

Chapter 1

Current Energy Security Situation

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Chapter 1

Current Energy Security Situation

Myanmar is a country in Southeast Asia endowed with rich natural resources such as crude oil, natural gas, hydropower, biomass, and coal. Myanmar's proven energy reserves in 2017 comprised 105 million barrels of oil, 6.58 trillion cubic feet of gas, and 542.56 million metric tons of coal. The country also has a large potential in developing its renewable energy sources, which are wind, solar, geothermal, bioethanol, biodiesel, and biogas.

Myanmar exports substantial amounts of natural gas and coal to Thailand and other neighbouring countries. Although Myanmar is a net exporting country, it imports around 90% of its total oil requirements.

As a developing country in the Association of Southeast Asian Nations (ASEAN) Myanmar's gross domestic product (GDP) has grown by an average of 7.0% per year since 2010. The industry and service sector were the main contributor for this growth, whilst the agricultural sector has experienced a declining share during the same period.

Myanmar's population experienced average annual growth of 0.8% over the 2010–2017 period. Most of the population is in the rural areas (around 69%), with average growth of 0.5% per year, slower than growth in the urban areas (1.5% per year).

1.1. Final Energy Consumption

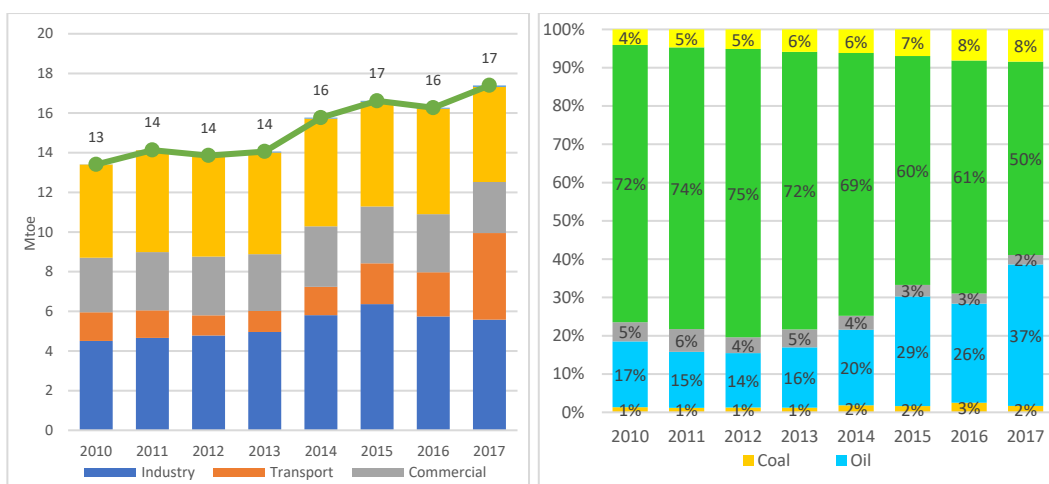
Based on the Myanmar Energy Balance Tables 2010–2017, total final energy consumption (TFEC) grew from around 13 million tons of oil equivalent (Mtoe) in 2010 to 17 Mtoe in 2017, at an average rate of 3.8% per year. Biomass is still the dominant fuel consumed in Myanmar, but with a declining share, from 72.4% in 2010 to 50.5% in 2017. Increasing household use of liquefied petroleum gas (LPG) or electricity for cooking, as well as increased use of more efficient biomass stoves, especially in the rural areas contributed to the reduction of biomass consumption in the country. Although other fuels have a smaller share in TFEC, both petroleum products and electricity experienced rapid growth over the 2010–2017 period. The average annual growth rate of petroleum product consumption was 15.8% per year, whilst for electricity, the growth was slightly slower at 15.2% per year. Coal consumption was also increasing at an average rate of 6.9% per year over the same period.

The main contributor of the rapid growth in petroleum product consumption is the increasing number of motor vehicles in road transport. As a result, the transport sector experienced the fastest growth compared to industry or the other sectors. The average annual growth of the transport sector of TFEC was 17.2% per year over the 2010–2017 period with gasoline and diesel consumption growing at 27% and 14% per year,

respectively. Between 2016 and 2017, the total number of vehicles increased at an average of 8.2%¹ and total fuel consumption increased almost twofold. The rapid increase of the transport sector consumption contributed to the large increase of oil consumption from 2016 to 2017.

