

Energy Related Projects



1. Assessment of Electric Vehicle Penetration in Lao PDR

Oil, a major fuel in the total primary energy supply in Lao PDR, is used mainly for transport and is imported from neighbouring countries such as Thailand and Viet Nam. Lao PDR is rich in hydropower and has significant potential to develop it. Therefore, penetration of electric vehicles (EVs) is an option for Lao PDR in terms of reducing its import of transport fuels such as gasoline and diesel and in developing its hydropower. Thus, the Ministry of Energy and Mines of Lao PDR requested ERIA to analyse the impacts of EV penetration in Lao PDR.

This project aims to support the Department of Planning and Cooperation of the Ministry of Energy and Mines in analysing the impacts of EV penetration in Lao PDR

in terms of changing its energy mix to shift from oil to electricity, forecasting oil demand reduction and electricity demand increase, revising oil imports on a physical and monetary basis, and elaborating hydropower development plans. In addition, the study specifies the number of EV charging stations needed, the required capacity enhancement of domestic transmission lines, and the need for construction of new hydropower plants on a physical and monetary basis.

This report, published on 31 March 2022, analyses the impacts of shifting from internal combustion engine to EVs in Lao PDR. First, shifting to EVs will reduce total final energy consumption in the country. Second, the additional electric power needed due to the penetration of EVs would come from domestic hydro or coal-fired power generation. Third, the decline of gasoline and

diesel fuel use and import caused by the shift to EVs should increase the country's GDP. Total carbon dioxide (CO₂) emissions would be reduced if the maximum rate of coal-fired power generation is kept below 50%. Finally, oil companies would experience a drop in revenue whereas the electricity sector would see an increase in investment and employment.

The study highlights the important roles of government support in the penetration of EVs with the assistance of the international community, the defined penetration targets of EV charging stations, energy saving, CO₂ reduction, energy supply security, GDP growth, and the role of domestic and foreign investment in the EV and power sectors.

2. Petroleum Supply Chain Master Plan for Cambodia – Phase 2

Based on the projected petroleum demand for each of Cambodia's provinces in 2040 in phase 1, ERIA sought the optimal petroleum supply chain using the minimum-cost approach under several constraints: two primary ports (Sihanoukville and Phnom Penh); three transport modes (pipeline, railway, and tank truck); and imports from Thailand.

Cambodia has seen fast-growing demand for petroleum, especially oil, which had the highest share of total primary energy supply in 2018 (42%). As a result, the oil supply rose at an average of 6% per year from 2010 to 2018. Growth in demand for petroleum was nearly 10% from 2017 to 2018, indicative of a rapid increase in oil transport demand (gasoline and diesel oil). Currently, all

petroleum products are imported, and most are shipped by tankers from Thailand, Singapore, and Viet Nam. However, liquefied petroleum gas can be imported by tanker trucks from Thailand and Viet Nam, so the import route is different from that of gasoline and diesel oil. As petroleum demand is expected to grow to meet end-use demand, the transportation routes, receiving terminals, and distribution terminals of petroleum products must be adequately studied and assessed to ensure efficient logistics costs in Cambodia's petroleum supply chain. The Ministry of Mines and Energy of Cambodia recognises the need for a properly designed petroleum master plan for the country to understand the entire petroleum supply chain in terms of logistics, storage, and distribution.

The report was published on 8 February 2022.

3. Study on Energy Statistics Regulations for Lao PDR

Although ERIA has been supporting Lao PDR's Department of Planning and Cooperation and Ministry of Energy and Mines to produce the country's energy statistics, many primary data are still needed. ERIA will continually support these entities in establishing energy statistics regulations from energy market players or the supply side of energy, and provide energy data collection tools – including questionnaires on coal, petroleum, electricity, and renewable energy (especially biomass). The preparation of Lao PDR's energy statistics regulations is consistent with the objective of the country's Ministry of Energy and Mines – to enhance energy data and statistics to support policy planning and actions for energy-related

sectors. In recent years, the ministry has emphasised the importance of having accurate energy statistics in place to guide the development of energy policy in Lao PDR. Such statistics are fundamental to establishing appropriate energy policies that can promote energy efficiency and conservation, deployment of renewable energy, affordable energy supply, maintenance of energy supply security, and investment in clean technologies and clean fuels.

The report was published on 10 June 2021.

4. Feasibility Study on Transmission Highway in the ACMECS

According to the East Asia Summit (EAS) energy outlook prepared by ERIA, demand for electricity, gas, and oil in AMS will increase considerably, in line with the expected economic and population growth in the region. The Ayeyawady–Chao Phraya–Mekong Economic Cooperation Strategy (ACMECS) in Indo-China has a variety of energy sources: huge hydropower potential in the Lao PDR and Myanmar, gas in Myanmar, and coal in Viet Nam. However, the abundant renewable resources, especially hydropower and solar power, are underused because the ACMECS countries have no bulk transmission lines to cover the entire region. High-voltage power is traded bilaterally and power stations are largely dedicated to exporting power from one country to another. If bulk transmission lines (e.g. east–west and north–south) could connect Viet Nam, Lao PDR, Cambodia, Thailand, and Myanmar, the optimal generation mix in the five countries could be achieved. Using diverse

resources requires a physical bulk transmission line and multilateral trading system – the Transmission Highway – amongst ACMECS countries. ERIA organised a working group to carry out a study to (i) nominate candidates for new cross-border interconnections, (ii) estimate the construction cost of these interconnections, and (iii) estimate the financial and economic aspects and social benefits.

