

# Chapter 3

## Brunei Darussalam Country Report

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## CHAPTER 3

# Brunei Darussalam Country Report

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### 1. Background

Brunei Darussalam is a sovereign state located on the north-west coast of the island of Borneo in Southeast Asia. Its land area consists of two unconnected parts with a total area of 5,765 square kilometres on the island of Borneo. The country is divided into four administrative districts – Belait, Tutong, Brunei–Muara, and Temburong. The capital city, Bandar Seri Begawan, is located in the Brunei–Muara district where the country's government operations and major business activities take place. The total population of Brunei was approximately 399,800 as of 2012, of which one-third live in the capital city. Other major towns are the port town of Muara, the oil-producing town of Seria, and its neighbouring town, Kuala Belait. In Belait District, the Panaga area is home to large numbers of Europeans expatriates, due to Royal Dutch Shell and British Army housing.

In 2012, Brunei's gross domestic product (GDP) amounted to US\$10.3 billion at constant 2005 US\$, reflecting a GDP per capita of US\$25,000 in constant 2005 US\$. The energy sector was mainly driven by crude oil and LNG exporting activity, which has been the primary driver of overall economic activity of the country. It contributes more than 60 percent of the country's GDP and the sector accounts for about 90 percent of Brunei's total exports.

The country supports the implementation of energy security strategies such as diversification of energy sources and energy efficiency and conservation. The government is currently actively working to achieve the country's economic development target through strengthening upstream and downstream activities for oil and gas, including corresponding energy services, while exploring plans to diversify its energy mix.

### 2. Energy Supply and Consumption

Natural gas and oil remained the primary sources of energy for Brunei. The country's total primary energy supply was 2.9 Mtoe in 2012, with natural gas contributing the biggest share, of 74.2 percent, followed by oil at 25.8 percent, and a very small part was contributed by solar energy as one of the sources of electricity. As a major oil and gas exporter, Brunei exported 84.2 percent of its oil and gas production in 2012.

Brunei has a total installed capacity of 806.2 MW for power generation, which recorded output of 3.9 TWh in 2012. On top of oil and gas as sources of power, the country has a 1.2 MW solar photovoltaic plant. Likewise, as part of total installed capacity, auto producers' capacity reached a total of 108.9 MW and produced 406 GWh of electricity during the period.

**Table 3-1. Energy Supply and Consumption 2012 (Mtoe)**

| Supply and Consumption                | Oil         | Gas         | Electricity | Total       |
|---------------------------------------|-------------|-------------|-------------|-------------|
| <b>Primary Energy Supplies</b>        |             |             |             |             |
| Indigenous Production                 | 8.00        | 10.45       | -           | 18.45       |
| Net Import and Others                 | -7.26       | -8.28       | -           | -15.54      |
| <b>Total Primary Energy Supplies</b>  | <b>0.74</b> | <b>2.17</b> | -           | <b>2.91</b> |
| <b>Final Energy Consumption</b>       |             |             |             |             |
| Industrial Sector                     | 0.20        | -           | 0.02        | 0.22        |
| Transport Sector                      | 0.45        | -           | -           | 0.45        |
| Other Sectors                         | 0.04        | 0.02        | 0.26        | 0.32        |
| <b>Total Final Energy Consumption</b> | <b>0.69</b> | <b>0.02</b> | <b>0.28</b> | <b>0.99</b> |

Source: EDMC, 2015.

Total final energy consumption (TFEC) of Brunei in 2012 amounted to 0.98 Mtoe. The transport sector had the highest energy consumption at 0.5 Mtoe or 46.0 percent of the TFEC. 'Other' sectors, covering residential and commercial, consumed 30.4 percent of total energy used, and the industrial sector's energy demand accounted for 22.2 percent in the TFEC. In terms of energy demand by fuel type, oil accounted for 69.7 percent of final consumption, followed by electricity and natural gas at 28.3 percent and 2.0 percent, respectively (Table 3-1).

