CHAPTER 10

The Lao PDR Country Report

Phaysone Phouthonesy

March 2021

This chapter should be cited as:
Phouthonesy, P. (2021), 'The Lao PDR Country Report', in Han, P. and S. Kimura (eds.), *Energy Outlook and Energy Saving Potential in East Asia 2020*, Jakarta: ERIA, pp.151-169.

CHAPTER 10

The Lao People's Democratic Republic Country Report

Phaysone Phouthonesy

1. Background

1.1 Socioeconomic Situation

The Lao People's Democratic Republic (Lao PDR) is the only landlocked country in the Association of Southeast Asian Nations (ASEAN). Located in the centre of the Indochina Peninsula, it borders 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; and a population of 7,013,000 as of 2018. The average population density is 27 persons per square kilometre. The Lao PDR comprises 18 provinces, and Vientiane is the capital.

Since 1986 when the Lao PDR changed its economic policy to an open-door policy, the economy has been progressing and expanding rapidly. The gross domestic product (GDP) in 2018 increased 6.29% from the previous year, to KN7,274 billion in 2012 constant prices (equivalent to $14,713 million), bringing per capita income to $2,098[1]. The economy has been changing gradually from agriculture-oriented activities to a wider range of activities, such as services and industry. For example, in 2018, the service sector accounted for 41.61% of GDP, while agriculture only accounted for 15.71%. Industry accounted for 31.53%, and its share is expected to expand in the coming years due to large investments in the mineral and hydropower sectors.

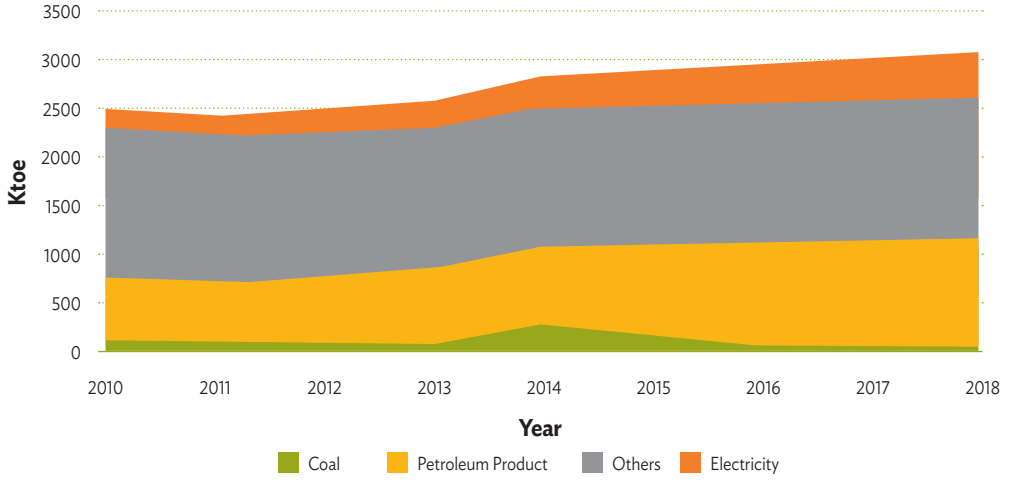
[1] Lao Statistics Bureau. www.lsb.gov.la

1.2 Energy Supply–Demand Situation

The Lao PDR is relatively well-endowed with renewable energy resources, especially hydropower and biomass. Recently, hydropower resources have been developed intensively to meet the electricity requirements of the country, as well as that of neighbouring countries. Every year the Lao PDR receives a significant amount of hard currencies from those power exports. This is widely considered to be one of the driving forces to boost socioeconomic development and energy security in the country.

The Lao PDR's total final energy consumption (TFEC) grew by 2.7% from 2010 to 2018 (Figure 10.1). Electricity grew the fastest at 10.5% per year, followed by petroleum products at 7.3%. Biomass consumption, which has the highest share in the TFEC, decreased at an average rate of 0.76% per year. A small amount of coal consumption was noted in the industry sector.

Figure 10.1. Total Final Energy Consumption by Sector



Ktoe = kilotonnes of oil equivalent.

Source: The Lao People's Democratic Republic, Department of Energy Policy and Planning (2019), Lao Energy Balance Table (EBT) Collection_ Historical. 24 July.

Source: Author's calculation.

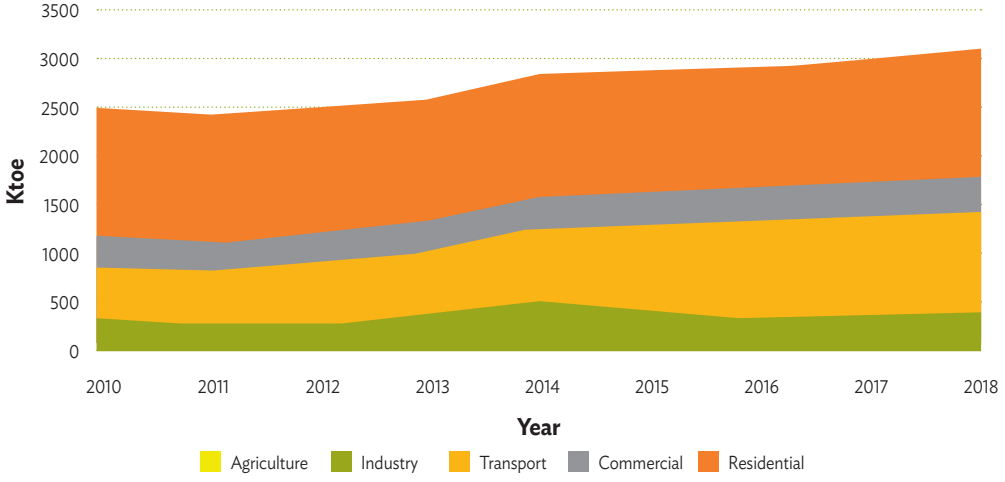
The residential sector is a major consumer of biomass. The industry and commercial sectors consume biomass but at a lower rate than the residential sector, which dominates the country's consumption. However, its share declined from 60.8% in 2010 to 46.1% in 2018, indicating the replacement of household biomass consumption with that of liquefied petroleum gas (LPG) and greater use of efficient biomass stoves in rural areas.

In 2018, the transport sector had the second largest share (33%) in the TFEC, but its consumption increased the fastest from 2010 to 2018, at an average rate of 9.9% per year.

This increase was mainly driven by the road transport sector given the rapid growth in the number of motor vehicles. Based on licensed vehicle statistics, the total number of vehicles increased by an average of 10% per year from 2010 to 2016.

Industry accounted for around 14% of the TFEC, while the commercial sector accounted for around 12%. The industrial sector's consumption grew at an average annual rate of 2.0%, while that of the commercial sector grew at a rate of 1.8% (Figure 10.2).

Figure 10.2. Total Final Energy Consumption by Sector



Ktoe = kilotonnes of oil equivalent.

Source: The Lao People's Democratic Republic, Department of Energy Policy and Planning (2019), Lao Energy Balance Table (EBT) Collection_Historical. 24 July.

