Chapter 16

Thailand Country Report

Supit Padperm
Energy Information System Development Division, Energy Policy and Planning Office (EPPO), Ministry of Energy (MOEN), Thailand

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CHAPTER 16

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1. Background

Thailand is in the middle of the South East Asian mainland, with the Pacific Ocean on the south-east coast and the Indian Ocean on the south-west coast. Its land area is approximately 513,115 square kilometres, with great plains in the centre, mountainous areas up north and highlands in the north-east. It has a small economy, with GDP in 2010 of around US$187.5 billion (in 2000 US$ terms). In 2010, the population was 67.3 million and income per capita was around US$ 2,800.

Thailand is an energy importer, especially crude oil, because of very limited domestic resources. Thailand's indigenous energy resources include natural gas, coal (only lignite) and biomass. In 2010, proven reserves were 0.2 billion barrels (32 million cubic metres) of oil, 10.6 trillion cubic feet (0.3 trillion cubic metres) of natural gas and 1,181 million tonnes of lignite.

Thailand's total primary energy supply (TPES) was 112.2 Mtoe in 2010. Oil accounted for the largest share at around 33.6 percent, followed by natural gas (27.5 percent), coal (13.3 percent). Others accounted for the remainder (25.6 percent). In 2010, net imports of energy accounted for 56.1 percent of TPES. Due to very limited indigenous oil resources, Thailand imported around 95.5 percent of its crude oil and most of its bituminous coal. Although Thailand produces large quantities of natural gas, about 19.6 percent of its use was imported from Myanmar.

In Thailand, natural gas is used as a major energy source for power generation. In 2010, primary natural gas supply was 39.1 Mtoe, around 80.4 percent was from

domestic supply with the rest imported from neighbouring countries. Coal was mainly consumed for power generation and by industry. In addition, it was also heavily used in cement and paper production.

Thailand has 31GW of installed electricity generation capacity and power generation was about 147.0TWh in 2010. The majority of Thailand's power is generation using thermal sources (coal, natural gas and oil), accounting for 96.3 percent of generation, followed by hydro (2.0 percent) and geothermal, solar, small hydro and biomass making up the remainder.

2. Modelling Assumptions

As a result of economic crises in 1997 and 2008, GDP growth during 1990 to 2010 was a moderate 4.4 percent per year. Thailand's GDP is assumed to grow at slightly stronger average rate of 3.9 percent per year between 2010 and 2035. Population growth is also projected to be reasonably slow at around 0.3 percent per year between 2010 and 2035, compared with average growth of about 0.9 percent per year between 1990 and 2010.

Coal and natural gas are projected to be the largest energy sources for power generation. Conversely, the shares of fuel-oil and diesel power plants are projected to decline. Nuclear power and renewable energy are projected to increase their shares in the power generation mix.

Thailand's energy saving goals is expected to be achieved through the implementation of energy efficiency programs in all sectors. In the industrial sector, improvements in technology development in manufacturing processes should help improve energy efficiency. In the residential and commercial (other) sector, large energy savings are projected, driven by programs to promote public awareness of energy efficiency and energy efficiency labelling. In the transportation sector, further development in the Bangkok metro area railway network will contribute to energy savings. Significant improvements in energy efficiency in passenger vehicles are also expected to be achieved in line with new developments in car technologies and the introduction of the Eco car program.

Government policies will continue to encourage the increased use of alternative fuels, such as nuclear power and biofuels. Reductions in the growth of CO_2 emissions are also expected to be achieved through the increased adoption of more energy efficient and lower emissions technologies. In particular, in the APS, nuclear power and renewable energy sources are expected to help reduce CO_2 emissions from electricity generation. Gasohol and biodiesel as oil alternatives are also expected to help curb CO_2 emissions from transportation.