The ACMECS has varying energy resources, but abundant resources – especially hydropower – are underused because ACMECS countries have no existing bulk transmission network covering their entire area. The high-voltage transmission network can bring multiple benefits, including reduced fuel costs of thermal power generation, reduced CO₂ emissions, improved electricity access, and the ability to consolidate higher shares of variable renewable energy.

For this report, published on 9 December 2021, a cost-benefit analysis on using high-voltage cross-border interconnections for power trade in ACMECS was carried out. The study was conducted with the support of experts from Cambodia, Lao PDR, Myanmar, Thailand, and Viet Nam, who shared relevant data. Following the outcome of this study, ACMECS countries need to continue exploring how they move the regional grid towards a more accessible, affordable, and sustainable future power sector through the transmission highway concept.

5. Global Situation of Small Modular Reactor Development and Deployment

Several countries need a huge amount of clean low-carbon energy to meet their climate goals. To reinforce the competitiveness of nuclear energy in the clean and low-carbon energy market, advanced reactors with innovative features have been developed in niche markets. Amongst those advanced reactors, small modular reactors (SMRs) are expected to meet various demands that have not been satisfied by conventional large-scale reactors because of the SMRs' design features: small generation capacity, modular construction technology, safety, and low risk of radiation exposure, etc. Because of such advantages, SMR development projects are taken up in leaders in nuclear energy such as the United States, the United Kingdom, and Canada. At the same time, some countries that have not used nuclear energy are considering the deployment of SMRs. However, many barriers exist in deploying nuclear power plants. The 'newcomer' countries are seeking various options to meet their energy and environmental policies. Most AMS are also at a critical point in deciding their future energy options because they are experiencing rapid economic development and are expected to continuously increase energy demand.

This research focused on the innovative efforts in the leading countries and on considerations in the 'newcomer' countries to provide AMS with useful insights and information to consider their future energy policy.

This report, published on 2 July 2021, examines the applicability of SMRs in the context of ASEAN. Since small reactors are envisaged as replacing fossil fuel plants in many advanced countries, it reviews the market conditions and licensing requirements in those countries and the regulatory and safety imperatives needed in the developing economies of ASEAN for the commercial deployment of SMRs. The report recommends international cooperation between the SMR-producing countries and potential newcomer countries in the fields of nuclear energy planning, conducting feasibility studies, and new low-carbon infrastructure development.

6. Study on Demand and Supply Potential of Hydrogen in East Asia – Phase 3

Phase 3 of this project forecasts the amount of hydrogen production from potential energy sources such as hydropower plants in an isolated area, flared gas, and low-ranked coal such as brown coal. Based on the hydrogen production and demand reviewed in phase 2, phase 3 seeks optimal hydrogen transportation routes between hydrogen production and demand sites applying the minimum-cost approach.

The phase 3 study estimates hydrogen production potential. However, the estimated hydrogen production potential from unused energies will be less than 10% of the hydrogen demand potential estimated in the phase 2 study, and most of it comes from low-ranked coal due to the limitations of existing data – especially hydropower potential.

Under the phase 3 study, two hydrogen workshops were held virtually for India and Malaysia to introduce the major outcomes of the phase 2 study – a review of hydrogen production technologies and their costs, revision of the hydrogen demand of EAS countries by 2040, and a brief presentation of New Energy and Industrial Technology Development Organization (NEDO) hydrogen projects in Brunei Darussalam and south Australia. ERIA held the workshops in cooperation with the International Advanced Research Centre for Powder Metallurgy and New Materials in India and the Ministry of Energy and Natural Resources in Malaysia. The workshops raised many issues on hydrogen from the participants of both countries.

A low-carbon energy transition was the priority energy issue announced at the EAS Energy Ministers Meeting hosted by Brunei Darussalam in September 2021, and the use of hydrogen as a renewable energy is on the global agenda for achieving a low-carbon energy transition. The first meeting of the EAS Hydrogen Working Group – comprising Australia, Brunei Darussalam, China, India, Indonesia, Japan, Malaysia, New Zealand, and Thailand – discussed the role of hydrogen in contributing to a low-carbon energy

transition or carbon-neutral pathway of EAS countries. Australia, Japan, and New Zealand emphasised the importance of hydrogen in their carbon-neutral scenarios or road maps up to 2050. On the other hand, China, Brunei Darussalam, India, Indonesia, Malaysia, and Thailand still consider Variable Renewable Energy such as solar and wind as the preferred energy sources to achieve their low-carbon energy transition. The second EAS Hydrogen Working Group meeting consisted of (i) a brief presentation on the phase 3 study's contents – a review of hydrogen production technologies and their costs, and seeking an optimal hydrogen transport solution based on two transport methods (MCH and LH2); (ii) an introductory presentation on hydrogen uses for power generation instead of gas power generation; and (iii) an introductory presentation on NEDO's hydrogen projects in Brunei Darussalam and Australia.