The industry sector, having the largest share in TFEC (32% in 2017), grew only by 3.1% per year over the same period. The residential sector consumption, accounting for 28% of TFEC in 2017, grew by 0.3% per year whilst the commercial sector consumption with 15% share in the 2017 TFEC, decreased at an average rate of 0.9% per year. Figure 1.1 shows the TFEC of Myanmar by sector and by fuel type.

Figure 1.1: Final Energy Consumption



Mtoe = million tons of oil equivalent.
Source: Myanmar Energy Balance Tables 2010–2017.

1.2. Power Generation

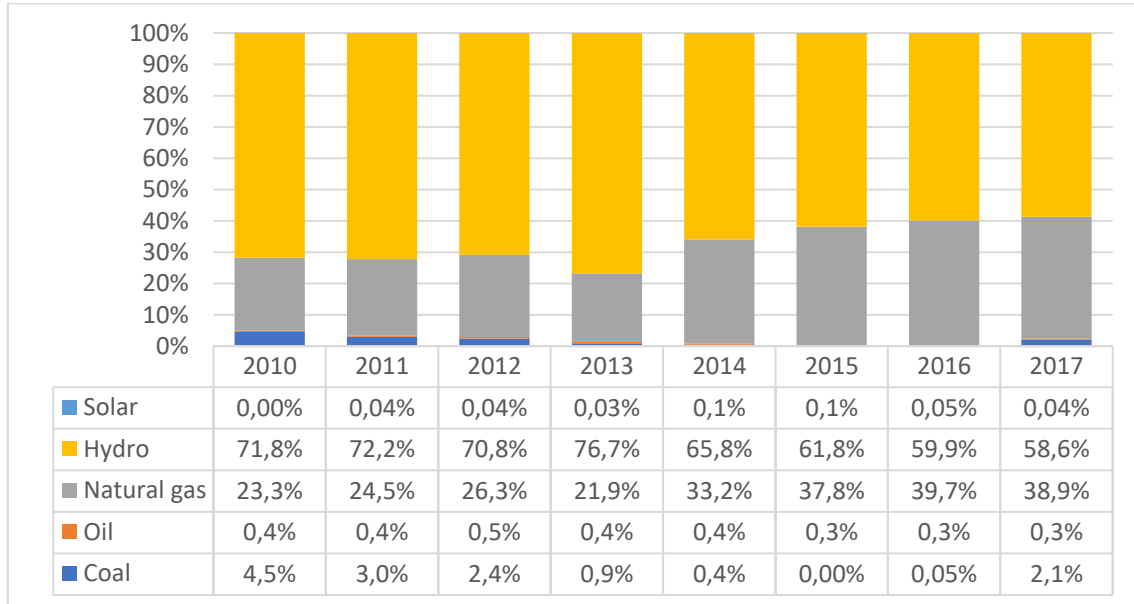
Myanmar’s electricity demand was 17 terawatt hours (TWh) in 2017, almost threefold the demand in 2010. Around 50% of the total, was consumption in the residential sector, followed by the industry and commercial sectors, at 31% and 19%, respectively. Beside the domestic demand, Myanmar exports electricity to China in cross-border areas without national grid connection.

Total power generated in 2017 was 21 TWh with natural gas and hydro as the main power sources of the country. Hydropower had the biggest share in total generation (67%) followed by natural gas (31%). The remaining shares were that of coal, oil, and solar sources. Although natural gas has a lower share than hydropower in the country’s power generation mix, generation from gas plants grew faster at 22.5% per year over the 2010–2017 period. Hydropower generation grew at 10.7% per year, lower than the total annual

¹ Myanmar Statistical Information Service. Registered Motor Vehicles by Type in Yangon and Other Areas 2010–2017.

growth rate of 13.9%, resulting in a declining share in total generation mix of the country. Figure 1.2 shows the power generation mix of Myanmar since 2010.