Source: Author's calculation

In 2018, the Lao PDR's total primary energy supply (TPES) was 6.38 million tonnes of oil equivalent (Mtoe), and the energy mix consisted of hydropower, oil, coal, and biomass. As there were many power plants in the Lao PDR generating electricity for export in 2018, the export figure reached 26,708 gigawatt-hours (GWh), the equivalent of 2.65 Mtoe. This amounted to more than half of all electricity consumed in the country and 77% of total hydropower generation. Biomass remained an important energy and was the most consumed energy type in the country. People who lack access to modern energy use biomass as a main source for cooking, heating, and many other activities, because it is abundant and can be obtained everywhere free of charge. In 2018, 1.4 Mtoe of biomass was used, representing 22.7% of the TPES. Consumption of oil products was the second highest after biomass. As the Lao PDR has not yet finished constructing its oil refinery, all oil product demand in the country is met by imports from Thailand and Viet Nam. In 2018, the Lao PDR imported 1.13 Mtoe of oil products to supply the demand from the transport sector and others. In the same year, the Lao

PDR consumed 4.5 Mtoe of coal, mainly in thermal power plants such as the Hongsa Thermal Power Plant, the country's first and largest coal power plant, which began operating in 2015. Thus, coal demand increased sharply from 2015 onwards.

Due to its geographic advantages, including its many rivers, the Lao PDR is rich in hydropower resources. According to the Mekong River Commission Study in 1995, the Lao PDR's potential hydropower resources total 26,000 megawatts (MW). However, as of 2020, only 9,985.9 MW or 38.4% of its total potential has been realised. In 2020 the Lao PDR produced around 52,217.8 GWh of electricity, of which 72% (equivalent to 37,596.8 GWh) was exported to Thailand, Viet Nam, and Cambodia; the rest was consumed domestically.[2] Power exports are projected to increase sharply because the Government of the Lao PDR has agreed to export 7,000 MW to Thailand and 5,000 MW to Viet Nam from 2020 to 2030. Exported power is mainly generated from hydropower; however, the Hongsa plant has 1,878 MW of installed capacity to generate electricity for export, and exported 95% of its generated electricity in 2018.

The power sector plays a major role in the energy sector as well as in the country's economy as it generates a significant amount of national revenue. Although this revenue is insignificant in the short to medium term, in the long term it will increase because the government plans to assume ownership of private power plants. The electrification rate in the Lao PDR was 93.79% in 2018,[3] and the government is striving to raise this to 98.00% by 2025. This plan is part of the government's strategy to eradicate poverty in the country. Considering the increasing demand for electricity in the Lao PDR and power generation for export, balancing domestic supply with exports is an issue that must be addressed to ensure the electricity supply in the future.

1.3. Energy Policies

Since the Ministry of Energy and Mines was established in 2006, energy infrastructure and legislation has been newly developed and expanded. Energy policy in particular has been gaining much public attention and support. It has gradually evolved from power sector policy to broader energy policies supporting the development of a sustainable and environmentally friendly energy sector. Close cooperation among ASEAN members can be credited for this improvement.

Although the Lao PDR is landlocked, it is located in the middle of the Mekong subregion and

[2] Department of Energy Policy and Planning (2020), Summary of Power Generation Project of Lao PDR. Vientiane.
[3] Department of Energy Policy and Planning (2018), Electricity Statistics Yearbook.

is surrounded by three large economies—China, Thailand, and Viet Nam—and two medium economies—Myanmar and Cambodia. As a result, the Lao PDR can promote itself as a land-linked country, and leverage the advantages thereof. The energy policies exchanged on the energy cooperation platform of ASEAN+3 (China, Japan, and the Republic of Korea) indicate that the high energy demand in these countries can support the energy trade and power integration in the region to boost energy security and sustainable development in the region. The Lao PDR has been trading electricity with Thailand for many decades and has now expanded this policy to other neighbouring countries to support regional energy cooperation. Specifically, the Lao PDR will increase power exports to 15,000 MW by 2030, including 10,000 MW to Thailand and 5,000 MW to Viet Nam, Cambodia, and Myanmar.

According to the Ninth Five-Year Energy and Mines Development Plan 5 (2021–2025), the Ministry of Energy and Mines has set the following six goals for the power sector:

(i) increase power supply efficiency by 65% for hydropower, 30% for thermal power plants, and 5% for renewable energy; and meet the domestic demand and export target;
(ii) develop transmission lines for domestic power supply and for export;
(iii) improve distribution and services;
(iv) expand the electrification rate to 98% in rural areas by 2025;
(v) promote green energy usage in the transport sector by increasing the number of electric vehicles to 15% of all cars in the country by 2025; and
(vi) promote energy savings and conservation by reducing energy consumption by 10% by 2030.

2. Modelling Assumption

This study aims to forecast energy supply and demand in the Lao PDR from 2018 to 2050, and to determine the country's potential for energy savings and carbon dioxide (CO2) emission reduction, improved energy efficiency, and feasible renewable development if the Lao PDR uses or implements certain alternative policy scenarios (APSs). Therefore, this study considers five scenarios: business as usual (BAU), APS 1, APS 2, APS 3, and APS 5, described below. [4]

(i) BAU is calculated based on the assumed growth of GDP, population, and oil prices.
(ii) In APS 1, the Lao PDR will implement energy saving and conservation programmes, reducing energy consumption by 10% during the study period (2018–2030) and 10% from 2030 to 2050.
(iii) In APS 2, the Lao PDR will make thermal power generation more efficient, increasing

[4] The APS 4, which promotes nuclear power generation, is omitted because there is no nuclear power plan.

thermal efficiency by 30% by 2030 and 32% by 2050.

(iv) APS 3 involves a higher contribution of renewable energy to the total supply.

(v) APS 5 combines APS 1, APS 2, and APS 3 into a single scenario.

Table 10.1. Assumption of Annual Average Growth of Gross Domestic Product and Population

Projection period	GDP growth	Population growth
2018–2020	7.1%	1.5%
2020–2030	6.4%	
2030–2050	5.7%	