### 3. Energy Policies

#### 3.1. Supply

Brunei's energy sector is entering an era of new challenges as the country needs to boost upstream production by maximising the potential of its matured fields and venturing into further exploration and development activities. Aligned with the National Vision known as Wawasan Brunei 2035, there is a need to go further in downstream development to maximise the added value creation potential of its upstream assets. In this regard, Brunei has devised the following strategies to strengthen and improve upstream and downstream activities for oil and gas:

1. Sustaining a reserve replacement ratio greater than 1 to ensure Brunei will continue to benefit from oil and gas production in the long term;
2. Improving oil and gas production to more than 650 kboe (kilo barrel of oil equivalent) per day in 2035 and continuously monitoring not only internal but also external variables that could require target refinement;
3. Raising revenue from domestic downstream industries to reach BN\$5 billion in 2035 through the development of energy related downstream sub-industries, which cover refinery, chemical, and petrochemical plants.

In addition to the energy supply targets, Brunei has also started to develop renewable energy resources in the country that cover solar and waste-to-energy projects. To support the development of renewable energy sources, the government will implement renewable energy policy and regulatory frameworks to stimulate not only public but also private sector investment in renewable energy development.

### **3.2. Consumption**

Brunei is actively working on energy efficiency and conservation towards a 45 percent energy intensity reduction goal by 2035. In achieving the energy intensity target, relevant government agencies, industry, and other energy stakeholders are collaborating in evaluating legislative, financial, and fiscal policy measures to promote energy efficiency and low-energy intensive industries. Industry's role includes the identification of technical levers that may lead to a reduction of energy usage over time. Other energy stakeholders, such as individuals and households, may shift their consumption behaviour towards the use of more energy-efficient appliances and equipment and take energy efficiency and conservation measures.

## **4. Outlook Result**

### **4.1. Total Final Energy Consumption (TFEC)**

#### ***Business-As-Usual (BAU) Scenario***

Energy consumption of Brunei has been increasing over the years along with an increase in the country's economic activities. The TFEC increased by 4.8 percent from 0.35 Mtoe in 1990 to 0.98 Mtoe in 2012. Under the BAU scenario, the projected average annual increase of the TFEC is projected to be 2.9 percent from its 2012 level, to reach 1.88 Mtoe in 2035. The projection is linked to a 4.9 percent annual average GDP growth rate in the model. The high rate of GDP growth is supported by the country's aspiration to strengthen its economic structure towards the development of the commercial and service sectors, along with the industrial sector. The highest rate of increase in TFEC by sector is forecast to come from the industrial sector, at 4.8 percent per year. Aggregate demand of the residential and commercial sectors is estimated to increase by 2.7 percent per year, which corresponds to

projected population growth of 1.6 percent per year for the period 2012 to 2035 and is also in line with a projected increase in economic activities of the commercial sector. The transport and non-energy sectors are projected to increase by 1.8 percent and 1.6 percent, respectively.

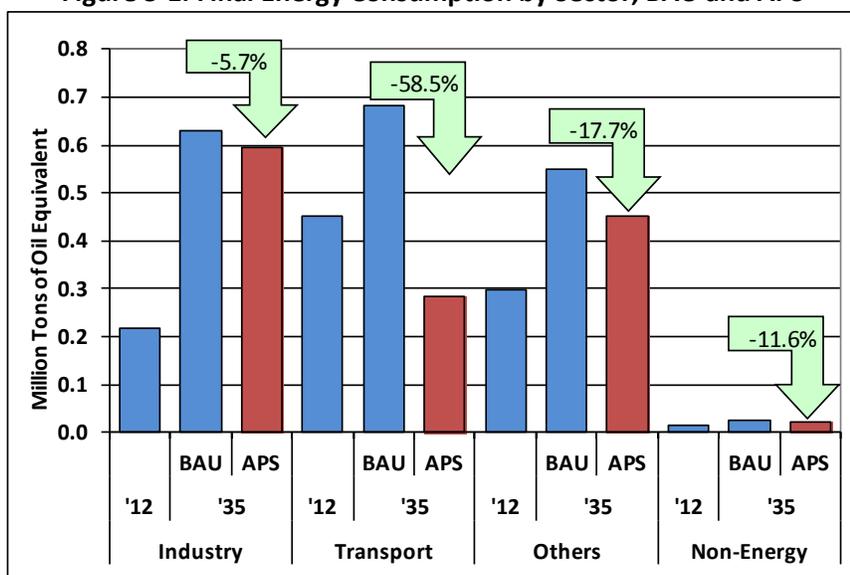
In 2035, the share of oil in the TFEC is forecast at 69.5 percent and will be consumed mainly by the transport sector. The TFEC for oil in 2012 was 0.68 Mtoe and is projected to increase to 1.31 Mtoe in 2035. Demand for electricity is expected to increase by an average 2.9 percent per year from 0.28 Mtoe in 2012 to 0.53 Mtoe in 2035.