Figure 1.2: Fuel Share in Power Generation Mix



Source: Myanmar Energy Balance Tables 2010–2017.

Hydropower plants total installed capacity is around 3255 megawatts (MW), whilst the potential is more than 100 gigawatts (GW). Gas-based power generation installed capacity reached 2175 MW, whilst coal-based power generation remains at 120 MW and diesel plants 92 MW (Zaw, 2019).

The reliance on hydropower created a vulnerability of supply caused by seasonal changes, creating frequent power shortages during the dry season. The government plans to increase the role of natural gas in the future power generation mix. In the case of coal, public opposition has delayed the construction of additional coal-fired power plants. The increasing use of solar energy to complement hydropower generation will further secure the country’s supply mix as well as addressing short-term needs during the dry season.

In the past, the implementation of solar home system rooftop types as part of the rural electrification programme has made these technologies more common in Myanmar. Solar rooftop facilities in factories and large buildings also increase the use of solar energy in Myanmar, but most of these are off-grid area connections. One utility-scale solar PV project of 50 MW capacity was recently connected to the national grid.

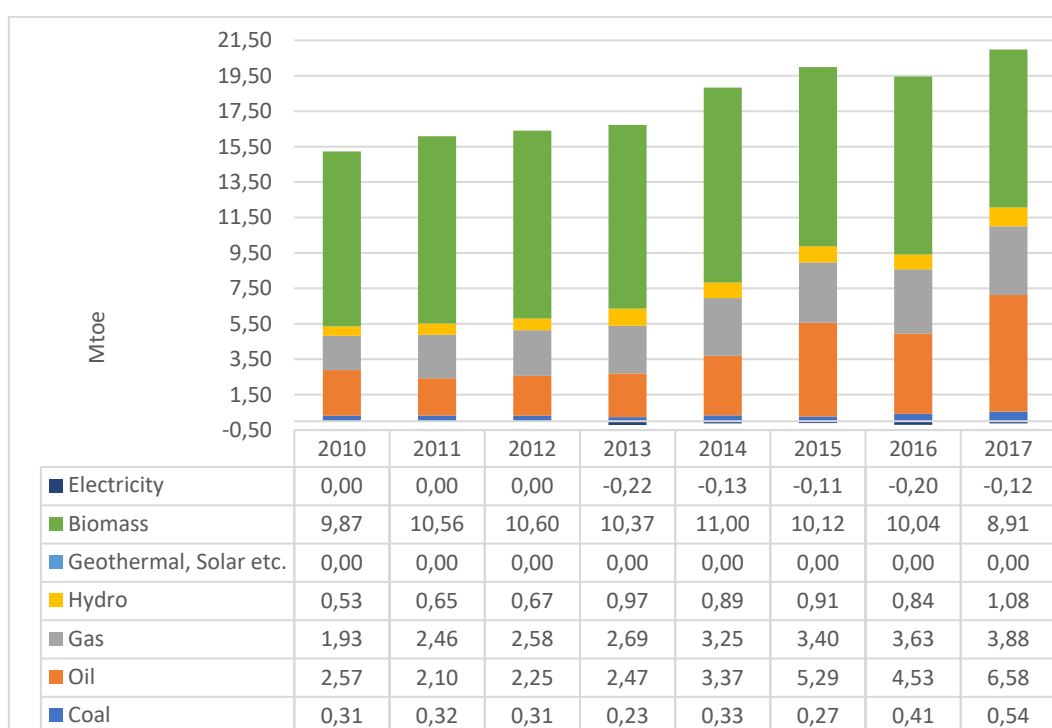
The estimated technical potential of solar energy in Myanmar can reach 118.2 TWh/year, one of the largest in the Southeast Asian region. About 60% of the country is suitable for solar PV generation particularly in the central dry zone where it is a flat plain area composed of infertile soil (Del Barrio-Alvarez and Sugiyama, 2020).

Wind energy can be another fuel mix option for power generation. The technical potential is much lower than solar energy, at around 365 TWh per year (Htet, 2019). Two feasibility studies have been completed for wind power projects in Myanmar – the 30 MW Chaung Tha project in the Ayeyarwady region and the 163 MW Phase-1 Magway region project.