Source: World Bank, World Development Indicators

3. Outlook Results

3.1 Business as Usual Scenario

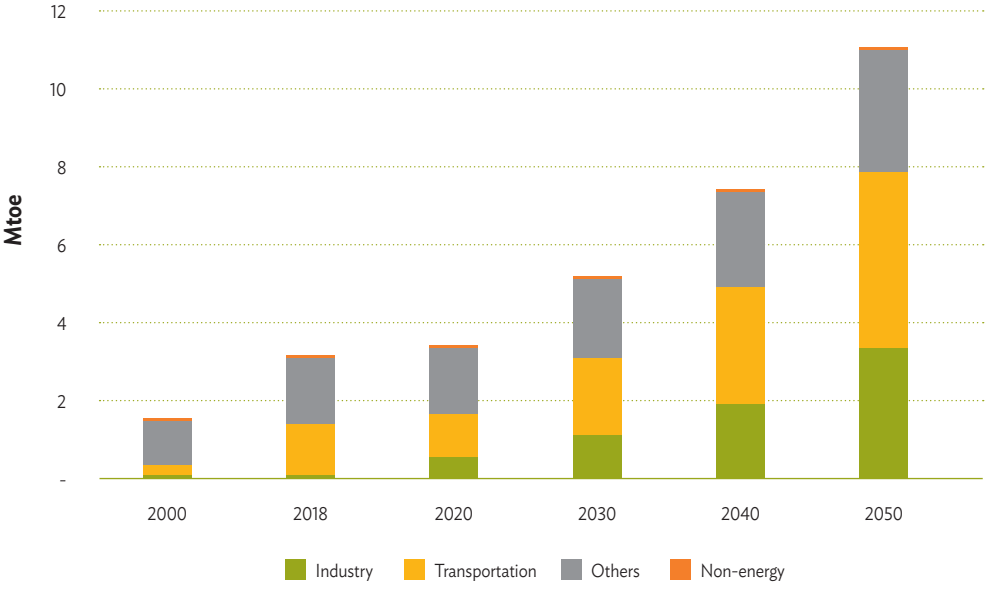
3.1.1 Final Energy Consumption

In the Lao PDR, the final energy mix comprises coal, oil, electricity, and 'others'. The country's TFEC increased from 1.51 Mtoe in 2000 to 3.09 Mtoe in 2018, an AAGR of 4.1%. This growth will continue at a rate of 4.9% in 2018–2020, 4.1% in 2020–2030, 3.8% in 2030–2040, and 4.1% in 2040–2050. From 2018 to 2050, this growth will increase at a constant rate of 4.0% per year.

With respect to final energy consumption by sector, like other Southeast Asian countries, the four main energy-using sectors in the Lao PDR are industry, transport, others, and non-energy. 'Others' covers subsectors such as residential, agriculture, services, and commerce. During 2000–2018, the industry sector grew the fastest, at a rate of 9.5% per year, followed by the transport sector at 8.0% per year, and the 'others' sector at 1.9% per year. Industry's high growth rate is expected to continue from 2018 to 2050, that of the transport sector at 4.8%, and that of 'others' at 2.0%.

In terms of energy types, 'others' (biomass, consisting of wood and charcoal) was the most frequently used in 2018, reaching 1.42 Mtoe, 46.1% of the TFEC. This is expected to decrease to 15.6% by 2050. Oil will become dominant in 2030–2050 and electricity will come second during 2040–2050. From 2000 to 2018, 'others' (including biomass) is expected to remain dominant from 2018 to 2050 in the Lao PDR because the majority of Lao people still live in

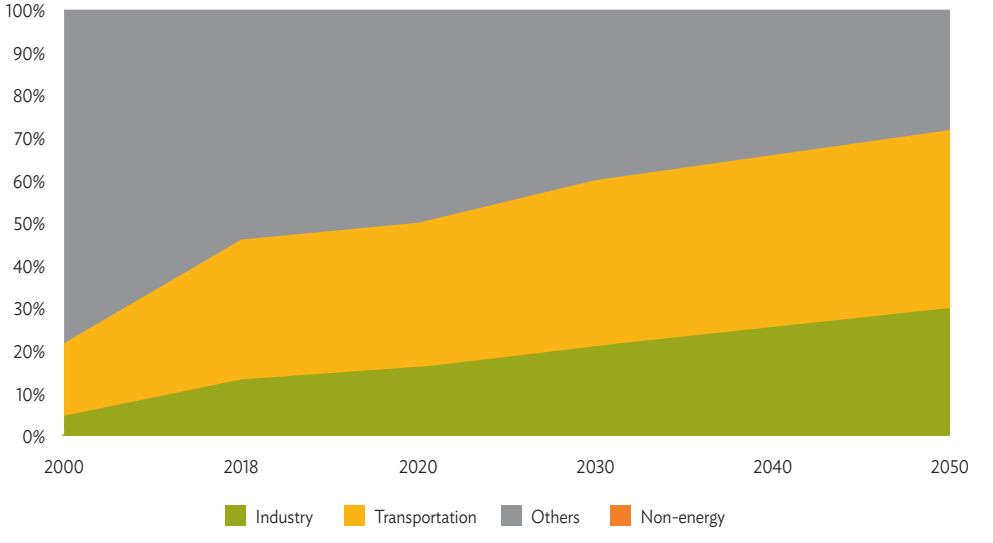
Figure 10.3. Final Energy Consumption by Sector



Mtoe = million tonnes of oil equivalent.

Source: Author's calculation

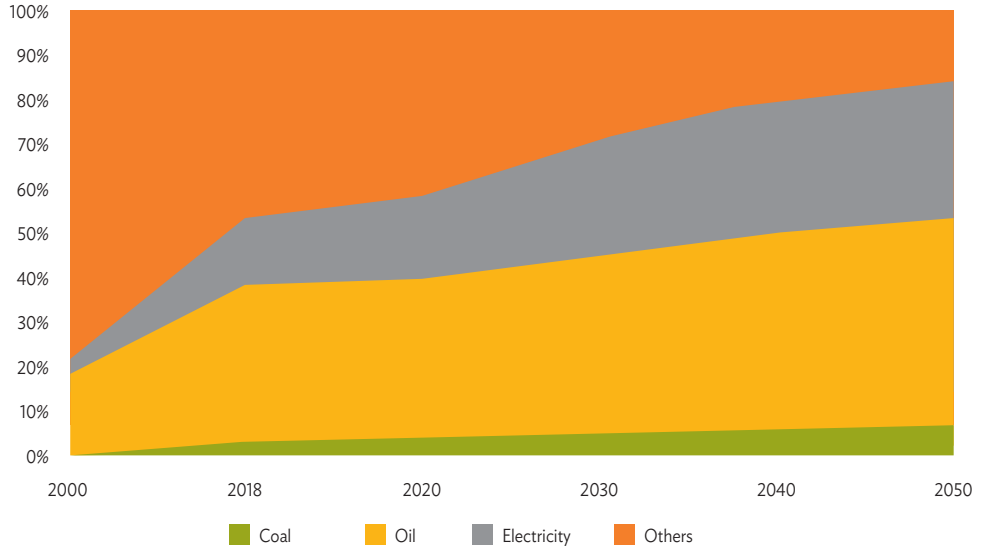
Figure 10.4. Sectors' Share in Final Energy Consumption



Source: Author's calculation

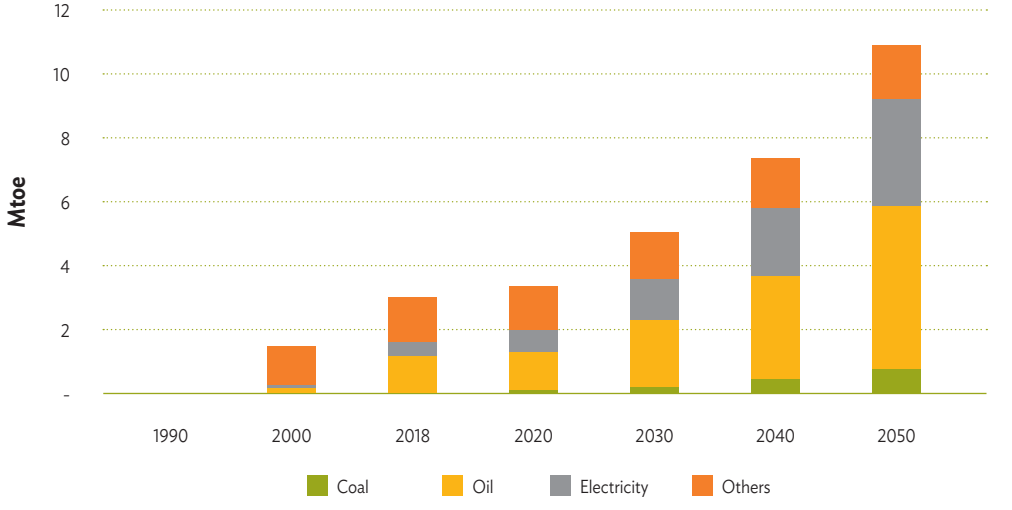
rural areas and rely on wood as the main fuel for cooking. Biomass consumption will decrease slightly because LPG and electric equipment will replace biomass. Although wood is more inconvenient than other energy types like electricity and LPG, which are mostly used for cooking in urban areas, it costs less.