### Alternative Policy Scenario (APS)

Under the Alternative Policy Scenario (APS), the goal is to reduce energy intensity by 45.0 by 2035 from the 2005 level, and average annual TFEC will increase moderately by 1.4 percent, or from 0.98 Mtoe in 2012 to 1.35 Mtoe in 2035. At the end of the planning period, the industrial sector's share TFEC will be the highest, at 44.1 percent. The combined share of 'other' sectors such as residential and commercial of TFEC is projected at 33.4 percent in 2035, and the transport sector's TFEC will account for 21.0 percent.

A future improvement in vehicle efficiency will be the result of fuel economy regulation. This could be the main factor behind an expected decline in the growth rate of demand in the transport sector of 2.0 percent per year throughout the planning period. Referring to the result of the forecasting model for energy outlook, the TFEC under APS will fall by 28.4 percent compared with the BAU level. The transport sector will contribute the biggest energy savings with a decrease in its demand by 58.5 percent, followed by a 17.7 percent reduction for 'other' sectors, and a 5.7 percent decrease for the industrial sector.

Figure 3-1. Final Energy Consumption by Sector, BAU and APS



Source: Author's calculation

BAU = Business-as-Usual; APS = Alternative Policy Scenario.

## 4.2. Total Primary Energy Supply (TPES)

### *Business-As-Usual Scenario*

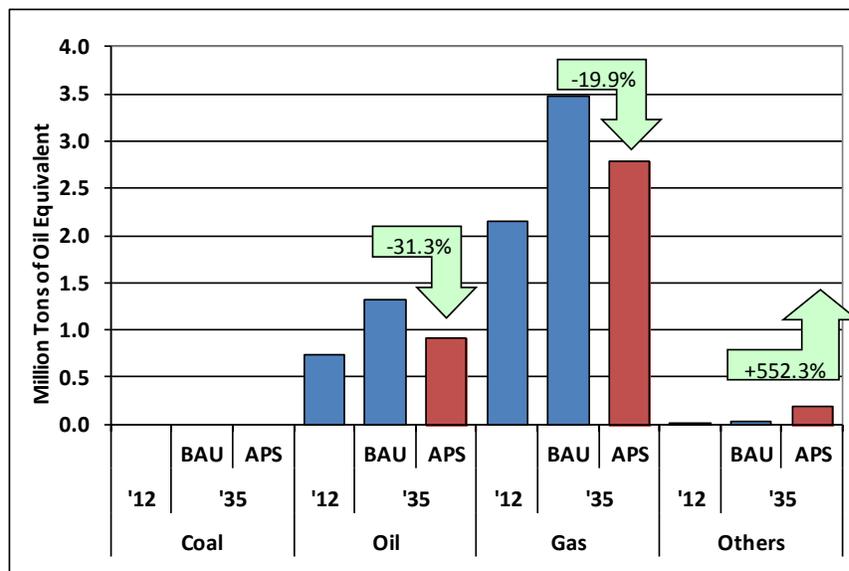
Based on the model projection for BAU, Total Primary Energy Supply (TPES) will increase by 2.2 percent per year, from 2.90 Mtoe in 2012 to 4.82 Mtoe in 2035.

TPES for oil will grow by 2.5 percent per year, from 0.8 Mtoe in 2012 to 1.3 Mtoe in 2035, and natural gas is expected to increase by 2.1 percent per year, from 2.2 Mtoe to 3.5 Mtoe. The figures show that Brunei will continue to be a net exporter of energy in the future. The energy balance table for 2035 indicates that Brunei will be exporting 20.6 Mtoe of natural gas and oil or 84.5 percent of total oil and gas production.