3. Outlook Results

3.1. Business-as-Usual (BAU) Scenario

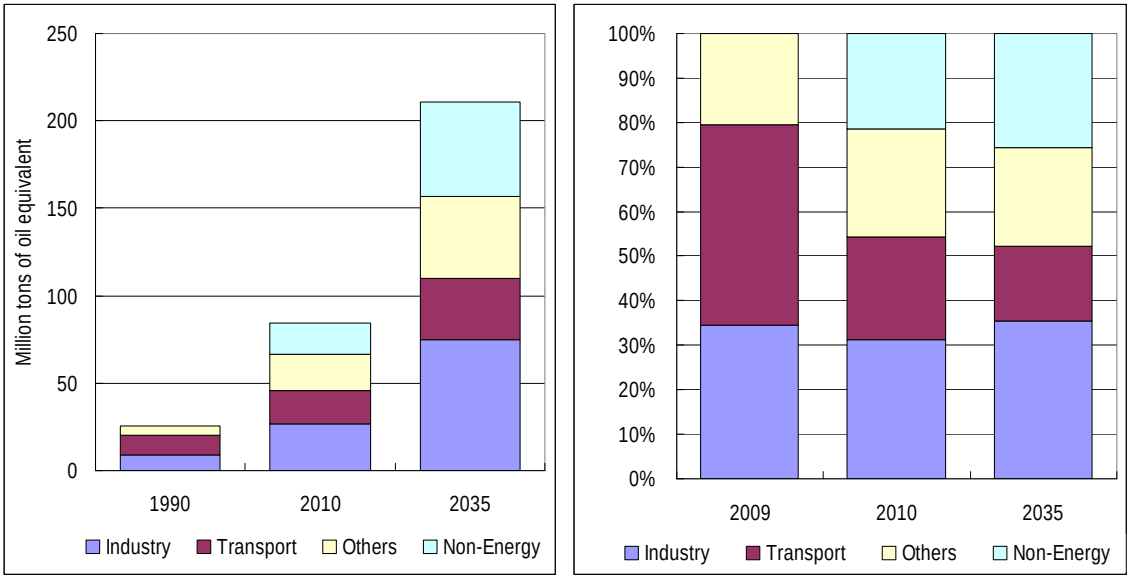
Total Final Energy Consumption

Between 1990 and 2010, Thailand's final energy consumption grew at a robust rate of 6.2 percent per year from 25.4 Mtoe in 1990 to 84.6 Mtoe in 2010. Given moderate economic growth and low growth rate in population, final energy consumption is projected to grow at a moderate rate of around 3.7 percent per year between 2010 and 2035.

The transportation sector was the largest consumer in 1990, using 11.4 Mtoe. While consumption in the sector increased only 2.7 percent a year between 1990 and 2010, the share of transport declined from 45.0 percent in 1990 to 23.0 percent in 2010. The industry sector is projected to remain the largest consumer, accounting for 35.4 percent of final energy demand in 2035. In contrast, the transportation sector will account for the smallest proportion of final energy demand (16.9 percent) in 2035, continuing the declining share observed since 1990.

Strong growth in energy consumption in the industrial sector of about 5.7 percent per year between 1990 and 2010 increased final energy use in the sector from 8.7 Mtoe in 1990 to 26.5 Mtoe in 2010. By 2010, the industrial sector had overtaken transport as the largest consumer, accounting for around 31.3 percent of final energy consumption.

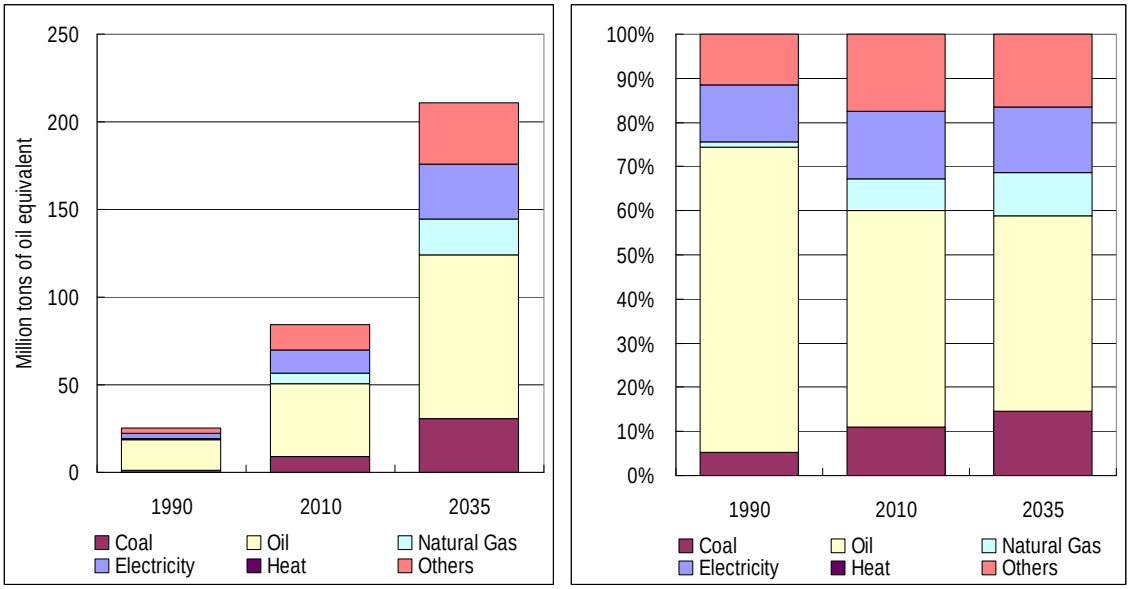
Figure 16-1: Final Energy Demand by Sector



Oil has been the dominant energy source in final energy consumption accounting for 41.7 Mtoe or a 49.3 percent share in 2010. Electricity was the second largest energy source, accounting for 12.8 Mtoe or a 15.2 percent share in 2010.