Figure 10.5. Fuels' Share in Final Energy Consumption



Source: Author's calculation

Figure 10.6. Final Energy Consumption by Fuel Type



Mtoe = million tonnes of oil equivalent.

Source: Author's calculation

Oil is an important energy source for the Lao PDR because the entire transport sector depends on it. Oil prices directly affect the country's socioeconomic development, especially the cost of living and doing business in the country. However, unlike electricity and coal, oil is not produced domestically, and the Lao PDR must import it from Thailand or Viet Nam. This keeps the country dependent on its neighbours. In this regard, it is necessary to observe and monitor this trend closely. In 2018, 1.09 Mtoe of oil was consumed, and demand is projected to increase from 1.09 Mtoe in 2018 to 5.06 Mtoe in 2050 (an AAGR of 4.9%), the third highest relative to coal, electricity, and biomass during this period.

3.1.2 Primary Energy Supply

The Lao PDR's energy primarily comes from coal, oil, hydropower, and 'others' (including biomass, biofuels, and electricity for export). The Lao PDR's TPES increased from 1.62 Mtoe in 2000 to 6.38 Mtoe in 2018, an AAGR of 7.7%. This growth is expected to decrease steadily at a rate of 0.4% per year from 2018–2020, because the Hongsa plant consumes coal lignite. The TPES growth rate is projected to decrease steadily at a slower rate of 3.1% per year from 2018–2050.

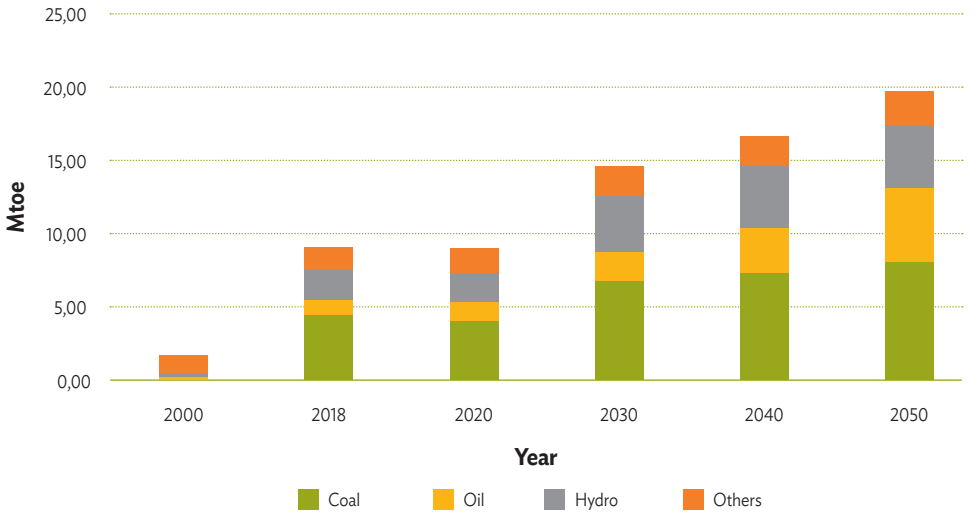
In 2018, coal was the most frequently used energy at 4.46 Mtoe, followed by hydropower at 1.98 Mtoe and biomass at 1.44 Mtoe. The Hongsa plant is driving the high rate of coal consumption, which is expected to increase by 1.9% from 2018 to 2050. Although coal's share of the TPES is projected to decrease from 69.98% in 2018 to 47.8% in 2050, coal is expected to remain dominant in 2050.

Hydropower generated 1.98 Mtoe (31% of the TFES) in 2018, and is expected to generate 4.25 Mtoe (25.1% of the TFES) in 2050. It is forecasted to grow at an AAGR of 2.4% from 2018 to 2050 because the Lao PDR has been developing hydropower projects intensively to meet increasing domestic demand and export more to its neighbours. Specifically, the Lao PDR has agreed to export 7,000 MW to Thailand by 2025 and 5,000 MW to Viet Nam by 2030.

Biomass is frequently used in the Lao PDR because it is a cheap fuel for cooking and is therefore the primary fuel used by rural people. The amount of biomass used has increased from 1.26 Mtoe in 2000 to 1.44 Mtoe in 2018, and is projected to increase to 1.98 Mtoe by 2050. Similar to projections regarding the share of biomass in the final energy mix, biomass as a share of primary energy is also estimated to increase by 1% during 2018–2050.

Oil is also experiencing high growth in the Lao PDR because many people can now afford to buy private cars, significantly raising the number of vehicles. As of 2018, the Lao PDR did not produce crude oil, and all oil products are imported. There are 11 oil import and export companies and 12 oil distribution companies authorised within the Lao PDR. In 2000, 0.27 Mtoe of oil was used, accounting for 16.8% of the TPES; this increased to 1.09 Mtoe (17.1% of the TPES) in 2018, an AAGR of 8.0% during 2000–2018. From 2018 to 2050, oil consumption is projected to grow at an AAGR of 4.9%, and oil will account for 29.9% of the TPES in 2050.

Figure 10.7. Primary Energy Supply



Hydro = hydropower, TWh = terawatt-hour.

