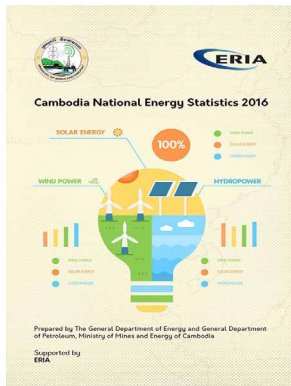


Energy

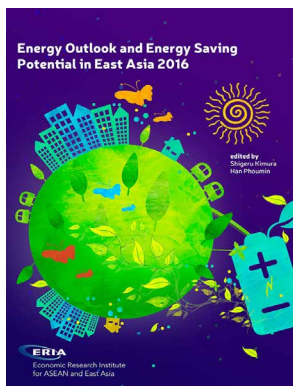


Cambodia National Energy Statistics 2016

*By the General Department of Energy and General Department of Petroleum, Ministry of Mines and Energy of Cambodia
Supported by ERIA*

Insufficient information and inadequate capacity to carry out comprehensive energy planning are identified as the main contributing factors to the current state of the energy sector in Cambodia. In this regard, the Ministry of Mines and Energy (MME) of Cambodia requested the Economic Research Institute for ASEAN and East Asia (ERIA) to provide support to overcome such technical constraint. Responding positively, ERIA subsequently deployed technical staff and experts to support staff of MME from the General Department of Energy and the General Department of Petroleum to conduct a series of data collection and analysis to put together Cambodia's National Energy Statistics.

This project and publication has greatly enhanced energy policy planning in Cambodia. To sustain the project, Cambodia will establish a systematic collection of energy data from various energy supply companies and other government agencies/corporations, so that energy data and statistics could be published in the future continuously. Having good energy statistics would allow Cambodia to contribute to and share data with ASEAN, the International Energy Agency, Joint Organization Data Initiative, and other international fora and arena.



Energy Outlook and Energy Saving Potential in East Asia 2016

Edited by Shigeru Kimura and Han Phoumin

Sustained economic growth and increasing population in East Asia are the two major drivers to the doubling energy demand in 2013–2040. This increase could threaten energy security and the effort to curb carbon dioxide (CO₂) emissions. These common energy challenges will need to be addressed through concerted efforts, including collective measures and actions to develop and deploy energy efficiency and saving, highly efficient and low-emission coal-fired power plant technology, and nuclear safety, and to double the share of renewable energy to the overall energy mix for inclusive and sustainable development.

This report presents the balance of energy best-mix based on each country's policy and targets, and predict the pattern of future energy consumption. Both Business-as-Usual and Alternative Policy Scenarios were used to examine the energy consumption and outline potential additional energy efficiency goals, action plans, or policies that are being, or likely to be, considered. The findings of this study would continue to set light towards policy implications for decision-making to ensure that the region could enjoy both economic growth and investment opportunities without compromising energy security and environmental problems resulting from rising CO₂ emissions.



Towards a Circular Economy: Corporate Management and Policy Pathways

Edited by Venkatachalam Anbumozhi and Jootae Kim

The transition to a circular economy is a unique opportunity for fast-growing Asian economies to be resource efficient, competitive, and innovative. The circular economy aims to eradicate wasteful use of raw materials and energy from the manufacturing process as well as systematically throughout the various life cycles. It also aims to reuse the by-products. By creating an enabling policy framework for circular economy, government can also motivate corporate leaders to achieve greater benefits for sustainable development. This book investigates the challenges and opportunities of how countries and corporations are able to strike a better balance between economic growth and resource efficiency stewardship in the context of the emerging paradigm on circular economy policy. Through analysis of several case studies, this book also highlights immediate and relatively easy-to-implement circular thinking based on current policy approaches and market trends.

