

# Chapter **1**

## Introduction

Han Phoumin

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# Chapter 1

## Introduction

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### 1.1 Background

The Lao People's Democratic Republic (Lao PDR) is in the middle of the Southeast Asian peninsula. It is bounded by five countries: China in the north, Viet Nam in the east, Cambodia in the south, and Thailand and Myanmar in the west. The Lao PDR has a total area of 236,800 square kilometres, about 70% of which is covered by mountains. In 2017, the country had a population of 6.787 million people, with an average population density of 28.66 persons per square kilometres (Lao Statistics Bureau, 2017). The country's geographical administration comprises 18 provinces, with Vientiane as the capital.

Since the country shifted to an open-door economic policy in 1986, the Lao PDR has experienced rapid growth and poverty reduction through its openness to trade, investment, and integration to the regional and world economies. The gross domestic product (GDP) in 2015 increased 7.56% from the previous year, increasing to KN39,647 billion at 2010 constant prices (Lao Statistics Bureau, 2017). This is equivalent to US\$140,814 million, bringing the per capita income to US\$1,628. The economy has been gradually changing from agricultural-oriented activities to a wider range of activities such as services and industry. While electricity generation is expected to increase due to large investments in the mineral and hydropower sectors, the construction business is benefiting from foreign direct investment in hydropower and transport projects, such as the railway line from Vientiane to the border with China, which is under construction and almost completed.

The population and sustained economic growth are the main contributing factors to the increasing energy demand in the Lao PDR. Also, the fast connectivity in terms of the electricity grid extension to remote areas brings additional demand in tandem with increasing per capita income.

## 1.2 Energy Supply–Demand Situation

The Lao PDR is relatively well endowed with renewable energy resources, especially hydropower and biomass. Since 1990 hydropower resources are being intensively developed to provide electricity for the requirements of the country and neighbouring countries. Every year the Lao PDR receives a significant amount of hard currencies from those power exports, widely considered as a driving force to boost socioeconomic development and the energy security of the country.

The total primary energy supply (TPES) of the Lao PDR increased from 1,618 thousand tons of oil equivalent (ktoe) in 2000 to 4,765 ktoe in 2015 at an average annual growth rate of 7.5%. Coal had the highest increase over the 2000–2015 period at an average of 42.2% per year. This is because the Hongsa coal-fired power plant started full production in 2015, resulting in a significant increase in coal supply that year. The Hongsa power plant was constructed only for export purposes to Thailand. The second-highest growth during 2000–2015 was hydropower at 9.8% per year. Hydropower is the major energy source for electricity production in the Lao PDR. Petroleum supply also increased rapidly at an average of 8.5% per year. Since the power sector does not use oil products, most of the increased demand came from the transport sector. The Lao PDR exports most of its electricity products to Thailand. However, it also imports from neighbouring countries to meet demand during the dry season and at the border areas not connected to the grid. The Lao PDR's TPES, which reflects the net trade of electricity (import minus export), shows a negative value, making the Lao PDR a net electricity exporting country. Its electricity supply grew from 225 ktoe in 2000 to 817 ktoe in 2015, reflecting an almost fourfold increase in electricity export over the 15-year period. In 2000, biomass had the largest share in the TPES at 78%, followed by petroleum (15%), hydropower (5%), and coal (0.5%). Coal grew rapidly, increasing its share in the TPES to 33% by 2015 due to the opening of the Hongsa coal-fired power plant in 2015.

Biomass continues to be an important energy source, and is mostly consumed in the rural areas. In places where modern energy is inaccessible, the Lao PDR people use biomass as a main source for cooking, heating, and other activities because it is abundant, obtainable everywhere, and mostly free. In 2015, 1.30 million tons of oil equivalent (Mtoe) of biomass, representing 13.7% of the TPES, was used. The slower growth of biomass supply indicates that

there was a substitution from biomass for cooking in the residential sector to liquefied petroleum gas. The share of the other supplies increased, but not as drastically as that of coal. Hydropower's share increased to around 9% by 2015, while the share of petroleum products reached 20%. The Lao PDR started generating electricity from solar energy in 2014, but the amount remained small.