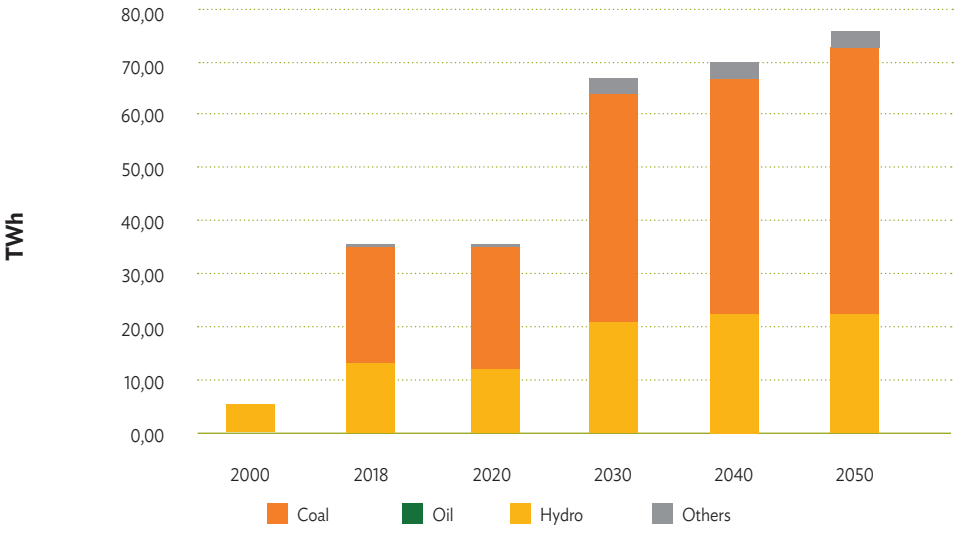
Source: Author's calculation

3.1.3 Power Generation

The history of power generation in the Lao PDR can be divided into two periods: 1970–2015, when all power was generated from hydropower sources; and after 2015, when the Hongsa plant began operating. In 1990, the Lao PDR only produced 0.82 terawatt-hours (TWh) of electricity; this increased to 3.51 TWh in 2000 and 36.76 TWh in 2018, and is forecasted to increase to 76.94 TWh by 2050. Power generation outputs are also estimated to rise dramatically from 2018 to 2050, at an AAGR of 2.3%. The inauguration of the first thermal power plant in 2015 changed the power generation mix in the Lao PDR (see Figure 10.8 for data from 2018). In 2018, hydropower accounted for 62.6% of total generation and the Hongsa plant accounted for 37.1%, with the remaining 0.3% coming from solar and biomass. Hydropower is forecasted to continue to dominate the Lao PDR's power sector. For example, it is projected that by 2050 hydropower will account for 65.1% of total generation, and the Hongsa plant 29.9%. According to the country's power mix policy, hydropower should

account for 65% and thermal power 30%, with the remaining 5% coming from other sources. Therefore, it appears that the power generation mix under BAU will comply with this policy by 2050.

Figure 10.8. Electricity Generation 2050



Mtoe = million tonnes of oil equivalent.

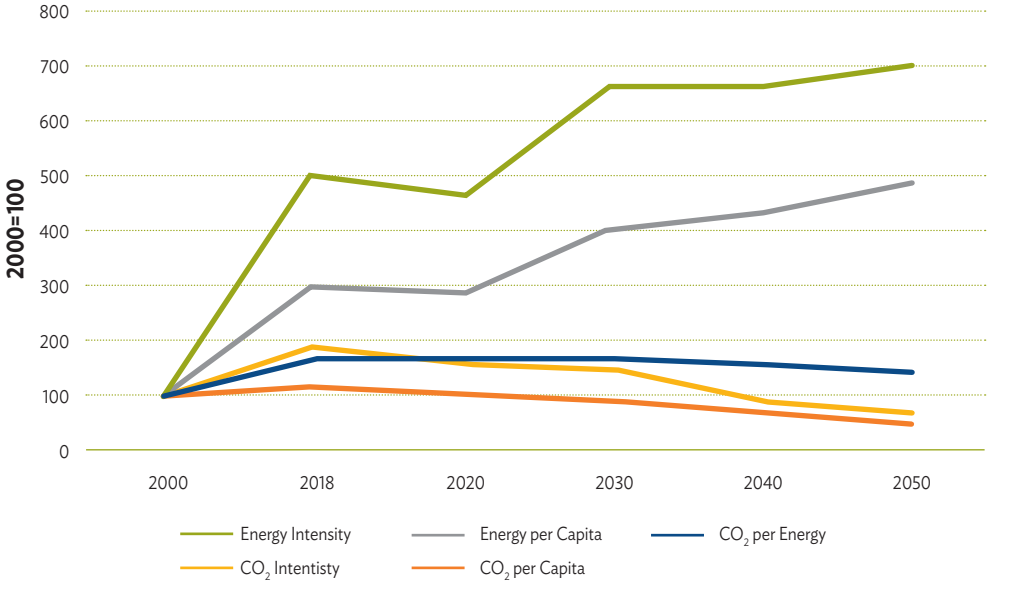
Source: Author's calculation

3.1.4 Energy Indicators

The Lao PDR's primary energy intensity (TPES/GDP) increased from 452 tonnes of oil equivalent per million dollars (toe/$ million) to 505 toe/$ million in 2018 because of steadily increasing coal consumption by the thermal power plant; this is expected to decline to 210 toe/$ million by 2050.[5] The final energy intensity is projected to decline even lower to 137 toe/$ million by 2050. This indicates that energy consumers are implementing energy efficiency and conservation programmes.

[5] All United States dollars in this report are in constant 2010 values unless specified.

Figure 10.9. Energy Intensity and Other Energy Indicators (2000 = 100)



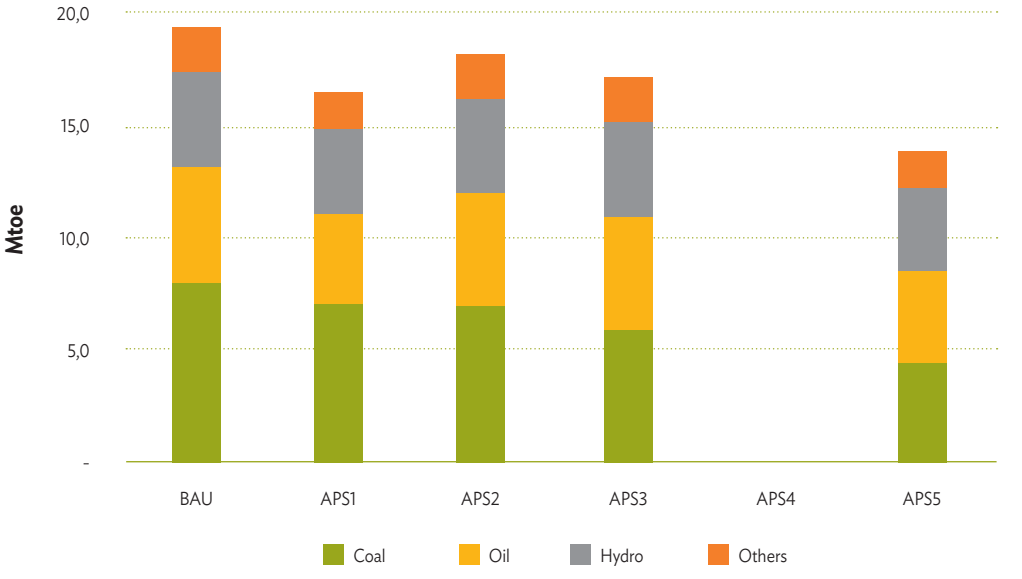
CO_2 = carbon dioxide.

Source: Author's calculation

3.2 Energy Saving and Carbon Dioxide Reduction Potential (Alternative Policy Scenario)

As outlined above, this study considers four APSs with respect to the Lao PDR's energy saving and CO2 reduction potential: energy efficiency and conservation (APS 1), improved efficiency of the thermal power generation plant (APS 2), development of renewable energy (APS 3), and a combination of APSs 1, 2, and 3 (APS 5). Under these four APSs, various changes can be observed. Under APS 1 the TPES decreases by 2.89 Mtoe (from 19.4 Mtoe to 16.5 Mtoe) compared with BAU. Under APS 2, more efficient thermal power generation reduces the TPES to 1.13 Mtoe. Under APS 3, replacing coal power generation with wind and solar will decrease the TPES from 19.4 Mtoe under BAU to 17.2 Mtoe. APS 5 combines the total reductions projected for APSs 1, 2, and 3. These reductions in the TPES mainly come from the targeted energy savings of 10%, followed by replacing coal power generation with renewable energy and improving the efficiency of thermal power generation.