Achieving an Integrated Electricity Market in Southeast Asia: Addressing the Economic, Technical, Institutional, and Geo-political Barriers

ERIA Research Project Report 2015-16

Edited by Yanfei Li and Shigeru Kimura

The research is divided into four interdependent clusters. Clusters 1 and 2 apply case studies on the BIMF countries (Brunei-Indonesia-Malaysia-Philippines). Cluster 1, led by the Institute of Energy Economics, Japan, simulates the development of power infrastructure, interconnection, and exchange of power in these countries through dynamic linear programming. It emphasises the economic rationale and feasibility of electricity market integration in the region. Cluster 2, led by the Brunei National Energy Research Institute, focuses on the regulatory, institutional, and technical barriers in BIMF, and develops a road map to solve these issues. Cluster 2 presents some insights on specific regional issues for other regions, based on an established understanding from previous studies. Cluster 3, conducted jointly by ERIA and the Energy Research Institute at Nanyang Technological University, refers to the Nordic and European cases of electricity market integration and derives implications on the possible business model and market design for ASEAN. Cluster 4, carried out by a researcher from the University of Western Australia, discusses the political and institutional barriers to the formation of an integrated ASEAN electricity market. It also derives several practical strategies in addressing such barriers as policy implications.

Addressing Energy Efficiency in the Transport Sector through Traffic Improvement

ERIA Research Project Report 2015-10

Edited by Ichiro Kutani and Yasutomo Sudo

The 2012 research of the Economic Research Institute for ASEAN and East Asia on energy efficiency of urban transport in East Asia countries identified investment options to reduce traffic congestion and, thus, demand for oil. However, the proposed investment and reactive policy measures are likely to have limited impact, and fundamental change is required to achieve a better future for megacities.

This study focuses on small to mid-sized cities that are in their early stages of development, with Da Nang of Viet Nam as a case study. Da Nang plans to develop a bus rapid transit system (BRT) in the near future but it does not have a blueprint for a feeder bus system, one necessary to enable BRT users to easily access BRT stations. This study focuses on the design issues of the feeder bus system, specifically its optimal route, assuming transport demand scenarios for Da Nang City in 2017, 2020, 2025, and 2030. The study further analyses how urban transport could be more efficient with more effective policy measures.

Building a Collaboration Network towards the Social Acceptance of Nuclear and Coal Power in East Asia

ERIA Research Project Report 2015-19

Edited by Tomoko Murakami

This project aims to build a collaboration network for nuclear and coal power to be socially accepted in East Asia. Some ASEAN countries are introducing or planning to introduce nuclear/coal power plants due to the high growth in energy demand. However, public concern on the safety and environmental impact of these plants makes it difficult for these countries to proceed with development plans. Based on these issues, two international symposiums on nuclear and coal, held in Japan and in Thailand, respectively, discussed the role of nuclear/coal power in the world and in East Asia, and how to promote its social acceptance.

Cooperation Framework for Oil Stockpiling and Emergency Response System

ERIA Research Project Report 2015-7

Edited by Yoshikazu Kobayashi and Venkatachalam Anbumozhi

Energy demand in ASEAN countries has been rapidly expanding in the last decades. While the total energy demand in the region has grown by almost 2.5 times from 1990 to 2011, oil demand in particular has shown the largest increase by more than 120 million tons of oil equivalent. Because domestic oil production has been either stagnant or shrinking in most ASEAN countries, oil demand growth has automatically increased oil import, making these countries more vulnerable to external supply disruption or highly volatile international oil prices.

Based on this recognition, this study developed two scenarios to draw a picture of what will happen if oil supply is unexpectedly and severely disrupted and there is no oil stockpiling. The report particularly focuses on ASEAN because the region has the highest need to promptly initiate stockpiling development actions in East Asia. The report then considers the kind of oil stockpiling option available to ASEAN countries which have not developed their stockpiling system yet, and how government and industry relationships will help promote stockpiling development.