Oil is expected to remain the largest final energy source throughout the projection period although oil and electricity shares are projected to decline from 49.2 and 15.2 percent in 2010 to 44.2 and 14.8 percent in 2035 respectively (Figure 16-2). In 2035, the shares of coal and natural gas in final energy consumption are projected to increase to 14.6 percent and 9.9 percent, respectively.

Figure 16-2: Final Energy Consumption by Sector



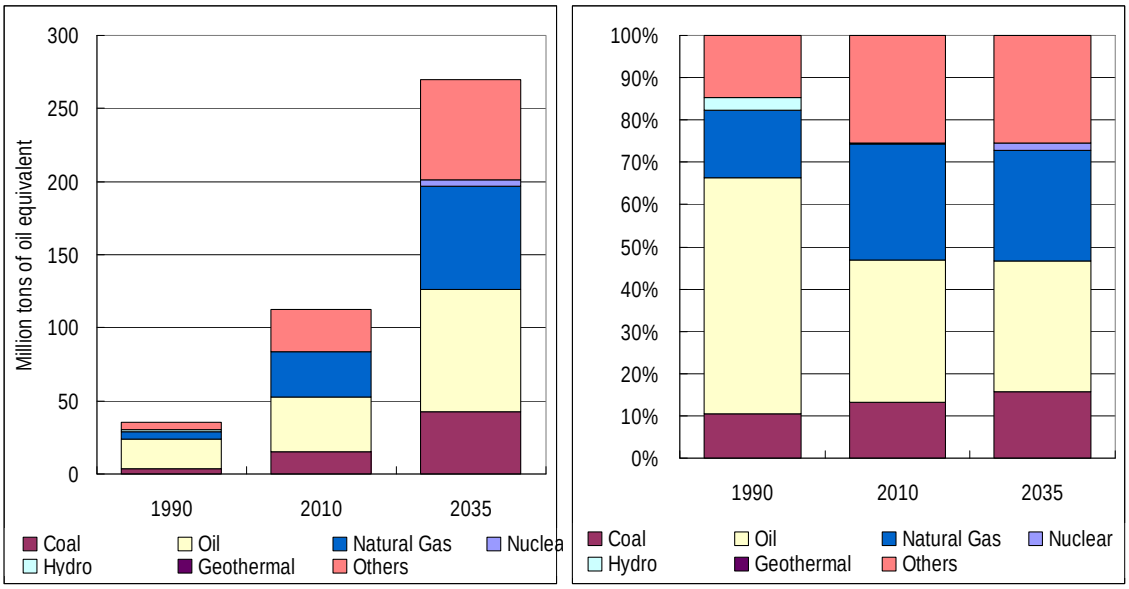
Total Primary Energy Demand

Primary energy demand grew at an average annual rate of 5.9 percent from 35.4 Mtoe in 1990 to 112.2 Mtoe in 2010, driven largely by fast economic development between 1990 and 1996. This growth in primary energy consumption was achieved despite the severe economic crisis in 1997-1998 and the world economic crisis in 2008. In 2010, the major sources of primary energy were oil, natural gas and coal with shares of 33.6 percent (37.7 Mtoe), 27.5 percent (30.9 Mtoe) and 14.9 percent (13.3 Mtoe), respectively. Although oil remained the largest source between 1990 and 2010, its share in primary energy demand shrank from 55.6 percent in 1990 to 33.6 percent in 2010. Natural gas, which is mainly consumed in the power generation sector, became an important source of energy with its share in primary energy demand increasing significantly from 16.0 percent in 1990 to 27.5 percent in 2010. The share of hydropower declined from 3.1 percent in 1990 to only 0.2 percent in 2010.

In the BAU scenario, primary energy demand is projected to grow at about 3.6 percent per year from 2010 to 2035, reaching 269.8 Mtoe in 2035 (Figure 16-3). The highest average annual growth rate is expected in coal (4.3 percent), with consumption expected to reach 42.3 Mtoe in 2035. Following the very strong

average annual growth in natural gas of 8.8 percent between 1990 and 2010, growth is expected to slow to about 3.4 percent per year between 2010 and 2035. It is recognized that future growth in natural gas consumption in power generation may be limited, with the potential for nuclear and other alternative fuels to be used instead in line with government plans.