The consumption of oil products was the second largest after biomass. The Lao PDR does not have oil refineries; thus, the demand for oil products has been met by imports from Thailand and Viet Nam. In 2015, the Lao PDR imported 0.99 Mtoe of oil products to supply the demand from the transport and other sectors. In the same year, 6.49 Mtoe of coal was consumed, mainly by the power generation sector, i.e. the Hongsa power plant, which is the first and largest coal-fired power plant that started operation in 2015. Therefore, from 2015 onwards, coal demand is expected to increase sharply.

Due to its geographic advantage and its many rivers, the Lao PDR is a rich country in terms of hydropower resources. According to the Mekong River Commission's *State of the Basin Report 2018* (MRC, 2019), the potential of the country's hydropower resources is 26,000 MW. However, until 2015, only 3,894 megawatts (MW) or 15% of the total potential had been realized. In 2015, it produced around 16,501 gigawatts per hour (GWh) of electricity (Department of Energy Policy and Planning, 2015). Out of this, 65.7% (equivalent to 10,842 GWh) had been exported to Thailand, Viet Nam, and Cambodia; the remainder was consumed domestically. Power exports are projected to increase sharply because of the government's agreements with neighbouring countries that, by 2020, the Lao PDR should export 7,000 MW to Thailand and 5,000 MW to Viet Nam. In addition, in 2018 three hydropower projects are being constructed for the export of power. All export projects are being developed by foreign private investors through the build–operate–transfer scheme.

The power sector plays a major role in the energy sector, as well as in the country's economy, as it generates substantial revenues for the country. The revenues may not be significant in the short to medium term, but for the long term, they will be high or will increase many fold because the ownership of the private power plants will be transferred to the government. The electrification ratio in the Lao PDR is 88.94% in 2015 (Department of Energy Policy and Planning, 2015). The government plans to raise the country's electrification ratio to 95% in

2020. This plan is amongst the government's priorities to eradicate poverty in the country. Considering the increase of electricity demand in the Lao PDR and power production for export, optimisation of the power sector will pay attention to future electricity supply.

### **1.3 Energy Policies**

Since the establishment of the Ministry of Energy and Mines in 2006, energy infrastructure is being developed and expanded. Also, energy policies are being developed and gaining public attention and support. The policies have gradually evolved from just the power sector policy to broader energy policies and the development of a sustainable and environment-friendly energy sector. The improvement of energy policies could be credited to the strong support from the Association of Southeast Asian Nations (ASEAN) and other international organisations, especially the Economic Research Institute for ASEAN and East Asia (ERIA) for their continued cooperation and support on energy policies of Cambodia, the Lao PDR, and Myanmar to catch up with other ASEAN countries.

The Lao PDR is a landlocked country in the middle of the Mekong subregion. It is surrounded by the three big economies of China, Thailand, and Viet Nam and the two medium economies of Myanmar and Cambodia. Thus, the Lao PDR can promote itself as a land-linked country to take advantage of its geography. Based on the energy policies exchanged in the platform of ASEAN energy cooperation, evidence shows that those countries have high energy demand and support the energy trade and power integration in this region because it can raise regional energy security and sustainable development. The Lao PDR has been trading electricity with Thailand for many decades; and now it expands this policy to other neighbouring countries to support regional energy cooperation. Particularly, the Lao PDR will increase power exports to 15,000 MW by 2030 – 10,000 MW to Thailand and 5,000 MW to Viet Nam, Cambodia, and Myanmar.

Apart from international cooperation, the Lao PDR also aims to:

- Increase access to electricity by grid extensions and off-grid rural electrification in which the target is to achieve the electrification rate of more than 95% by 2020.
- Maintain an affordable tariff to promote economic and social development.
- Promote energy efficiency and conservation.

- Make modern energy more affordable and accessible for every Lao PDR citizen, even in remote areas.
- Increase the share of renewable energy in total energy supply by 30% in 2030, including 10% biofuels in the oil supply for the transport sector.

The Lao PDR's energy outlook suggests appropriate energy policies and action plans to contribute to the achievement of the aims mentioned above.

## References

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