Cost Assessment of Energy Security Improvement in East Asia Summit Region

ERIA Research Project Report 2015-6

Edited by Ichiro Kutani, Mitsuru Motokura, and Naoki Okubo

Energy security is a central pillar in the energy policy of all East Asia Summit (EAS) countries. Self-sufficiency of energy supply forms the basis of energy security, and many policy options are available to improve it. Enhanced oil production, increased use of domestically available renewable energy, and improved energy efficiency are examples of effective policies. Meanwhile, each EAS government is requested to utilise its tax income economically and effectively. It should carefully assess each policy option, which has different costs and effects, to gain maximum utility under a limited budget.

This study assesses the cost and effect of different policy options, and compares them with each other. Such assessment is expected to help policymakers choose more economically effective policy options to improve the self-sufficiency of energy supply for each country's energy security.

Development of the Eco Town Model in the ASEAN Region through Adoption of Energy-Efficient Building Technologies, Sustainable Transport, and Smart Grids

ERIA Research Project Report 2015-20

Edited by Shigeru Kimura, Romeo Pacudan, and Han Phoumin

The recent economic growth among ASEAN countries has driven the rapid increase of energy demand in the region. Energy demand in the region has grown about 2.5 times since 1990 and is expected to triple by 2035. Therefore, ASEAN will need to apply the concept of a low-carbon city or eco town to curb increasing energy demand and to mitigate emissions of greenhouse gases. This is because both increasing energy demand and carbon dioxide emissions could threaten the sustainability of future energy supply and impact the environment, health, and tourism; i.e. the quality of life. Therefore, this eco town project study focuses on the introduction of current and future energy efficiency technologies on buildings and road transport as well as smart grid technologies. Such technologies can be applied to any town in an ASEAN country, such as the Temburong District in Brunei Darussalam.

Economic Impact of Removing Energy Subsidies in Malaysia

ERIA Research Project Report 2015-13

Edited by Shigeru Kimura

The share of demand for fossil fuel-based energy (i.e. coal and oil) in Malaysia will remain the largest in 2035. This significant demand is largely driven by stable economic growth as well as energy prices that are kept low by its energy subsidy policy across sectors. Whereas it is widely acknowledged that subsidy encourages overconsumption and inefficient resource allocation, subsidy reforms will bring about structural changes at all economic levels. Therefore, the effects of fuel subsidy removal need to be simulated to help government formulate mitigating measures to cushion the effects on most affected sectors. The first part of this research estimates the price impact on industry subsectors as an offshoot of energy subsidies removal by applying 2010 Malaysian Input-Output Table; the second part measures the economic impact of removing energy subsidies using a Malaysian macroeconomic model.

Financing Renewable Energy Development in East Asia Summit Countries: A Primer of Effective Policy Instruments

ERIA Research Project Report 2014-27

By Shigeru Kimura, Youngho Chang, and Yanfei Li

This research aims to identify and update the most effective policies in the Asian context, especially for ASEAN Member States, China, and India. The research highlighted policies addressing the following issues on more effective promotion of renewable energy investment in the region: (i) to develop viable and innovative business models and financial mechanisms/structures, especially for distributed generation from renewable sources; (ii) to facilitate market creation through the implementation of market-based mechanisms; (iii) to provide stability of policies and the need for renewable energy legislation; (iv) to enhance the availability of high-quality and high-accuracy renewable energy resource data and other technical assistance to reduce the uncertainty of renewable energy production; (v) to rationalise electricity market design that internalises both the positive and the negative externalities of renewable energy (especially the impact on grid capacity and grid balancing); and (vi) to improve the availability of financial resources in the region through market creation and enhancement of innovative financial instruments, such as the Green Bond, which may be familiar and attractive to Asian investors. The other innovative instrument aimed at reducing the cost of debt financing is a public hedging facility of foreign exchange for renewable energy financing.

