CHAPTER 5

ENERGY SECURITY

5.1 Current situation of energy security in Cambodia

A sustained population and economic growth in Cambodia are the key drivers in significantly increasing energy demand to more than double for both primary and final energy demand during 2015–2040. In absolute terms, Cambodia's primary energy supply is projected to increase from 7.02 million tonnes of oil equivalent (Mtoe) to 15.24 Mtoe during the period, while final energy demand is also expected to rise from 5.93 Mtoe to 11.77 Mtoe (Kimura and Han, 2019). The strongest growth in final energy consumption is likely to occur in the transportation and industry sectors, with average growth rates of 3.9% and 3.5%, respectively. Cambodia's electricity demand is projected to have strong growth, with an average annual growth rate of 9% between 2015 and 2040. The fastest growth in electricity generation will be in hydropower (9.1% per year), followed by coal (7.5% per year). Generation from oil-fired power plants will decrease considerably due to high fuel costs. In the past, until 2001, almost 100% of electricity generation came from oil-fired power plants. In 2002, a hydropower plant started operation in Cambodia, and by 2013, its share in the power generation mix had increased to 57.4%. Coal power generation was also introduced to Cambodia rather late, in 2009. By 2015, the share of coal in the power generation mix had risen to 48.4%, the highest share in the power generation mix.

Cambodia has a very high import dependency as the country relies heavily on imports of coal, oil (petroleum products), and electricity. To fuel economic growth, Cambodia continues to increase imports of these fossil fuels, which puts pressure on energy security. Cambodia's import dependency increased from 50% to almost 60% during 2013–2016. The increase in energy demand in Cambodia will also see an increase in carbon dioxide (CO_2) emissions from the combustion of fossil fuels. It is projected that CO_2 emissions will increase by 5.6% per year from 1.96 million tonnes of carbon in 2015 to 8.62 million

tonnes of carbon in 2040 under the business-as-usual scenario. Oil and coal are the largest sources of carbon emissions.

The increasing energy demand in Cambodia poses a threat to supply security. Yet, oil stockpiling and other security measures are yet to be developed to cope with an unexpected supply disruption as they may arise from external factors, such as conflict in the Middle East, natural disasters, accidents, or terror attacks on oil supply cargo. Almost 80% of oil exports from the Middle East are bound for Asia. So far, piracy and armed robbery have played a role in disrupting the free movement of vessels, causing delays, financial losses, and even loss of life. Data from the International Maritime Bureau of the International Chamber of Commerce reveals that globally, acts of piracy and robbery at sea have declined over the past 5 years. However, piracy incidents in Southeast Asia and South Asia are either rising or continuing unabated, which could pose threats at any time to the supply security in the region, including Cambodia.

Besides the oil supply security risks, Cambodia is affected by tropical weather, with plentiful rainfall that results in floods almost every year. Flooding is the major natural disaster in Cambodia, especially in the lower Tonlé Sap basin and the lower Mekong River provinces. The significant probability of flooding, combined with the relatively underdeveloped state of the road system in the country, results in the risk of oil supply disruption, especially the supply transported by lorry. This was evident when Typhoon Ketsana hit the country in 2009. Extreme weather, as Cambodia has become increasingly vulnerable to climate change, typhoons, and flooding, could possibly damage not only roads but (in an extreme case/scenario) could possibly damage the Sihanoukville port and railways, which could prevent oil transportation to major parts of Cambodia. In such an extreme but plausible case, it may take at least 1 month before oil transportation could be resumed normally as Cambodia does not have any strategic oil stockpiling to address the supply shortage during an oil supply disruption. Oil supply in Cambodia has been undertaken by private companies such as Chevron, Total, and PTT, as well as Cambodian suppliers like Sokimex and Tela. Based on government regulations, these companies are supposed to hold inventory of (operational) oil stock at the terminals for about 30 days. However, these oil importing companies, in reality, may hold operational oil stock of only about 15–20 days as the country does not have a mechanism in place to monitor the petroleum product stock holdings of these companies. The government's imposition on companies to hold inventory oil stock of about 30 days will require these companies to invest more in oil facilities, to which oil-importing companies may not comply with without government inspection and monitoring systems in place.

Notably, the government is aware of these energy security issues, especially for oil supply security. The government has been working on improving road conditions and developing

other forms of transport such as railways and barges to diversify the modes of oil transportation. The government's efforts for the improvement of the disaster forecasting system, as well as emergency schemes for distributing fuel by various transport modes, are seen as a move in the right direction to reinforce oil supply resilience in the country. The current development of the oil refinery in Sihanoukville by Cambodian Petrochemical Company, with outsourcing of the construction contract to the state-owned Chinese National Petroleum Company, is to be completed by 2019, and the expected domestic oil production developed by KrisEnergy Ltd, the operator of Cambodian's offshore Block A in the Gulf of Thailand, will likely increase Cambodian energy security in the near future.