Figure 16-3: Primary Energy Demand by Source, BAU and APS



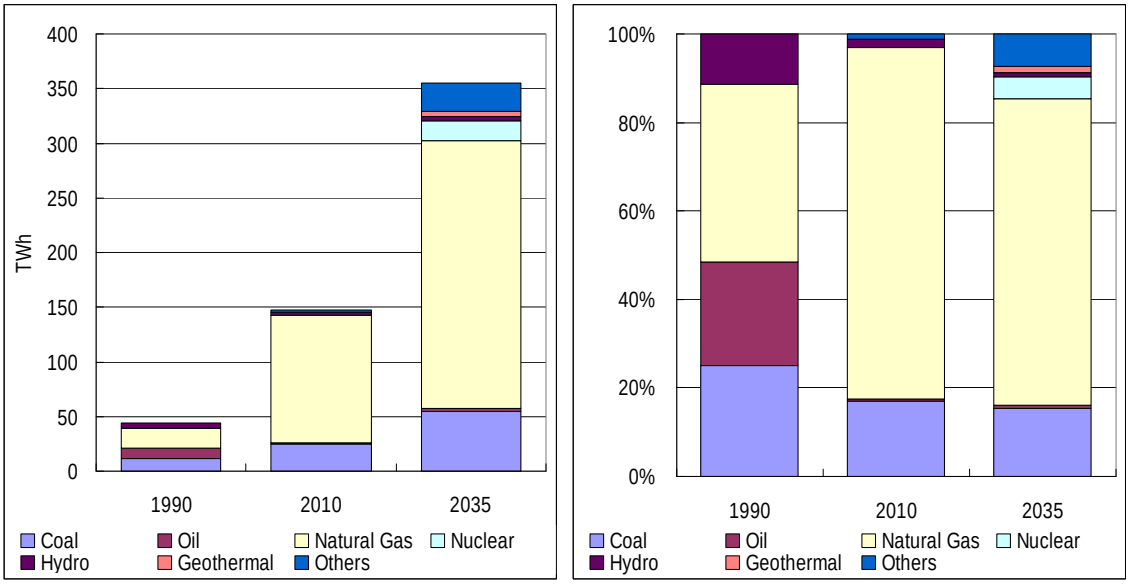
Power Generation

In 1990, total power generation was 44.2 TWh and increased to 147.0 TWh in 2010 with an average growth rate of 6.2 percent per year. From the Figure 16-4, natural gas has been a major fuel for power generation since 1990, at least. Natural gas in power generation grew with robust rate at around 9.9 percent per annum from 17.8 TWh and a share of 40.2 percent in 1990 to 116.6 TWh and a share of 79.3 percent in 2010. Coal had the second largest share of 25.0 percent in 1990 but its share shrank some to 17.0 percent in 2010. Oil became the smallest source in power generation with only 0.8 TWh in 2010.

In the BAU, power generation is expected to grow moderately around 3.6 percent per annum from 2010 till 2035 and will reach 355.0 TWh in 2035. In 2035, natural gas will remain the dominant fuel in power generation with the highest share

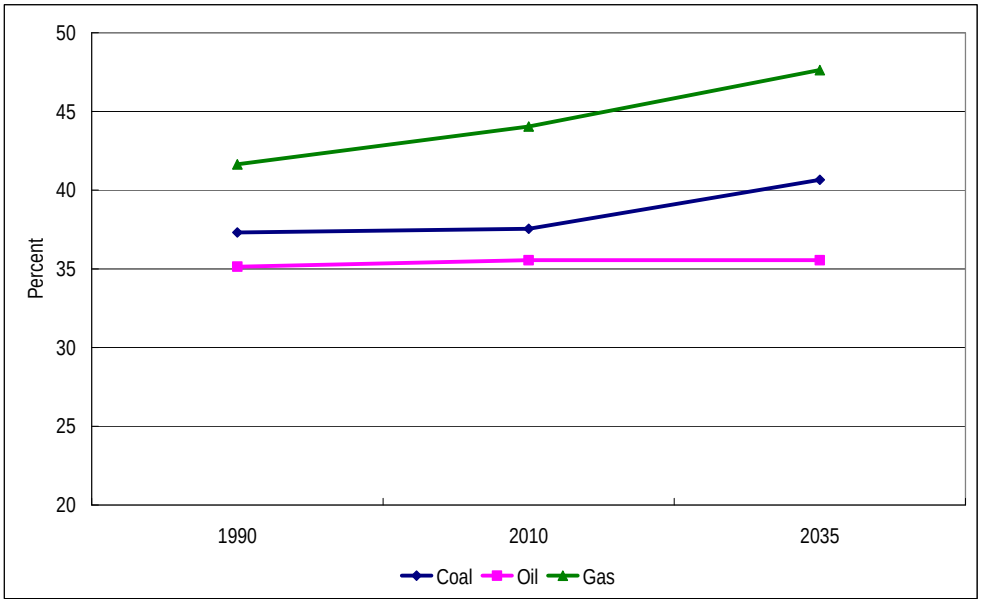
of about 69.2 percent or 245.5 TWh. Coal also remains the second largest with 15.4 percent, or 54.8 TWh. Nuclear will start use as a new energy in 2026, and in 2035 it is expected to take a share of only around 4.9 percent or 17.5 TWh. Hydro has had no growth since 1990, and will only grow at 1.0 percent to 2035 on the average.

