

# Chapter 1

## Energy Supply and Demand Situation in Brunei Darussalam

June 2020

**This chapter should be cited as**

ERIA, BNERI and Chiyoda Corporation (2020), 'Energy Supply and Demand situation in Brunei Darussalam', in *Brunei Darussalam: Shifting to Hydrogen Society*. ERIA Research Project Report FY2020 no.04, Jakarta: ERIA, pp.1-5.

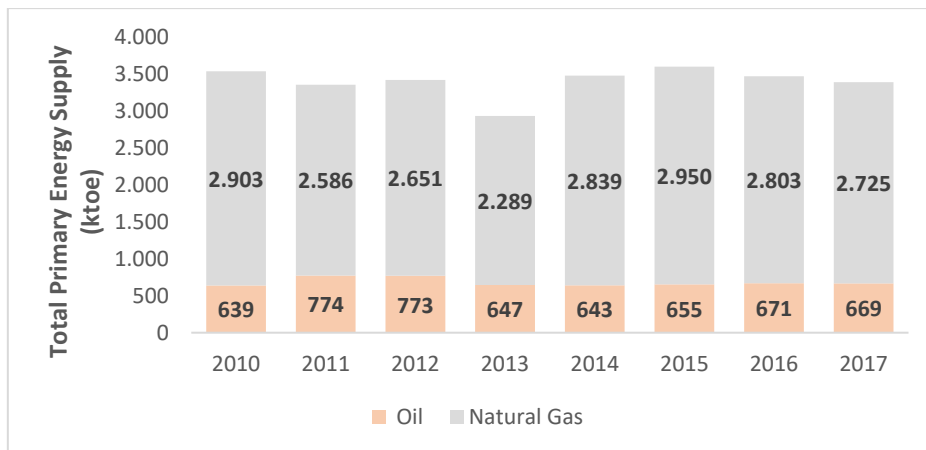
# CHAPTER 1

## Energy Supply and Demand Situation in Brunei Darussalam

### 1.1. Total Primary Energy Supply and Total Final Energy Consumption

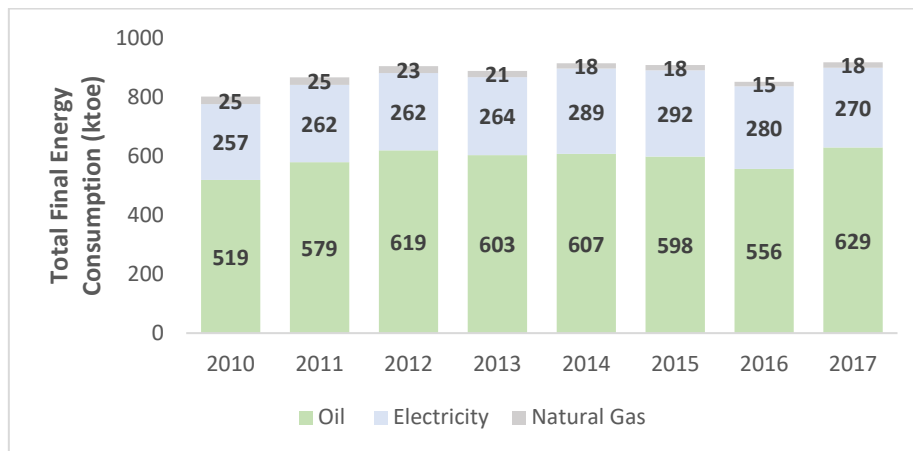
Firstly, we review the historical oil and gas trend of Brunei’s total primary energy supply (TPES) and total final energy consumption (TFEC). In particular, oil and natural gas account for 80% and 20% of TPES, respectively. During 2010–2017, oil grew at 0.7% per year but natural gas recorded a negative growth at –0.9% per year due to a decrease in natural gas production (Figure 1.1). Over the same period, the TFEC expanded at 2% per annum; however, oil consumption grew at a faster rate, at 2.8%, higher than the TFEC. Consumption from natural gas was reduced at 4.6% per annum, whilst electricity consumption recorded a growth of 0.7% per year (Figure 1.2).

**Figure 1.1: Total Primary Energy Supply, by Fuel Type, in Brunei Darussalam**



Source: APEC Energy Working Group (2020).

**Figure 1.2: Total Final Energy Consumption, by Fuel Type, in Brunei Darussalam**



Source: Author (2020).

### 1.2. Energy Security

Brunei relies heavily on fossil fuels for its domestic power generation (natural gas and diesel) and road transport (gasoline and diesel). Although domestic supplies certainly remained secure, the vulnerability of these supplies would entail disruptions that could cause power outages and insufficient fuel supply. Therefore, it is important to increase the reliability of these supplies to lessen the country's vulnerability and the economic risks associated with interrupted power and fuel shortages.