1.3. Primary Energy Supply

The total primary energy supply (TPES) of Myanmar in 2017 reached almost 21 Mtoe, which was 1.4 times higher than 2010 (Figure 1.3). On average, the growth rate of TPES over the 2010–2017 period was around 4.6% per year.

Figure 1.3: Primary Energy Supply



Source: Myanmar Energy Balance Tables 2010–2017.

The majority of the supply in Myanmar was still biomass but the share decreased from 65% in 2010 to 43% in 2017 as more households move to LPG, electricity, and efficient biomass stoves that are available in the market. Biomass supply slowed at an average rate 1.5% per year; from 10 Mtoe in 2010 to 9 Mtoe in 2017.

Oil supply grew faster than biomass and the other fuels, increasing its share from 17% in 2010 to 32% in 2017. The main contributors of the rapid growth of oil supply is the consumption of the transport sector, particularly road transport. In addition, increasing industrial heating demand and increasing LPG consumed by the residential and commercial sectors also contribute to the rapid growth in oil supply.

Natural gas supply also experienced rapid growth from around 2 Mtoe to almost 4 Mtoe in 2017. This was mainly due to the increased operation of gas turbine plants to meet the immediate shortfall in power generation. Increased demand from coal-fired power plants also contributed to the increase of coal supply but not as fast as natural gas. The average annual growth rate of coal supply between 2010 and 2017 was 8% per year, whilst natural gas was 10.5% per year.

Hydropower supply increased slightly faster than natural gas supply, at an average rate of 10.7% per year. Hydropower was still the major source of Myanmar's power generation mix. Beside hydro, the other renewable share, which is solar PV, is also growing fast, especially to support the rural electrification programme. The share in TPES of solar PV is negligible (0.004%).

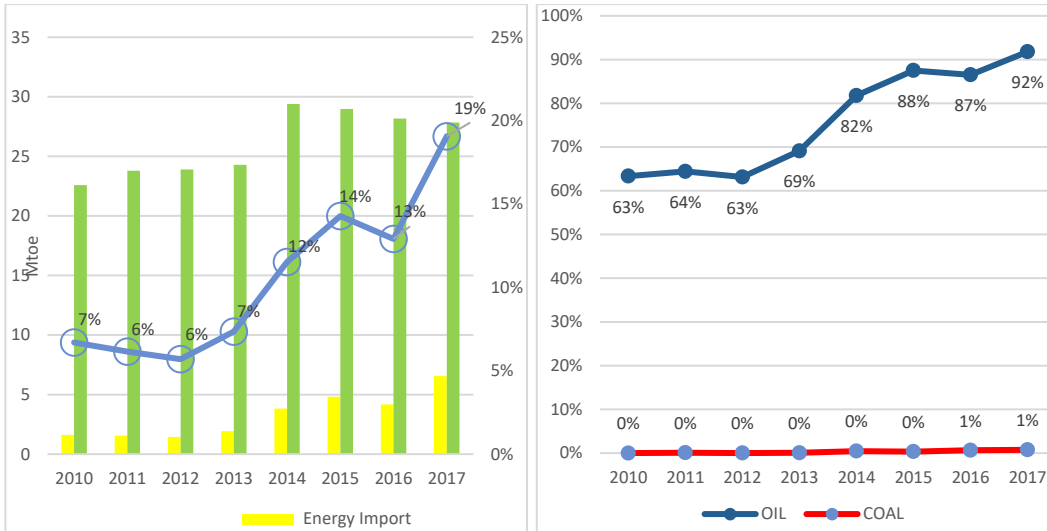
Since 2013, Myanmar has been exporting electricity to China. This occurred only as cross-border exports in areas without connection to the grid. The share in TPES is around 1% over the 2013–2017 period, and the electricity comes from hydropower plants.