Figure 16-4: Power Generation Mix in Thailand, BAU



Thermal efficiency of power generation from natural gas will continue to have the highest thermal efficiency from 35.2 percent in 1990 and 44.0 percent in 2010 and further increasing to 47.6 percent in 2035. Coal efficiency did not change much from 1990 till 2010 but change significantly by 2035. Thermal efficiency of oil power plants will remain at almost the same level as in 2010 (Figure 16-5).

Figure 16-5: Thermal Efficiency of Power Generation in Thailand, BAU

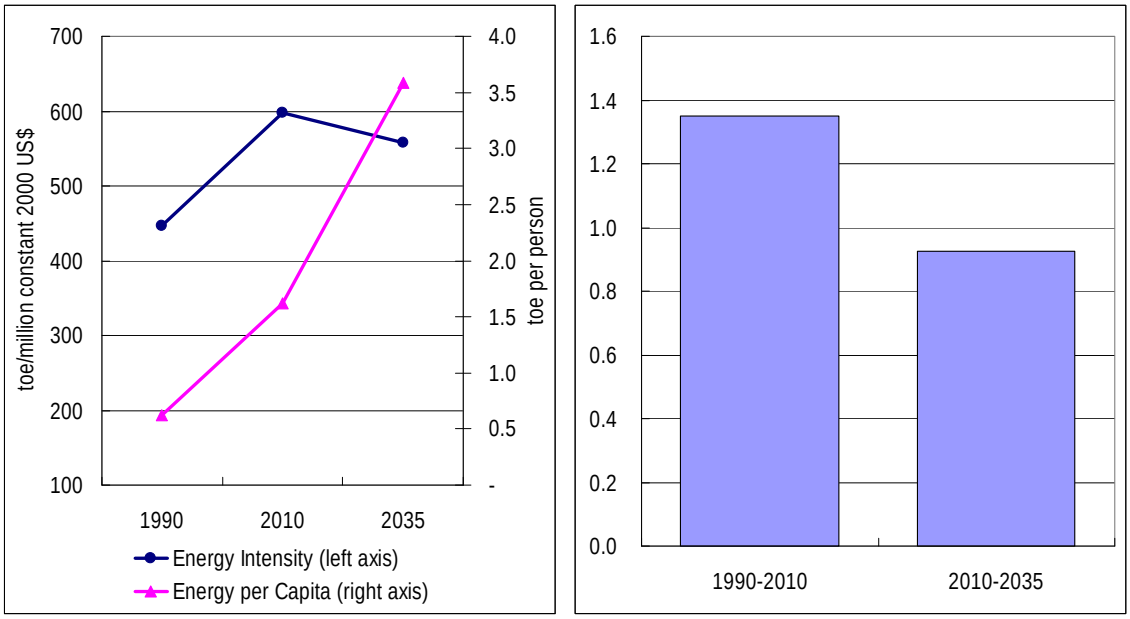


Energy Intensity, Energy per Capita and Energy Elasticity

Energy intensity reached 598 toe/million constant 2000 US$ in 2010. In BAU case, energy intensity is expected to gradually decline and in 2035 will be 557 toe/million constant 2000 US$. On the other hand, energy per capita will move upward from around 1.6 toe per person in 2010 3.7 toe per person in 2035.

Energy elasticity between 1990 and 2010 was above 1.0, or around 1.4. It means that the growth in energy consumption outpace the growth in GDP. However, there will be a great change in energy elasticity in the future. Unlike in the past, even in the BAU, energy elasticity could be 0.9. It means that, the growth in energy consumption will be growing at a slower pace than GDP growth.