The government is making efforts to develop energy infrastructures, such as oil refineries, and tap domestic oil production by 2020, but Cambodia may still face many challenges regarding how to manage resources effectively, which could threaten energy security, as well as the need to have adequate energy policy in both downstream petroleum products regulation and upstream resource extraction. While Cambodia is expecting indigenous oil production with the completion of its oil refinery by the end of 2019, the current energy security of Cambodia remains weak, with rising oil imports to meet the growing energy demand in the country. The energy security situation is worsening from the viewpoint of the lack of fuel diversification in the energy mix. For power generation, Cambodia mainly relies on hydropower and coal-fired power generation for its cities and provinces that are connected to the national grid. However, the electrification rate remains a critical issue for Cambodia, as about 40% of the population does not have access to electricity. Biomass remains a dominant source of energy for cooking in most rural parts of Cambodia. Thus, all these daunting issues of inaccessibility to commercial energy use contribute to energy insecurity. In addition, Cambodia has its Law on Disaster Management for Flood and Drought but not a law for an energy emergency response during the disruption of the energy supply. Given the background of the energy landscape of Cambodia, it is crucial for the government and specialised agencies to set energy security policies and provide suggested policy recommendations to overcome the energy security challenges.

5.2 Current policies related to energy security

The Government of Cambodia defined its energy sector development policy in October 1994. Later on, this evolved to become the Power Sector Strategy 1999–2016, with objectives to (1) provide an adequate supply of energy throughout Cambodia at reasonable and affordable prices, (2) ensure a reliable and secure electricity supply at prices that allow sufficient investment in Cambodia and the development of the national economy, (3) encourage the exploration and environmentally and socially acceptable development of the energy resources needed to supply all sectors of the Cambodian economy, (4)

encourage the efficient use of energy and minimise the detrimental environmental effects resulting from energy supply and use. This strategy guided the development and policy framework of all energy sectors in Cambodia, including the Rural Electrification by Renewable Energy Policy, Renewable Electricity Action Plan 2002–2012, and the energy efficiency and conservation (EEC) goals.

In early 2001, the Electricity Law was passed with the aims of (1) ensuring the protection of the rights of consumers to receive reliable and adequate supply of electric power services at reasonable costs; (2) promoting private ownership of the facilities for providing electric power services; (3) establishing competition wherever feasible in the sector; (4) establishing the Electricity Authority of Cambodia (EAC) for regulating electricity power services, granting the right and obligation to penalise, if necessary, the suppliers and consumers of electricity in relation to electricity generation and supply facilities; and (5) creating favourable conditions for investment in, and the commercial operation of, the electric power industry.

The EAC is an autonomous body set up to regulate and monitor the electric power sector throughout the country. Its duties include issuing licenses, approving and enforcing performance standards for licensees to ensure quality supply and better services to consumers, and the determination of tariff, rates, and charges for electric power services that are fair to both consumers and licensees.

The law also sought to promote private investment and the ownership of power facilities and to encourage competition in the sector. The Electricity Law established the EAC as a legal public entity with the power to act as the regulator for power sector business activities. It also defined the roles of the Ministry of Mines and Energy (MME), formerly known as the Ministry of Industry, Mines and Energy. The MME is responsible for the overall administration of the energy sector. It is responsible for developing policies and strategies, power development plans, electricity trade with neighbouring countries, major investment projects, and the management of the rural electrification sector. Along with the Ministry of Economy and Finance, the MME is the joint owner of Electricité du Cambodge (EDC).

EDC was established in 1996 and became a state-owned company with the responsibility to generate, transmit, and distribute electricity throughout Cambodia. Its main functions are supplying electricity, developing the transmission grid, and facilitating the import and export of electricity to and from neighbouring countries. Independent power providers are private companies that have received a license from the EAC to generate electricity for public consumption. They generate electricity and sell it on to EDC, which then distributes it through the national grid.

In 2006, the government approved the Rural Electrification by Renewable Energy Policy. Its main objective is to create an enabling framework for renewable energy technologies to increase access to electricity in rural areas. The policy acknowledges the Master Plan Study on Rural Electrification by Renewable Energy in the Kingdom of Cambodia as the guiding document for the implementation of projects and programmes. The Master Plan envisions the following: (1) to achieve a 100% level of village electrification, including battery lighting, by 2020; and (2) to achieve a 70% level of household electrification with grid-quality electricity by 2030. In addition, Cambodia aims for 15% of rural electricity supply from solar and small hydro by 2015. The Master Plan also lays out clear targets, investments, and responsibilities. About 1.83 million households are to be connected to the national grid by 2020. An additional 260,000 households in very remote areas – too far from the planned grid extension – will be supplied through isolated mini-grids using diesel-generated power and/or renewable energy (220,000 households) and solar home systems (40,000 households). The total cost for expanding the rural grid is estimated at US$1.37 billion. In the plan, EDC will be responsible for the overall planning, development, investment, and operation of the rural medium-voltage (22 kV) sub-transmission lines; and it will partner with private rural energy enterprises to expand, operate, and maintain low-voltage distribution and service lines (<0.4 kV).