### *Alternative Policy Scenario*

A significant decrease in TPES for oil and natural gas is projected for the APS compared with the BAU scenario in 2035. Oil supply under APS is projected to be 31.3 percent lower than the BAU level, and natural gas supply under APS 19.9 percent lower. But renewable energy is significantly higher under the APS, particularly from solar and waste-to-energy sources, as shown in Figure 3-2.

Figure 3-2. Primary Energy Supply by Source, BAU and APS



Source: Author's calculation

BAU = Business-as-Usual; APS = Alternative Policy Scenario.

## 4.3. Power Generation

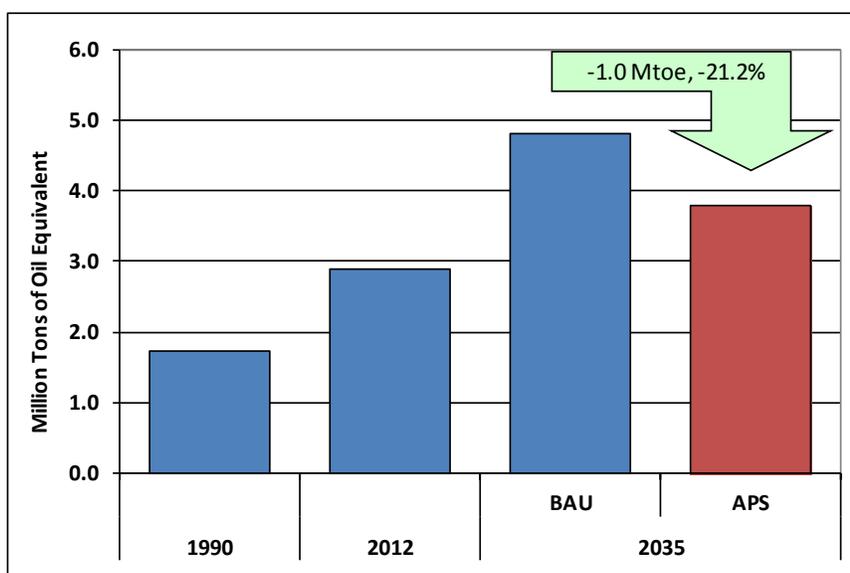
Power generation capacity for public utilities is dominated by natural gas power plants in Brunei. Of the total installed capacity of 806.2 MW, 1.2 MW is Solar PV and 12.0 MW is

diesel power plants. Based on the model’s projection, about 7.4 TWh of electricity will be generated in 2035, which means an average annual increase of 2.8 percent over the planning period. Under the BAU scenario, diesel power plants will have been decommissioned by 2018. In future, all new thermal power plants will be use Combined Cycle Gas Turbine technology with an efficiency improvement of 45 percent. Solar PV power plant will be maintained at 1.2 MW capacity throughout the planning period and a 10 MW Municipal Waste-to-Energy plant will be developed as additional capacity.

#### 4.4. Projected Energy Savings

The energy savings potential, derived from the difference between primary energy consumption in the BAU scenario and the APS at the end of the planning period, is projected at 21.2 percent or 1.0 Mtoe. This could be achieved through the implementation of legislative measures on energy efficiency and conservation as well as the development of renewable energy in Brunei (Figure 3-3).

**Figure 3-3. Reduction of Primary Energy Consumption, BAU and APS**



Source: Author’s calculation  
 BAU = Business-as-Usual; APS = Alternative Policy Scenario.