Figure 16-6: Energy Intensity, Energy Per Capita and Energy Elasticity

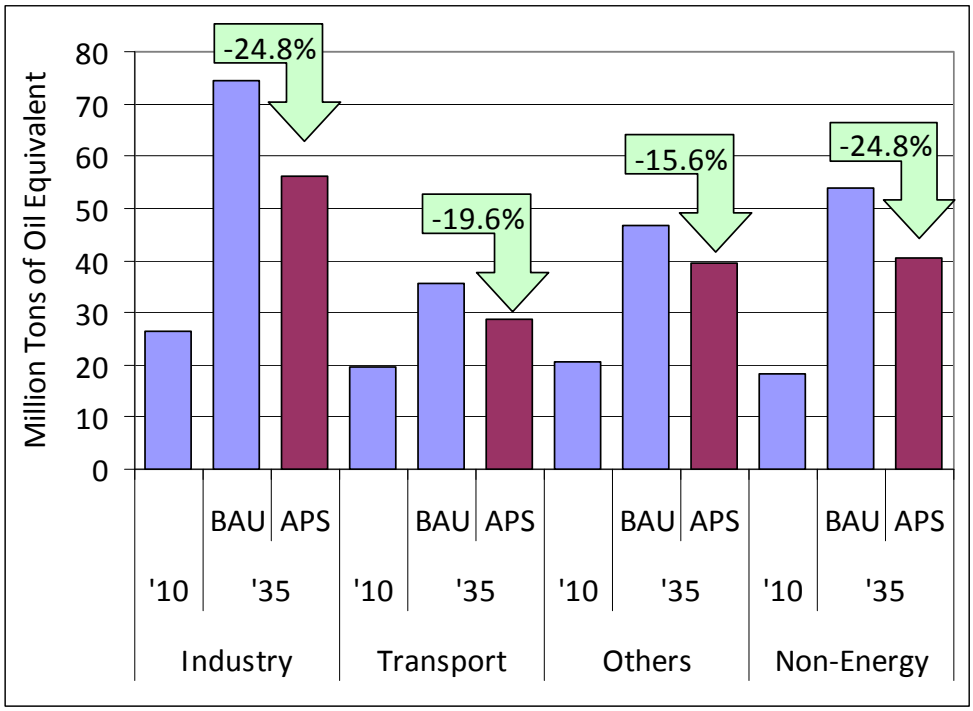


3.2. Energy Saving and CO_2 Emission Reduction Potential

Final Energy Demand

In the APS, final energy demand is projected to grow at 2.7 percent per year, from 84.6 Mtoe in 2010 to 164.7 Mtoe in 2035, much slower than the BAU average annual growth rate of 3.7 percent. The majority of energy savings will be achieved through energy efficiency improvement programs implemented in the industry and transportation sectors. Improvements will also be achieved in other sectors as shown in Figure 16-7.