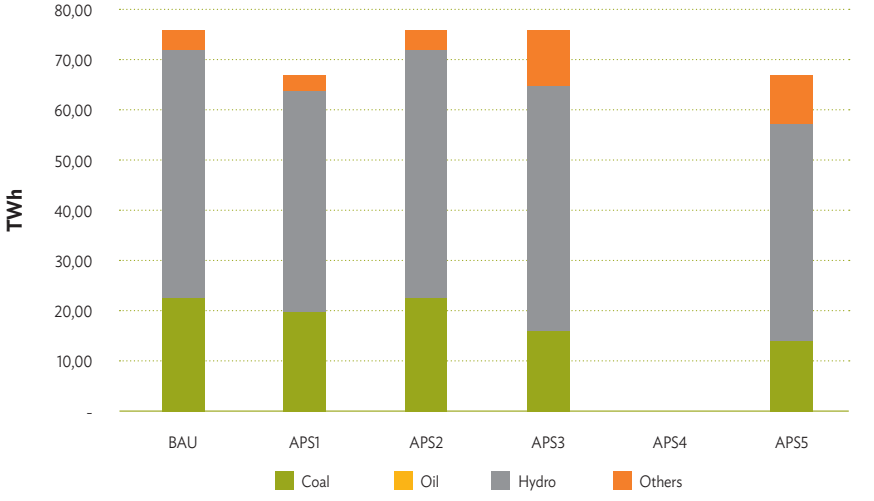
Figure 10.10. Comparison of Scenarios for Total Primary Energy Supply (2050)



APS = alternative policy scenario, BAU = business as usual, Hydro = hydropower, Mtoe = million tonnes of oil equivalent.

Source: Author's calculation

Figure 10.11. Comparison of Scenarios for Electricity Generation (2050)

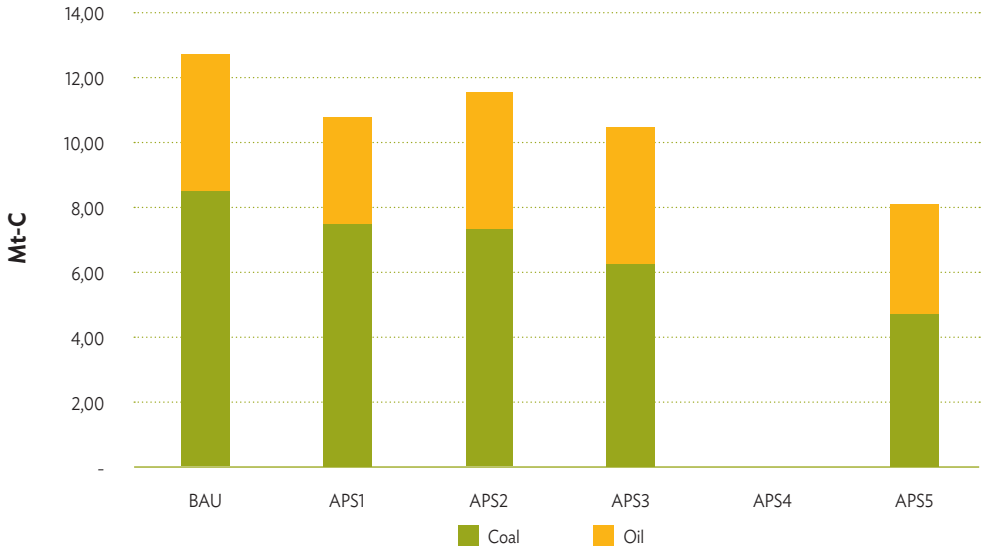


APS = alternative policy scenario, BAU = business as usual, Hydro = hydropower, TWh = terawatt-hour.

Source: Author's calculation

Comparing projected levels of CO2 emissions across these five scenarios reveals that APS 5 will eliminate 2.26 million tonnes of carbon (Mt-C), followed by APS 1 at 1.9 Mt-C, and APS 2 at 1.2 Mt-C. In total, this study projects that APS 5 will reduce total CO2 by 4.65 Mt-C, from 12.7 Mt-C of BAU to 8.09 Mt-C by 2050 (Figure 10.12).

Figure 10.12. Comparison of Scenarios (2050)



APS = alternative policy scenario, BAU = business as usual, Mt-C = million tonnes of carbon.

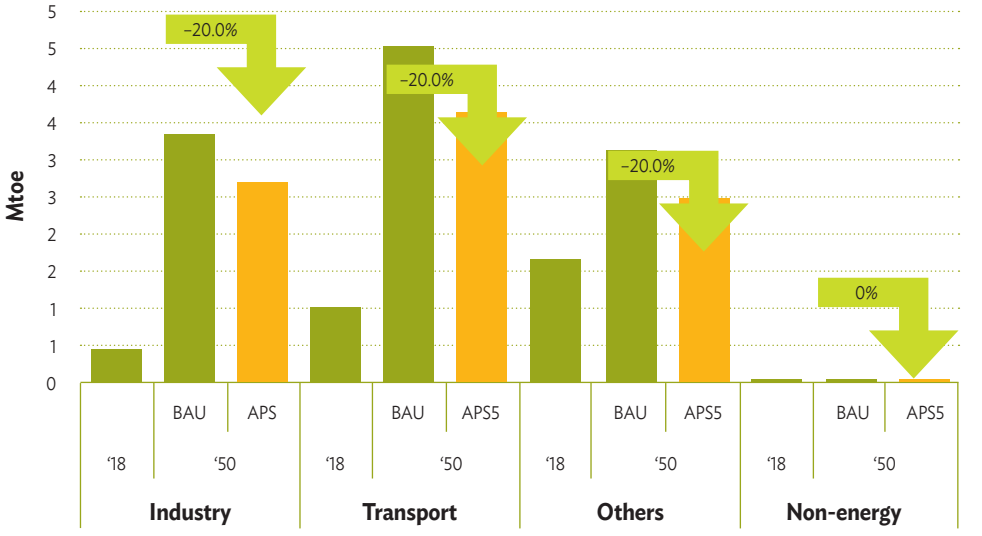
Source: Author's calculation

With respect to trends of final energy consumption under BAU and in the APSs in each sector, the model yields the following results: in APS 1, final energy consumption is expected to increase from 3.09 Mtoe in 2018 to 8.80 Mtoe in 2050. Under BAU, the largest consumer is the 'others' sector, which consumes 1.65 Mtoe, or 53.5% of the TFEC in 2018; this will increase to 3.12 Mtoe (28.3%) by 2050. The transport sector, the second largest consumer, consumes 1.01 Mtoe or 32.8% of the TFEC, this is projected to increase to 4.54 Mtoe by 2050, making this sector the largest consumer of energy. The industry sector's consumption is also expected to increase at a rate of 6.7% from 2018 to 2050, making it the second largest consumer by 2050.

APS 1 is expected to realise energy savings of 10% of the TFEC by 2030 and another 10% by 2050, with all sector consumption decreasing by 10% compared to BAU. In APS 2, under which the efficiency of thermal power generation will improve, the results are still the same as under BAU, and final energy consumption is not affected. In APS 3, replacing coal with solar and wind will reduce primary consumption of fossil fuels and increase the use of renewable energy. Therefore, this scenario does not affect final energy consumption, which remains the same as in BAU.