1.4. Energy Security Indicator

Reliance on overseas energy sources is a major concern for energy security. Energy import dependency is the extent to which a country relies on imported fuels to meet the demand. The import dependency ratio (Figure 1.4) is measured as the ratio between the total energy import and the total energy supply defined as production plus import. Total import increased fourfold between 2010 and 2017 to meet the increasing oil demand. Coal has also been imported since 2011, but the share in total imports was only 4%, whilst the majority was oil imports. Total production also increased, but more slowly. By 2017, the total production was only 1.2 times higher than in 2010. The majority of the production is natural gas (61% of total production) and biomass. Oil and coal production combined was only around 3% in 2017. The resulting import dependency increased gradually from 7% in 2010 to 19% in 2017.

By fuel type, oil import dependency was already 98% in 2017, whilst in 2010 it was 63%. Coal import dependency, on the other hand was only 1% in 2017 indicating most of the increase in coal demand can still be met from domestic coal. Similarly, increased use of natural gas for power generation in 2017 has not triggered imports of natural gas since the domestic production is still sufficient to meet not only exports but also domestic demand. Figure 1.4 shows the import dependency of Myanmar in terms of total and by fuel type.

Figure 1.4: Import Dependency Ratio



Mtoe = million tons of oil equivalent.
 Source: Myanmar Energy Balance Tables 2010–2017.

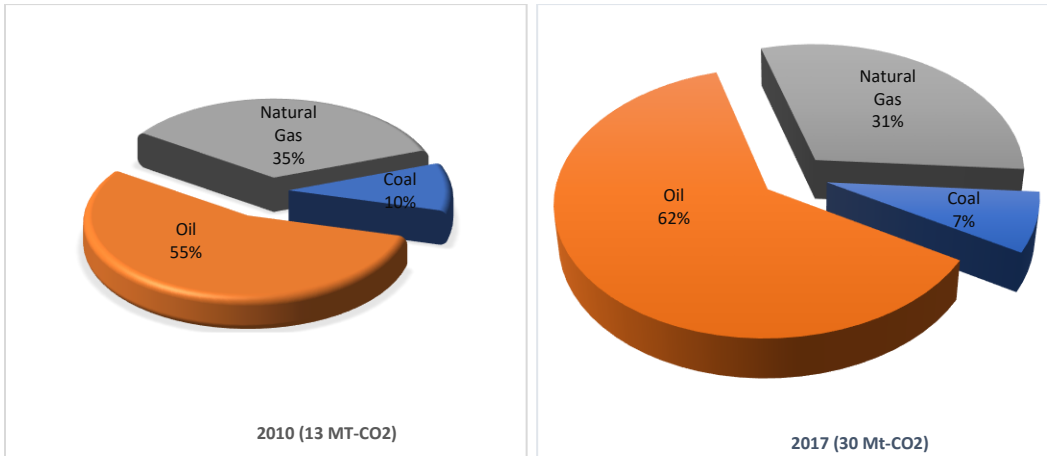
Due to continuously stable economic growth in Myanmar, which is realised by aggressive foreign investment in the country, oil and electricity demand will increase in the future. In addition, natural gas production shall decline year by year according to the report of the Natural Gas Master Plan for Myanmar (ERIA, 2018) if new gas fields are not discovered in Myanmar. So far the energy supply security level of Myanmar has not been serious, but in future due to the two reasons mentioned above, the energy supply security level of Myanmar will be vulnerable. Thus, energy policies to utilise domestic energy supplies, which are coal, hydropower, and biomass are crucial.

1.5. CO₂ Emissions

Myanmar’s CO₂ emissions have been increasing at an average rate of 13% per year from 2010 to 2017. The total amount of CO₂ emissions in 2017 was 8 million ton-C (in terms of carbon content) or around 30 million ton-CO₂ (Figure 1.5). Combustion from oil fuels constitute the main source of the CO₂ emissions (32%), whilst natural gas and coal make up the remaining shares. Compared to 2010, the share from oil in 2017 is higher, whilst for coal and natural gas, the share in 2017 is lower than 2010. This was due to the faster growth of oil supply compared to coal and natural gas.

CO₂ emissions are a component being considered when discussing the future energy supply security of Myanmar. This study seeks the best energy mix to maintain not only the energy supply security level of Myanmar but also the CO₂ emissions level in the future.

Figure 1.1: CO₂ Emissions by Fuel Type



Source: Myanmar Energy Balance Tables 2010–2017.