### 1.3. Environment and Climate Change

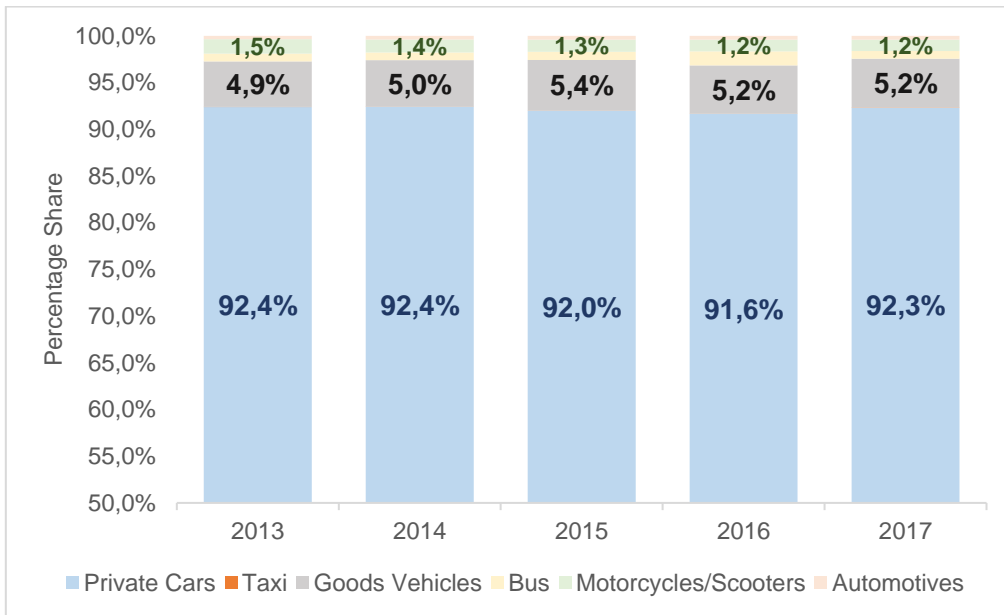
Brunei is one of the countries with the lowest emissions of carbon dioxide (CO<sub>2</sub>). Despite being negligible, emissions are projected to grow significantly as the economy grows in the next few years. Hence, being a signatory to the Paris Agreement, the country is committed to reduce its total emissions by 2035, via:

- Energy sector – reduction of total energy consumption by 63%;
- Land transport sector – reduction of CO<sub>2</sub> emissions from morning-peak-hour vehicle use by 40%; and
- Forestry sector – increase in total gazetted forest reserve area from 41% to 55%.

### 1.4. Current Road Transport Profile

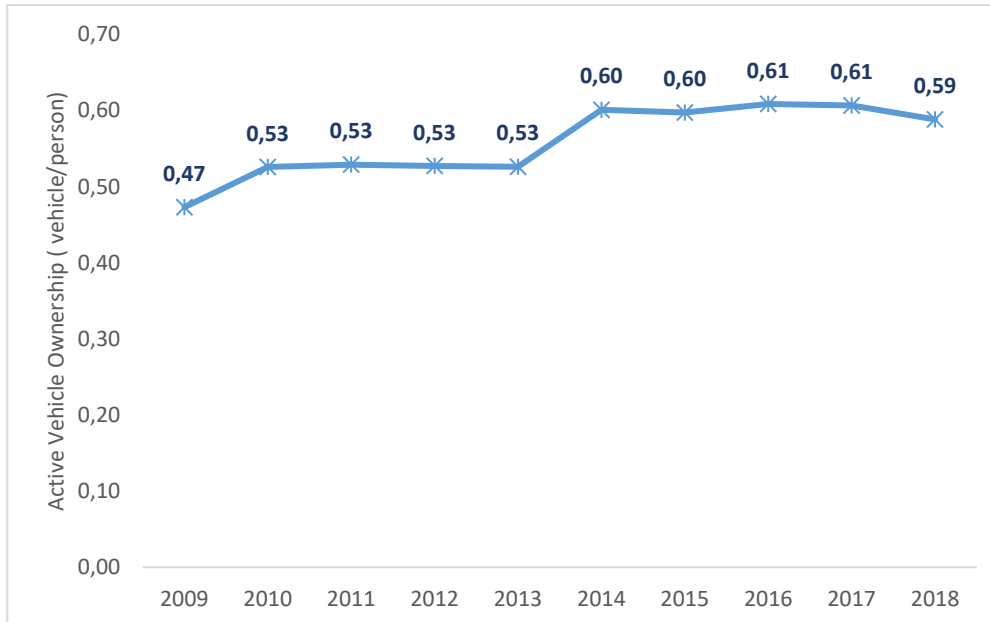
Road transport accounts for about half of the country's final energy consumption. Private vehicles constitute more than 90% of the total fleet, whilst other vehicle types account for the remaining 10% (Figure 1.3). Gasoline and diesel vehicles are dominant, accounting for about 78% and 21%, respectively. Statistics show that there were about 282,345 active vehicles for a population of 442,400 in 2018, equivalent to a vehicle ownership of about 0.59 active vehicles per person (Figure 1.4).

**Figure 1.43: Share of Active Vehicles in Brunei Darussalam**



Source: Ministry of Finance and Economy (2019).