Although APS 5 is a combination of APSs 1, 2, and 3, its effect is the same as that of APS 1, that is, each sector's final consumption reduced by 10%.

Figure 10.13. Final Energy Demand by Sector—Business as Usual, and Alternative Policy Scenario 5



APS = alternative policy scenario, BAU = business as usual, Mtoe = million tonnes of oil equivalent.

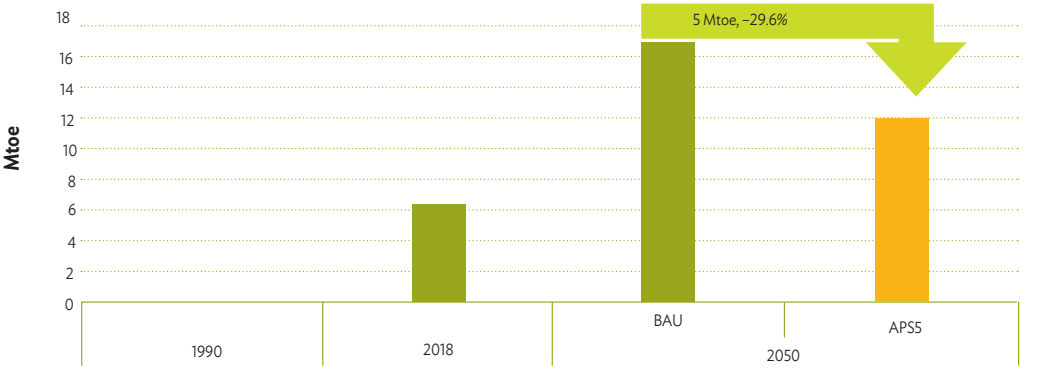
Source: Author's calculation

3.2.1 Primary Energy Supply

3.2.2 Projected Energy Savings

By 2050, primary energy is expected to decrease by 5 Mtoe or 29.6% from BAU to the APS 5 level (Figure 10.14). This decrease in the TPES is due to the 10% reduction in energy consumption as well as the shift to renewable electricity such as solar photovoltaics from 2018 to 2050.

Figure 10.14. Total Primary Energy Demand—Business as Usual, and Alternative Policy Scenario 5



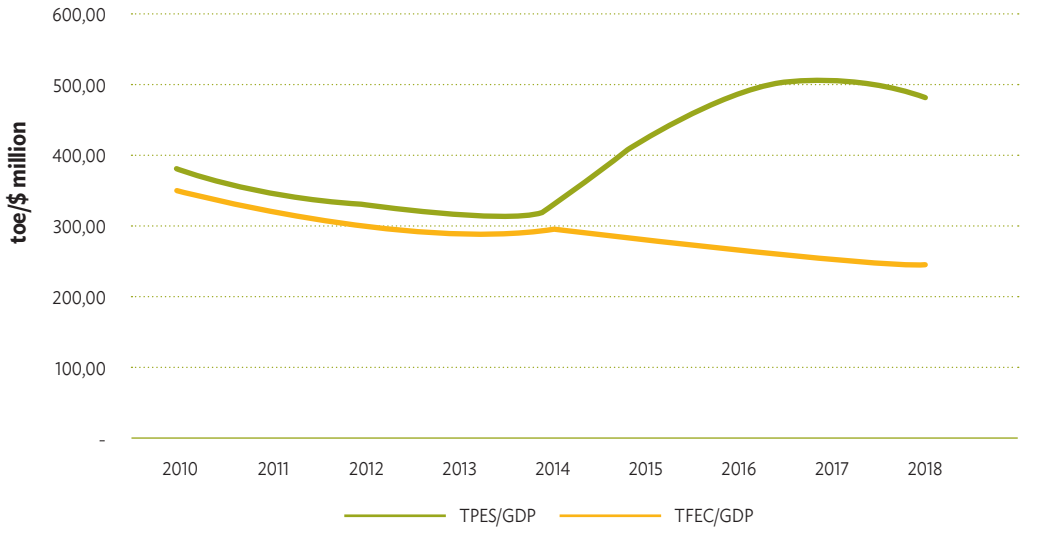
APS = alternative policy scenario, BAU = business as usual, Mtoe = million tonnes of oil equivalent.

Source: Author's calculation

3.2.3 Energy Intensities

Energy intensity is defined as the TPES divided by GDP. Figure 10.15 below shows that growth decreased to 3.9% from 2010 to 2014, increased to 4.2% through 2017, and decreased again to 4.5% from 2017 to 2018. This indicates that energy intensity increased from 380 toe/$ million in 2010 to 484.33 toe/$ million in 2018 as a result of the Hongsa power plant beginning operations in 2015. Coal consumption also increased rapidly due to its lower thermal efficiency (less than 30%). On the other hand, the final energy consumption intensity (TFEC/GDP) showed a declining trend due to the decreasing use of biomass consumption from 349.59 toe/$ million to 244.76 toe/$ million during the same period.

Figure 10.15. Energy Intensity (2010–2018)



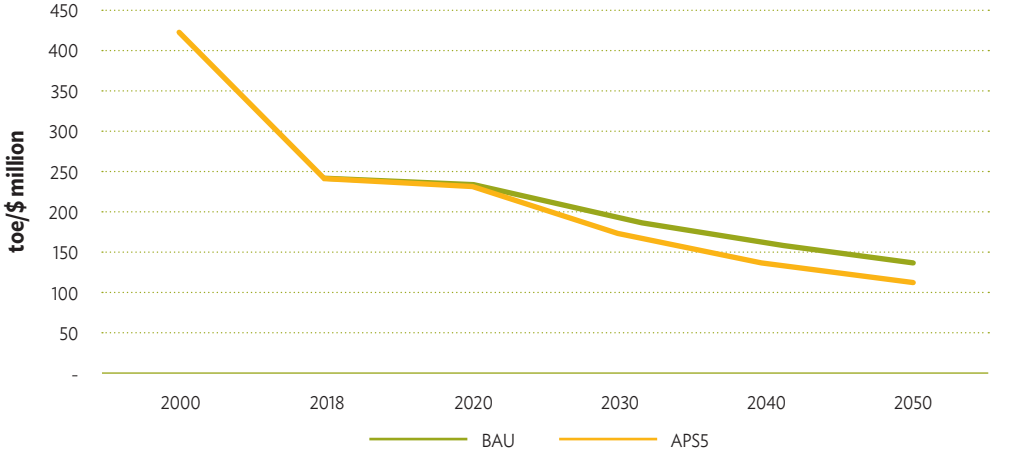
GDP = gross domestic product, toe = tonnes of oil equivalent, TPES = total primary energy supply.

Source: The Lao People's Democratic Republic, Department of Energy Policy and Planning (2019), Lao Energy Balance Table (EBT) Collection_ Historical. 24 July.

Source: Author's calculation.

As the Lao PDR endeavours to make its economy more efficient and competitive and promote sustainable development, energy intensity, both final and primary, has been significantly reduced. The final energy intensity is projected to decrease from 245 toe/$ million in 2018 to 137 toe/$ million by 2050. As Figure 10.16 shows, the final energy intensity in APS 5 is less than under BAU due to the implementation of the 10% energy savings in APS 1.