Integrative Strategy and Policies for Promoting Appropriate Renewable Energy Technologies in Lower Mekong Basin Region: With Special Focus on Viet Nam

ERIA Research Project Report 2015-21

Edited by Venkatachalam Anbumozhi and Nguyen Anh Tuan

Cambodia, Lao PDR, Myanmar, Thailand, and Viet Nam – located in the Lower Mekong Basin Region (LMBR) and have great potential and opportunity for cooperation – have remarkable achievements in economic development. Exploitation of renewable energy (RE) sources is seen as one of the best ways to facilitate economic growth in a low carbon way, ensure energy security with focus on indigenous resources and benefits to public health, and improve the economy of rural areas. This report assesses strategy and policies for the RE development of LMBR countries and analyses the social, economic, and environmental benefits of RE development for Viet Nam. It also evaluates Viet Nam's five technologies – solar photovoltaic (PV), biogas, wind, small hydro, and biomass – and finds that these meet 14.1% of power generation potential by 2040. Moreover, the report estimates that the RE technologies used for power generation will reduce greenhouse gas emissions from 9.5 million tons to 175.2 million tons CO₂eq, based on the level of technology deployment. Finally, to achieve the RE development target of countries, the report proposes new market-based instruments and a regional cooperation framework that facilitating cross-border projects.

Joint Study for Liquefied Natural Gas Market

ERIA Research Project Report 2015-11

Edited by Ken Koyama, Ichiro Kutani, and Yanfei Li

Energy demand in many East Asia Summit countries is on an upward trend, thus making the role of natural gas in energy supply increasingly important from various aspects. Yet the market for liquefied natural gas (LNG) is in transition in terms of geographical and quantitative expansion, diversification of price formations, and lower oil and gas prices. It is important to balance benefits between importers and exporters and to find workable solutions for developing a sustainable LNG market in various energy situations in importing and exporting countries. Thus, LNG market players and policymakers are encouraged to enhance their efforts to create a more flexible, transparent, and sustainable LNG market in Asia. Whereas the private sector is mainly responsible for commercial deals, the public sector is encouraged to support in improving the business environment for a better-functioning LNG market, especially in terms of flexibility, price formation, and gas supply security, and in securing necessary investments.

Sea Lane Security of Oil and Liquefied Natural Gas in the East Asia Summit Region

ERIA Research Project Report 2015-14

Edited by Shigeru Kimura, Tetsuo Morikawa, and Siddharth Singh

With robust demand – yet modest supply growth – of energy in the region, the East Asia Summit (EAS) area is expected to rely more on imported oil and natural gas. However, without an international pipeline infrastructure, the region imports these products through sea transport. Sea lane security of oil and liquefied natural gas (LNG) is then vitally important to ensure energy supply in the region. This study firstly forecasts future oil and LNG import into the Asia-Pacific region in order to assess the congestion in the Hormuz and Malacca/Singapore straits. Secondly, the study identifies various risks to sea lane security in terms of key background elements (congestion, geography, geopolitics, climate change, poverty, and law and order) and trigger events (piracy, terrorism, regional conflicts, accidents, and extreme weather events). Trigger events in turn impact the energy security of the region in the form of supply disruptions, price volatility of traded goods, financial risks to the industry including increased insurance premium, and physical risks to human life. Finally, the study introduces countermeasures adopted by countries, such as Indonesia and Thailand, to mitigate various risks.

Study on Electricity Supply Mix and Role of Policy in ASEAN

ERIA Research Project Report 2015-18

Edited by Emiri Yokota and Ichiro Kutani

Increasing demand for electricity and relatively lower income level are urging ASEAN Member States to develop large-scale power-generating capacity economically and efficiently. Mitigating environmental burden in this development is also becoming more important than ever. Thus, the simultaneous achievement of the so-called 3Es – energy supply security, economic efficiency, and environmental protection – in power development has become indispensable in the energy policy of ASEAN countries.

Each country has a policy/target for future power supply mix. Yet without an appropriate implementation tool, such policy or plan will likely not be implemented. This study then aims at suggesting possible policy tools to realise such an appropriate power supply mix.