#### 4.5. Carbon Dioxide (CO<sub>2</sub>) Emissions

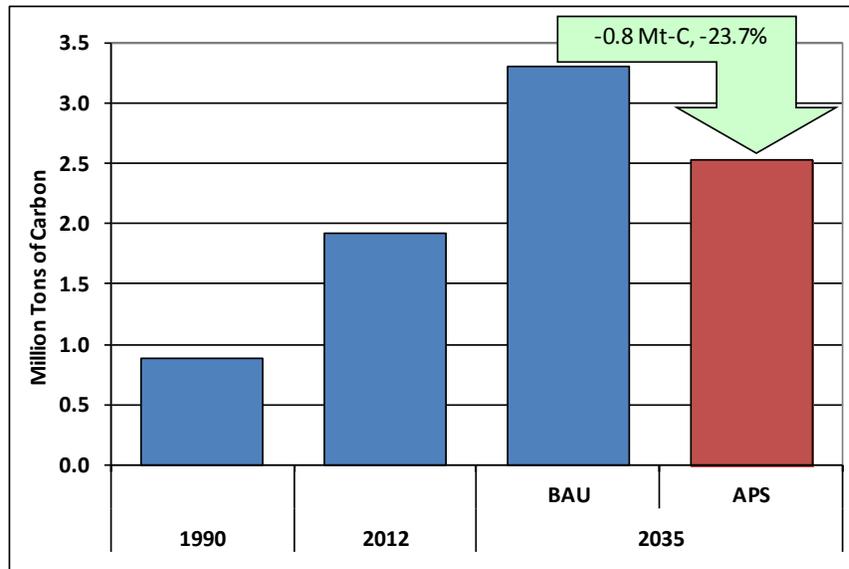
##### *Business-As-Usual*

The percentage increase in the CO<sub>2</sub> emission correlates with the increase of the TPES. This is expected because the energy mix of Brunei is 99 percent dependent on fossil fuel. In 2012, the level of CO<sub>2</sub> emission from the energy sector’s activity reached 1.9 Mt-C. This level will increase by an average 2.3 percent per year to reach 3.3 Mt-C in 2035.

### Alternative Policy Scenario

In the APS, CO<sub>2</sub> emission is projected at a lower level, of 2.5 Mt-C, than under the BAU scenario at the end of the planning period. The decrease in CO<sub>2</sub> emission by 23.7 percent from the BAU scenario to APS could be attained through greater energy efficiency and use of renewable energy.

Figure 3-4. CO<sub>2</sub> Emission from Energy Consumption, BAU and APS



Source: Author's calculation

BAU = Business-as-Usual; APS = Alternative Policy Scenario.

## 5. Findings and Policy Implications

### 5.1. Findings

Achieving the objectives of the National Vision – Wawasan Brunei 2035 – will require a significant increase in the activity level of all economic sectors, including the energy sector. Despite the efforts to focus on energy efficiency and sustainability measures, demand for energy will continue to grow for the next 20 years and fossil fuels will remain the primary source of energy to meet future requirements. The results of the model used in the study show that the improvement in energy efficiency and the development of renewable energy are critical to the reduction of energy demand to realise the country's significant energy savings potential.

### 5.2. Policy Implications

The projected increase in final energy consumption requires the government to work in close coordination with relevant energy stakeholders to make concerted efforts to continuously promote energy efficiency and conservation. This should be done in collaboration with concerned government and private sector, industries and other energy stakeholders, including individuals.

To realise this, the government should pursue the following objectives:

1. Introduce a policy framework on Public Private Partnerships to accommodate collaboration with the private sector to accelerate the development of renewable energy resources in Brunei.
2. Replace simple cycle power plant with a more efficient combined cycle or cogeneration plant, and put in place an appropriate maintenance programme. This could improve overall power generation efficiency by more than 45 percent by 2020.
3. Evaluate the feasibility of altering the tariff structure to promote desired consumption behaviour and, if appropriate, apply the current progressive electricity tariff of the residential sector to other sectors.
4. Develop a National Standard and Labelling Order for electrical appliances with a view to restricting imports of non-efficient electrical appliances and products.
5. Ensure compliance with EEC Building Guidelines for Non-Residential Buildings that was developed to establish energy efficiency and conservation standards and a regulatory mechanism for buildings in Brunei.
6. Develop a policy initiative for the implementation of Fuel Economy Regulation. To support this policy, hybrid cars, fuel-efficient vehicles, and electric vehicles will have to be introduced.
7. Conduct awareness programmes at all community levels.