Figure 10.16. Final Energy Intensity—Business as Usual and Alternative Policy Scenario 5

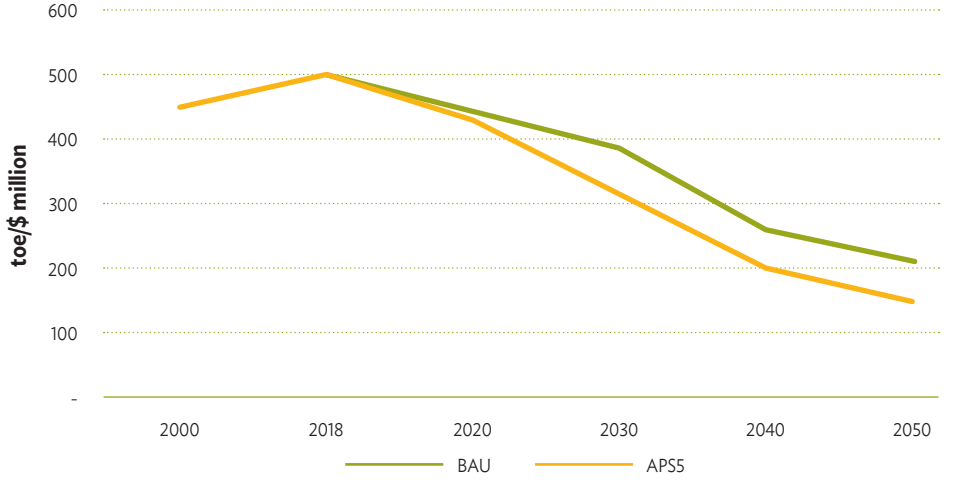


APS = alternative policy scenario, BAU = business as usual, toe = tonnes of oil equivalent.

Source: Author's calculation.

The primary energy intensity is also expected to decline from 505 toe/$ million in 2018 to 210 toe/$ million by 2050. As shown in Figure 10.17, in APS 5 the primary energy intensity is expected to decline more than 30% from BAU, from 210 toe/$ million to 148 toe/$ million by 2050 due to energy savings, improved efficiency of thermal power generation, and the replacement of coal power generation with solar and wind. Therefore, the primary energy intensity will improve in the future.

Figure 10.17. Primary Energy Intensity—Business as Usual and Alternative Policy Scenario 5



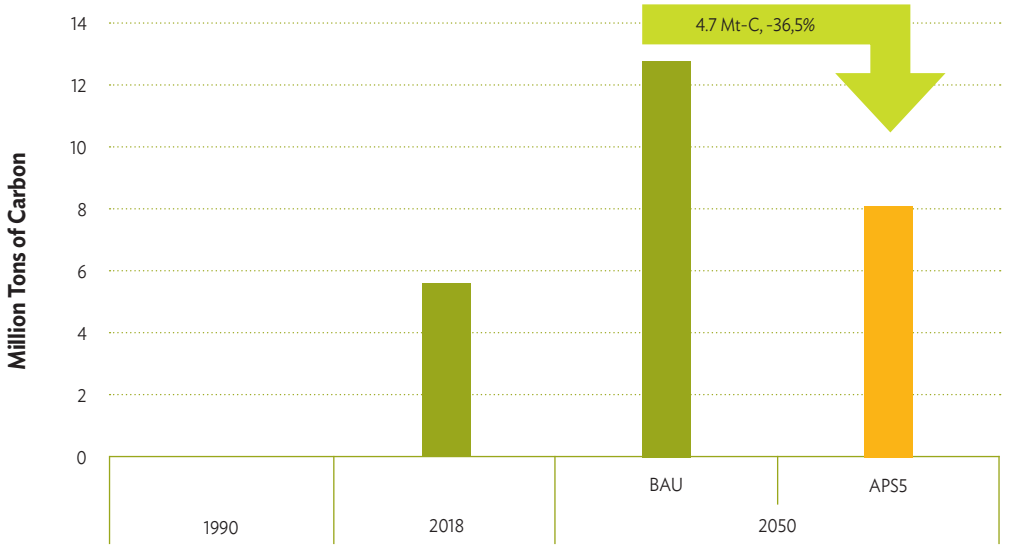
APS = alternative policy scenario, BAU = business as usual, toe = tonnes of oil equivalent.

Source: Author's calculation.

3.2.4 Carbon Dioxide Emissions from Energy Consumption

CO2 emissions from energy consumption are projected to decrease by 36.5% from 12.7 Mt-C under BAU to 8.1 Mt-C in APS 5 due to the implementation of APSs 1, 2, and 3. By 2050, it is expected that APS 1 will reduce CO2 emissions by around 1.9 Mt-C or 15% from BAU, APS 2 by 1.2 Mt-C or 9%, and APS 3 by 2.2 Mt-C or 18%.

Figure 10.18. Carbon Dioxide Emissions from Energy Combustion—Business as Usual versus Alternative Policy Scenario 5



APS = alternative policy scenario, BAU = business as usual, Mt-C = million tonnes of carbon.

Source: Author's calculation.

4. Implications and Policy Recommendations

This study suggests that the Lao PDR has more options with respect to its future energy outlook, including energy efficiency and conservation, reducing the TFEC by 10%, improving the efficiency of thermal power generation, promoting renewable energy, and reducing the use of fossil fuels in the primary energy supply.

To reduce both the TPES and TFEC, as well as CO2 emissions, the Lao PDR should extend its renewable energy and energy efficiency and conservation programmes until 2050. As these programmes are of primary importance in reducing energy consumption, they should be proposed as a Lao PDR energy policy. At the same time, sound projects and programmes should be implemented. The industry sector should install an energy management system, develop and implement its own energy saving or reduction plans, cooperate with the

government on energy security, and conduct regular seminars on energy saving measures. The transport sector should increase public transport in large cities and conduct campaigns to promote the use of that transport. Other sectors should raise public awareness of energy conservation and implement energy management in the building sector. In addition, a study of the correlation between GDP and energy consumption should be carried out and the quality of energy statistics should be improved accordingly. Finally, the government should consider implementing the following actions:

(i) Promote and implement energy efficiency and conservation programmes in all sectors.
(ii) Establish a fund to support energy efficiency and conservation programmes and energy service companies.
(iii) Promote clean coal technology to improve the efficiency of thermal power generation and reduce CO2 emissions.
(iv) Include the findings of this study in the Lao PDR's energy policy and plan.
(v) Promote electric vehicles, which can reduce oil imports as well as CO2 emissions.
(vi) Reform the electricity tariff regime to encourage more energy efficiency and conservation activities.
(vii) Increase the share of coal thermal power generation in the power generation mix by using local coal and clean coal technology to ensure a stable supply of electricity.
(viii) Promote a power generation mix of 64% hydropower, 21% thermal power, and 15% other sources (such as solar, wind, and biomass) from 2030 to 2050.
(ix) Promote power interconnection and power trade through system-to-system transmission within ASEAN.

Annex 1

Energy Outlook Results of Total ASEAN

Alloysius Joko Purwanto

March 2021

This chapter should be cited as:
Purwanto, A.J. (2021), 'Energy Outlook Results of Total ASEAN', in Han, P. and S. Kimura (eds.), *Energy Outlook and Energy Saving Potential in East Asia 2020*, Jakarta: ERIA, pp.312-326.