Study on Power Grid Interconnection and Electricity Trading in Northeast Asia

ERIA Research Project Report 2015-9

Edited by Yanfei Li and Shigeru Kimura

This research report analyses the costs and benefits of power grid interconnection in the Northeast Asia region – covering north and northeast of China, Japan, Mongolia, East Russia, and South Korea – using a linear programming and optimisation model. Such analysis yielded several important observations on the feasibility and optimal plans of power infrastructure development for power grid interconnection in the region. Large-scale interconnections among Mongolia, Russia, and China are identified as needed and feasible in almost all scenarios. Savings in the total system cost of all countries vary at US\$500 billion in total in about 30 years as a net present value, compared to the case of no power grid interconnection, and thus no trade of electricity. This is equivalent to about 10% of total system cost for all countries involved. On the environment side, some 4 billion tons of carbon dioxide emissions – about 10% of total carbon emissions in the case of no interconnection – could be reduced during the same period. Solar photovoltaic, which has a better match with peak power demand, appears to be more competitive than wind power and to be developed at a large scale in Mongolia starting 2033 or 2038, depending on the scenario.

Study on the Advancement of the Energy Management System in the East Asia Summit Region

ERIA Research Project Report 2015-17

Edited by Yasushi Iida, Inoue Shota, and Yanfei Li

This study aims to (i) analyse the potential for deploying advanced energy management system (EMS) in the East Asia Summit region, especially focusing on ASEAN countries; and (ii) propose, upon identifying the policy challenges common in the region, policy recommendations to promote EMS. The study was conducted for 2 years, and this report deals with the results of the second-year study which focused on the applicability of EMS for factories. It is meant to complement the first-year study report (ERIA Research Project FY2014 No. 39, published in September 2015) on EMS for office buildings. It likewise proposes a set of policy recommendations promoting the deployment of EMS in the ASEAN region.

A Review on Institutional Framework, Principles, and Key Elements for Integrated Electricity Market: Implications for ASEAN

ERIA Discussion Paper 2016-26

By Tsani Fauziah Rakhmah and Yanfei Li

ASEAN member countries are becoming large energy consumers and growing participants in the global energy market. Cross-border electricity trade becomes increasingly important particularly in the context of fast-rising energy demand and growing urban population. This paper attempts to set out the common principles, methodologies, institutions, and structure for designing an integrated cross-border electricity market and delivering practical policy implications for ASEAN. To allow cross-border electricity trade, the region will need a target model, common vision, and principles that govern electricity market and grid operation. For countries, energy prices administratively determined by the government should be shifted to market-oriented pricing mechanism. Integrated electricity market has enormous potential that can be realised at reasonable costs. When individual countries pursue regional cooperation mechanism to secure their energy supply, investment comes and contributes to optimisation of available energy resources throughout the region.

Analysis of Distributed Energy Systems and Implications for Electrification: The Case of ASEAN Member States

ERIA Discussion Paper 2016-28

By Han Phoumin and Shigeru Kimura

This study highlights the potential role of distributed energy systems (DES) to enhance electricity access and provide energy solutions as a modern energy system in response to increasing energy demand in ASEAN. This study grasps the overall status and policies of DES in selected ASEAN Member States through literature survey and information exchanges from meetings and conferences within the region. The study also attempts to estimate the DES-related renewable energy capacity and investment needed for 2013–2040. In ASEAN, the estimates of DES-related renewable capacity and needed investment for combined renewable energy such as wind, solar photovoltaic, geothermal, hydropower, and biomass will increase significantly from the investment opportunity of US\$34 billion in the business-as-usual (BAU) scenario to US\$56 billion in the alternative policy scenario (APS). At the same time, the application of DES-related renewable energy also implies reduced CO₂ emissions of 46.1 million metric tons for BAU and 64.6 million metric tons for APS. Finally, the study suggests that the DES-related investment opportunity is large, and will provide jobs and business opportunities to the community. DES is a modern generation system and its deployment will also help address the electricity supply shortage in ASEAN Member States.