Investment through Power Grid Interconnections in East Asia' aims to support existing initiatives—the ASEAN Power Grid and Greater Mekong Subregion Power Master Plan—by quantitatively showing the possible economic and environmental benefits of such power grid interconnections. The study team selected specific candidate routes of cross-border transmission lines for further examination. They carried out the preliminary project planning and per kilowatt-hour cost estimation for the selected cross-border lines. The estimated results indicate that although these are capital-intensive projects, attainable benefits seem to be large enough to justify the investment well.

The ERIA study on 'Effective Power Infrastructure Investment through Power Grid Interconnections in East Asia' in fiscal year 2013–2014 reported the results of the quantitative assessment of the costs and benefits of selected cross-border power grid interconnection projects in ASEAN countries (Table I). Accordingly, cases B, E, and G are identified as economically feasible and should thus be prioritised.

Table I: Possible Interconnection Lines and their Priority*

Line	Possible cumulative net cost benefit range [Million USD]	Estimated cost of transmission 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

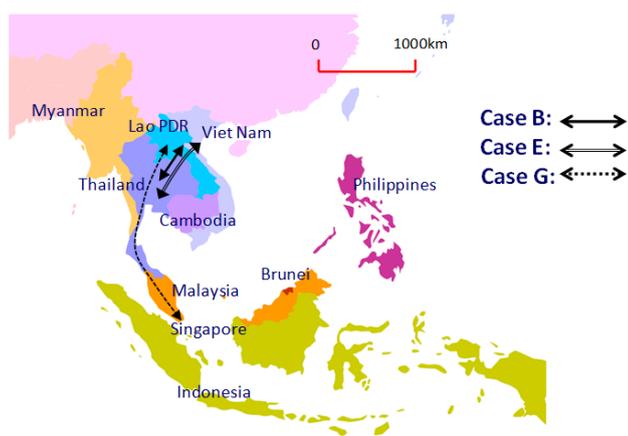
IDN = Indonesia, KHM = Cambodia, LAO = Lao PDR, MYA = Myanmar, MYS = Malaysia, SGP = Singapore, THA = Thailand, VNM = Viet Nam.

* Numbers in brackets are negative.

Source: ERIA.

The study was continued in fiscal year 2014–2015 and focused on the prioritised cases (Figure 1): the interconnection between Thailand and Lao PDR; between Viet Nam, Lao PDR, and Thailand; and between Lao PDR, Thailand, Malaysia, and Singapore.

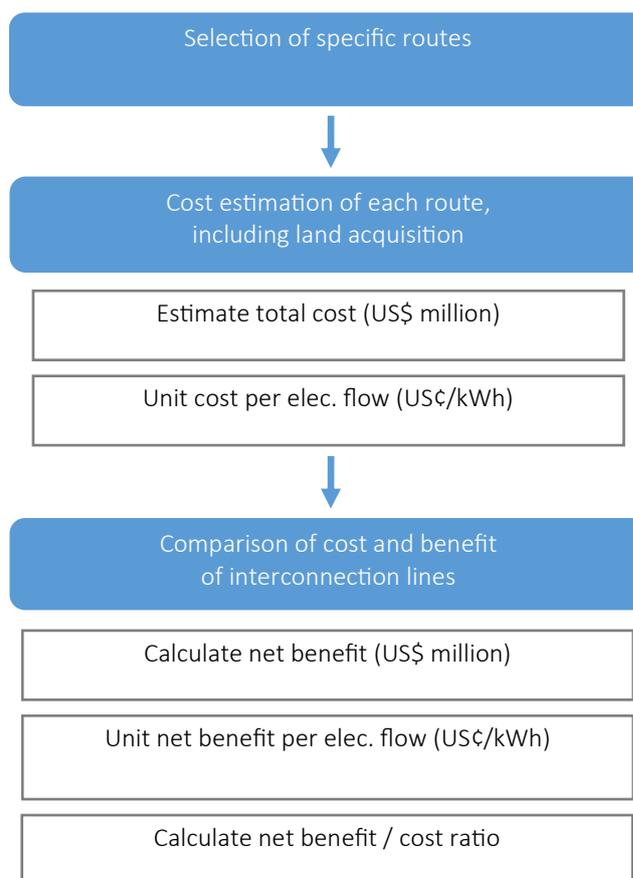
Figure 1: The Three Prioritised Routes of Power Grid Interconnection



Source: ERIA.

This 2014–2015 study went into close-to-real project costs estimation based on realistic project design and route planning, rather than the general cost estimation for constructing and operating cross-border transmission lines applied in the earlier study. It covers as much engineering and economic details as possible to reflect the accurate costs of constructing and operating cross-border transmission lines. Figure 2 illustrates the methodology through a flow chart. At the same time, this study applies a regional model for electricity trading among the countries connected by the cross-border transmission lines, based on a merit-based dispatching algorithm to minimise the cost of electricity for all countries.

Figure 2: Methodology for Cost Estimation



Source: ERIA.

The model thus simulates potential trading for the period 2025–2035, as the three selected routes of new interconnections are assumed to be completed by 2025. The net benefits, resulting from avoided peak generation capacities and saved expensive fossil fuels for peak power generation, are summarised in Table 2 and compared to the costs of investing and operating interconnection projects.

Table 2: Return on Investment, 2025–2035

Case		Net Benefit [US\$, million]	Construction Cost [US\$, million]	Benefit/Cost [-]
B	THA–LAO	19,881	1,506	13.2
E	VNM–LAO–THA	22,610	2,097	10.8
G	LAO–THA–MYS–SGP	25,490	2,000	12.7

Source: ERIA.

The following trade flows are projected in 2025–2035 with the newly established interconnections (Table 3).

Table 3: Trade Flow, 2025–2035, by Route (Unit: TWh)

Route	Trade flow, 2025–2035
VNM–LAO	105
LAO–THA	567
THA–MYS	52
MYS–SGP	91

Source: ERIA.

The following observations are made based on these quantitative simulation results on the economic feasibility of these interconnection projects:

- In terms of the size of net benefit, Case G provides the largest net benefit.
- In terms of return on investment, Case B is the most beneficial.

These results thus indicate that although the three interconnection projects are capital

intensive, the attainable benefits seem to be large enough to justify the investment well. These projects thus firmly stand as feasible and should be prioritised for implementation as early as possible. In addition, this study also highlights potential institutional barriers that may hinder the progress of implementation of such interconnection projects. Firstly, the region needs to establish a regulatory or coordination body to oversee the entire electricity market in the region. The body needs to harmonise rules for cross-border line interconnection and electricity transactions. Secondly, the efficiency of investment for power stations and transmission lines needs to be improved. At present, the region does not coordinate country-based power development plans (PDPs). High costs in country-based PDPs can be avoided with more cross-border interconnection and electricity trade. Lastly, harmonisation of technical standards regarding cross-border interconnection is an indispensable precondition.

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