The EEC goals submitted to the 5th East Asia Summit Energy Ministers Meeting, held on 20 September 2011 in Brunei Darussalam, state that the country uses final energy demand as the energy efficiency (EE) indicator and aims at a 10% reduction from the business-as-usual scenario by 2030. The action plans to achieve the EEC goals cover the use of energy by the industry, transport, commercial, and residential sectors, such as the introduction of energy efficient equipment and EE labelling as well as the promotion of EE awareness amongst the public.

5.3 Setting up energy security policy

Securing the energy supply with affordable prices and environmentally sustainable energy uses is the main objective of Cambodia's overall vision for energy policy. However, Cambodia has experienced rapid growth of energy demand, higher oil import dependence, a growing share of coal use for meeting electricity demand, and, thus, greater challenges to energy security and CO_2 emissions towards 2040. These could threaten the stable supply of energy with affordable prices at the national and local levels.

Thus, Cambodia needs to be well-prepared for possible oil supply disruptions and enhance EE, reduce oil demand, particularly in the transport sector; engage in the clean

use of fossil fuels; and promote energy diversification to such sources as natural gas and renewable energy.

Any measures to strengthen Cambodia's energy security could be more efficiently and effectively pursued by regional collaboration (any mechanism of bilateral and regional energy cooperation), which includes coordinated emergency response measures, cross-country energy interconnections (Mekong subregion power connectivity), and the harmonisation of energy-related standards and the regulatory environment for energy industries. Pursuing energy security policies also requires capacity building and enhanced awareness by the general public. Specific actions towards addressing energy security for policy, institution, and energy infrastructure investment are vital for addressing the key salient policies for energy security in Cambodia.

5.4 Policy recommendations

- As Cambodia is expected to have stable economic growth in the medium-to-long term, in which the industry sector will play a major role in contributing significantly to GDP, the country will need a stable, reliable, and affordable energy price to ensure that Cambodia is competitive in the global market. In this regard, the country may need to establish an institution, such as a national emergency strategy organisation, to deal with energy supply disruption in the future.

- The Cambodian government may consider establishing hard infrastructure, such as oil stockpiling by the government, on top of what oil importing companies hold in inventory oil stock of 30 days of net imports. Having oil stock is significant for ensuring that important industries and sectors, such as the healthcare, food, and electronics industries, are well protected during an emergency response to an energy supply disruption.

  However, having a stock of oil is a good signal to investors, and it could attract more important investment to Cambodia, such as in electronics and other sectors, as these will require a stable energy supply without blackouts, and energy input is key to overall production costs to ensure Cambodia's industries remain competitive for products produced outside of Cambodia. The government should note that having an oil stock is good for energy security, but the effects could also increase the price of petroleum products, which could affect industry and other sector competitiveness as these sectors may use petroleum products as inputs of production.

- Policymakers may need to develop energy policies to shelter the country from potential risks by bringing energy resiliency through appropriate energy policy and energy infrastructure investment, such as for oil-receiving terminals, ports, pipelines, and strong electricity grids.

- As Cambodia only has an operational oil stock of 30 days, other response measures during an oil disruption may be need to be considered, such as (i) demand restraint measures, which can range from being light-handed (e.g., public information campaigns to promote voluntary actions) to more medium- and heavy-handed measures (e.g., driving restrictions or fuel rationing). These measures can be applied differently across various sectors, but road transportation is commonly targeted due to the high proportion of oil consumption it represents; (ii) fuel-switching measures, which comprise the substitution of one form of fuel for another (e.g., natural gas is a possible alternative to oil in the event of an oil disruption, particularly in those power generators capable of operation using either fuel; (iii) surge production measures, comprising the rapid activation (within 30 days) of spare crude oil production capacity to increase oil supply; and (iv) fuel specification measures, such as environmental or quality standards, which can be temporarily relaxed by governments to increase the flexibility of supply.

- In addition, Cambodia could see huge energy savings in the transformation sector if policies are formulated to ensure that new fleets of power generation be deployed for high efficiency and low-emission power generation. Currently, coal-fired power plants are deployed in Sihanoukville based on sub-critical technology as these plants are installed with a small capacity (50–100 MW) in which high-efficient technology such as Ultra Super Technology cannot be used unless the installed capacity is at least 400–500 MW. In addition, low technology, such as sub-critical technology, is relatively cheaper in terms of capital cost, and, thus, Cambodia may opt for low technology. However, this low technology is associated with low efficiency, high CO_2 emissions, and other pollutants, such as sulphur dioxide, nitrogen dioxide, and particulate matters, which could threaten the health of residents living near the plants, and acid rain could be a serious problem in the future.

- Collective measures and actions to rapidly develop and deploy EE and savings in all sectors and double the share of renewable energy, such as off solar, wind, and biomass power generation, in the overall energy mix for inclusive and sustainable development are highly recommended as a holistic approach.

- Finally, electrifying Cambodia to the 100% electrification rate is a must and urgent as many households still cannot access commercial energy. Thus, appropriate energy policies to promote distributed energy systems, either using fossil fuel power generation or renewable energy, are highly recommended to ensure that remote and mountainous areas are able to access electricity as this energy is important for their day-to-day needs. The lack of this energy will affect their health, the capital formulation of children, and other businesses-related opportunities.

Reference

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