Figure 16-7: Final Energy Consumption by Sector, BAU and APS

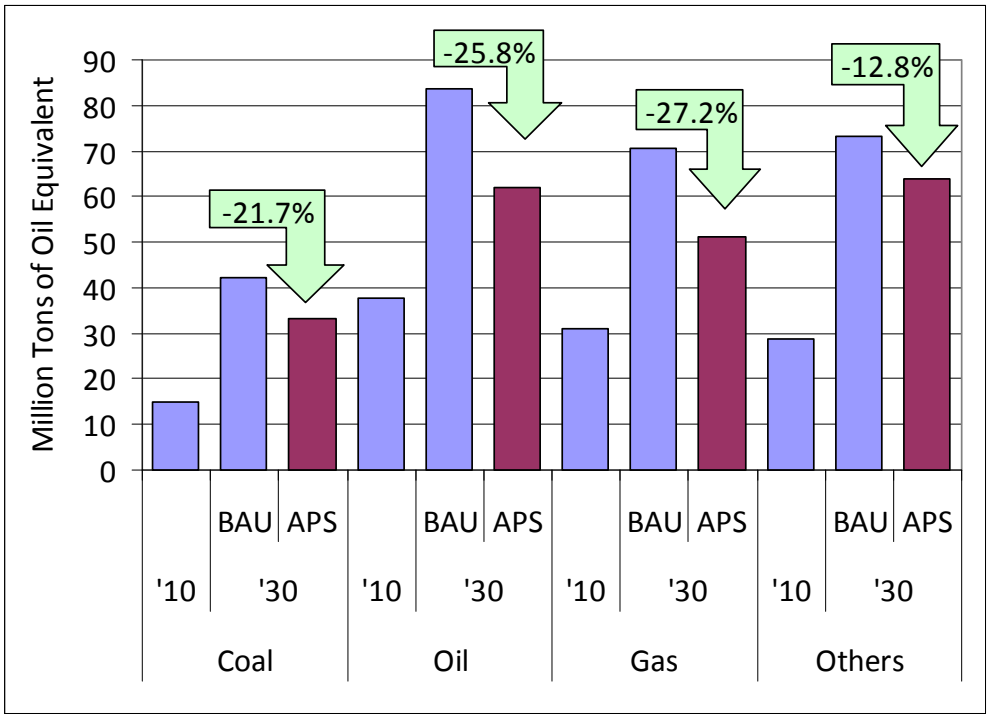


Primary Energy Demand

In the APS, growth in primary energy demand is projected to be much slower than in the BAU scenario, increasing at 2.5 percent per year (compared with 3.6 percent in BAU) to reach 210.5 Mtoe in 2035. Primary energy demand is expected to be about 22.0 percent lower in the APS than in the BAU scenario in 2035 – an energy saving of about 59.3 Mtoe.

Oil is also projected to increase at an annual average rate of 2.0 percent from 37.7 Mtoe in 2010 to 62.1 Mtoe in 2035 and natural gas use is projected to increase at an annual average rate of 2.1 percent from 30.9 Mtoe in 2010 to 51.3 Mtoe in 2035. The lower growth rates, relative to the BAU scenario, are mainly achieved through energy efficiency and conservation measures on the demand side. The differences in the projections between the two scenarios are shown in Figure 16-8.

Figure 16-8: Primary Energy Demand by Source, BAU and APS

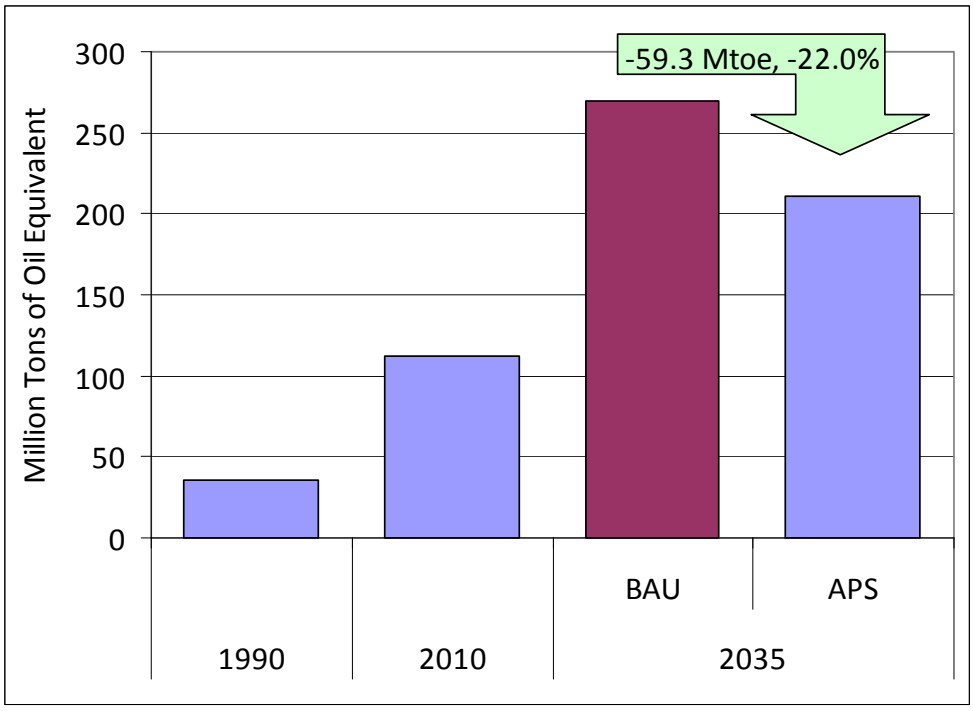


Projected Energy Savings

The difference between primary energy demand in the BAU scenario and the APS in 2035 is 59.3 Mtoe (Figure 16-9). This represents the potential energy savings that could be achieved if energy efficiency and conservation goals and action plans were implemented. This energy saving is equivalent to about 52.9 percent of Thailand's primary energy demand in 2010. Oil will contribute the largest energy savings (21.5 Mtoe) followed by natural gas (19.3 Mtoe).

In final energy consumption, the savings in the APS, relative to the BAU scenario in 2035, could reach 46.1 Mtoe. The largest savings are expected to be achieved in the industry sector at 18.5 Mtoe. Both the transportation and other sectors are expected to achieve energy savings of 14.4 Mtoe.