**Figure 1.4: Active Vehicle Ownership in Brunei Darussalam**

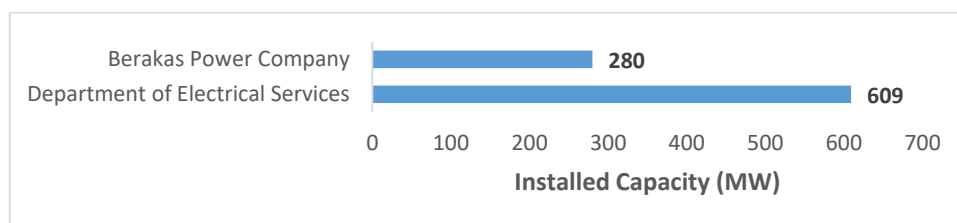


Source: Author (2019).

## 1.5. Current Power Sector Profile

About 98% of the electricity supplied in Brunei comes from natural gas, with a remaining 1% collectively coming from diesel and solar PV. The Department of Electrical Services (DES) – which owns four natural gas power stations (Gadong 1A, Gadong 2, Bukit Panggal, and Lumut) and a diesel power station (Belingus) – supplies about 58% of the national electricity requirements covering mainly residential areas. The Berakas Power Company (BPC) – which operates three main natural gas power stations (Berakas, Gadong 3, and Jerudong) – supplies the remaining 42% that covers most of the strategic and critical areas such as government offices, hospitals, an international airport, etc. In addition, the BPC recently installed OREgen™<sup>1</sup> waste heat recovery system at its Berakas station that recovers waste heat from gas turbines and converts it into 14 MW of extra net electricity without using fuel or water and does not produce additional emissions. The existing total capacity for public electricity generation stands at 889 MW, out of which 609 MW and 280 MW come from DES and BPC, respectively (Figure 1.5).

**Figure 1.5: Installed Capacity of National Utilities in Brunei Darussalam**



Source: Author (2020).

Most natural gas power plants in Brunei Darussalam in both DES and BPC systems have turbine models originating from General Electric. DES turbines are of types frame 5 and frame 6B, whilst aeroderivative LM2500 turbines make up the BPC system (Table 1.1).

---

<sup>1</sup> OREgen™ is a thermodynamic superheat cycle that recovers waste heat from gas turbine exhaust and converts it into electric energy. The thermodynamic cycle is the traditional Rankine cycle, using an organic fluid as working fluid. Heat from the turbine exhaust is transferred to a closed diathermic oil loop, which acts as thermal vector and is used to heat an organic fluid loop. This lower temperature heat is then converted into useful work that generates power.

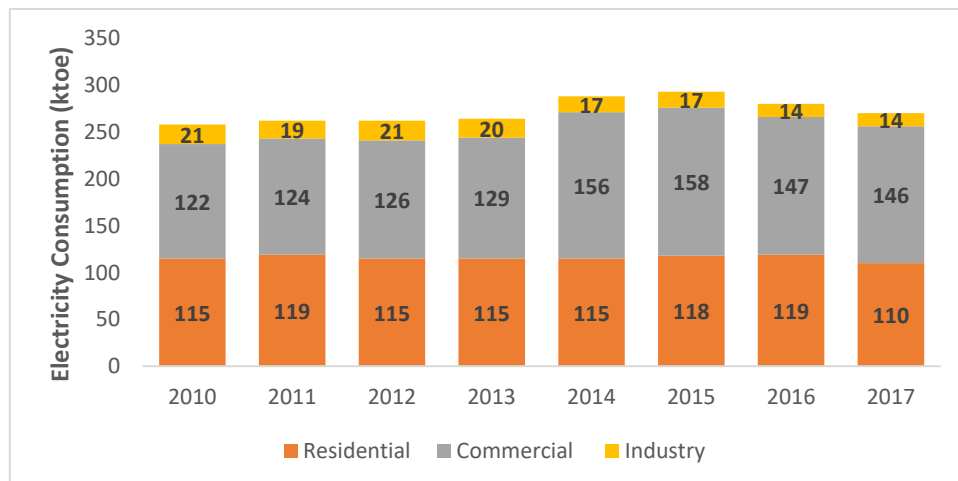
**Table 1.1: Gas Turbine Models of DES and BPC Systems**

Power Station	Gas Turbine Model
<i>Department of Electrical Services (DES)</i>	
Gadong 1A	GE Frame 6B
Gadong 2	GE Frame 6B
Bukit Panggal	GE Frame 6B
Lumut	GE Frame 5
<i>Berakas Power Company (BPC)</i>	
Berakas	GE LM2500
Gadong 3	GE LM2500
Jerudong	GE LM2500

Source: Power Systems Consultants Asia Pte. Ltd. (2016).

Figure 1.6 shows the electricity consumption across the three main demand sectors in Brunei. Between 2010 and 2017, total electricity demand grew at 0.7% per year, from 258 ktoe to 270 ktoe. The commercial sector constitutes the largest share in electricity consumption that increased from 122 ktoe to 146 ktoe, corresponding to an annual growth of 2.6%. This is followed by the residential sector at 43% share, despite registering a negative annual growth at -0.6%.

**Figure 1.6: Electricity Consumption across Demand Sectors in Brunei Darussalam**



Source: APEC Energy Working Group (2020).