Figure 16-9: Total Primary Energy Demand, BAU and APS

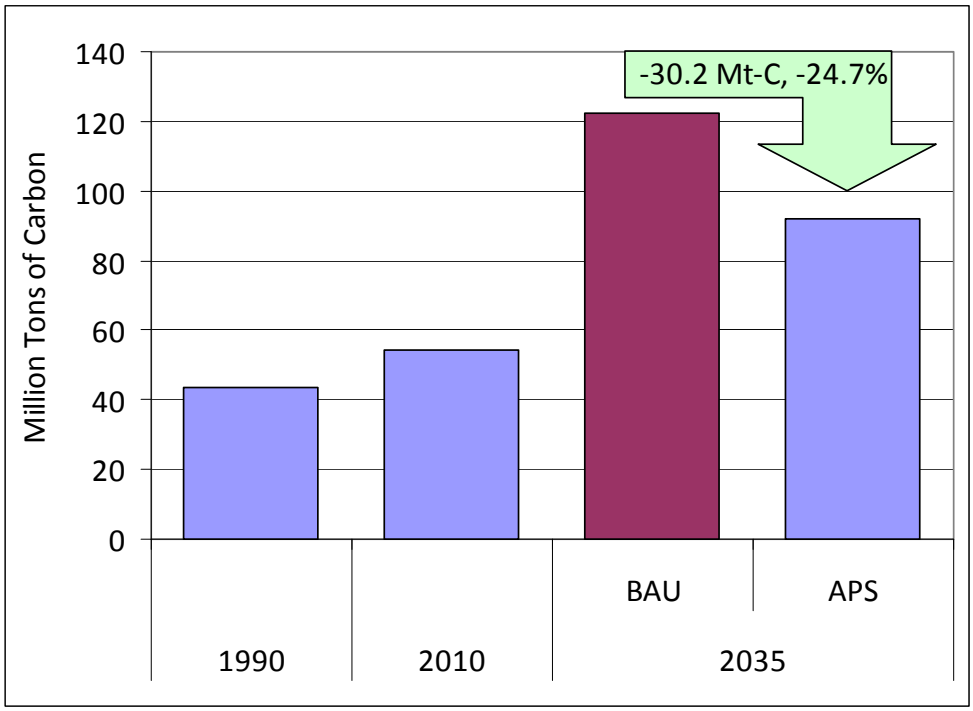


3.3 CO_2 Emissions from Energy Consumption

CO_2 emissions from energy consumption are projected to increase by 3.3 percent per year on average from 54.5 Mt-C in 2010 to 122.2 Mt-C in 2035 under the BAU scenario. Thailand plans to promote the use of less carbon intensive energy sources such as nuclear and renewable fuels.

Under the APS, the average annual growth in CO_2 emissions from 2010 to 2035 is projected to be about 2.1 percent, with emissions of 92.0 Mt-C in 2035. The reduction in CO_2 emissions between the APS and BAU scenario highlights the range of benefits that can be achieved through energy efficiency improvements and savings via action plans (Figure 16-10).

Figure 16-10: CO_2 Emissions from Energy Consumption, BAU and APS



4. Implications and Policy Recommendations

Strong economic growth prior to the Asian Financial Crisis in 1997 contributed to relatively high energy intensity in Thailand between 1990 and 2010. However, the energy intensity of the economy has declined since it recovered from the 1997 crisis. Furthermore, Thailand's energy efficiency programs in a wide range of areas (including industry, transportation and residential sectors), and high world oil prices, are expected to contribute to a continued decline in the energy intensity of the Thai economy.

Improving energy efficiency will also help Thailand (which is an oil importer), to address the challenges posed by high world oil prices. Thailand is committed to reducing the intensity of energy consumption, especially in oil, and is also looking for more sustainable energy sources and environmentally friendly fuels. It is recognised that the more Thailand saves energy, the less sensitive it will be to fluctuations in world energy prices and supply. It is wise and rational to save more and more sustainable. Furthermore, Thailand realises that energy savings is

important and should put more effort on it.

Although Thailand has an alternative policy for future 20 years, oil will remain a major energy source for this economy. Oil is one of the most sensitive energy in terms of price and its security. Thailand probably focuses more on oil saving in the future to less depend on it. Furthermore, energy use in transportation sector will become the smallest in the future, compared to the rest. Nonetheless, this sector is also less productivity in the economy than the others. It means that it consumes more energy, but produces less. The more saving effort in Transport sector, the more benefit to economy as a whole will be.