Chapter 16

Thailand Country Report

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September 2015

This chapter should be cited as
Padrem, S. (2015), 'Thailand Country Report', in Kimura, S. and H. Phoumin (eds.), *Energy Outlook and Energy Saving Potential in East Asia*. ERIA Research Project Report 2014-33, Jakarta: ERIA, pp.239-247.

CHAPTER 16

Thailand Country Report

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1. Background

Thailand is in the middle of the South East Asian mainland, with the Pacific Ocean on the southeast coast and the Indian Ocean on the southwest coast. Its land area is approximately 513,115 square kilometres, with great plains in the centre, mountainous areas up north, and highlands in the northeast. Its gross domestic product in 2012 was US$226.4 billion (in constant 2005 US$ terms). In 2012, the population was 66.8 million and income per capita was US$3,390.

Thailand is an energy importer, especially of crude oil, because of very limited domestic resources. Its indigenous energy resources include natural gas, coal (only lignite), and biomass. In 2012, proven reserves were 0.3 billion barrels (21.6 million cubic metres) of oil, 8.4 trillion cubic feet (0.24 trillion cubic metres) of natural gas, and 1,181 million tonnes of lignite.

Thailand's total primary energy supply (TPES) reached 117.7 Mtoe in 2012. Oil accounted for the largest share, at around 41.3 percent, followed by natural gas (22.8 percent), and coal (14.5 percent). 'Others' accounted for the remaining 20.8 percent. In 2012, net imports of energy accounted for 50.0 percent of TPES. Due to very limited indigenous oil resources, Thailand imported around 81.7 percent of its oil and most of its bituminous coal. Although Thailand produces large quantities of natural gas, about 19.2 percent of its use was imported from Myanmar and other countries, in terms of natural gas liquid (NGL).

Natural gas is used as a major energy source for power generation in Thailand. In 2012, primary natural gas supply registered at 26.8 Mtoe, around 80.7 percent of it sourced from domestic supply and the rest imported from neighbouring countries, while NGL was also sourced from countries. Coal was mainly consumed in power generation and industry, and was also heavily used in cement and paper production.

Thailand has 32.6 GW of installed electricity generation capacity and power generation was 166.6 TWh in 2012. The majority of Thailand's power generation used thermal sources (coal, natural gas, and oil), accounting for 91.8 percent of generation, followed by hydro at 5.3 percent, with geothermal, solar, small hydro, and biomass making up the remainder.

2. Modelling Assumptions

GDP growth from 1990 to 2012 was a moderate 4.3 percent per year. Thailand's GDP is assumed to grow at an average rate of 3.9 percent per year between 2012 and 2035. Population growth is also projected to be reasonably slow, at around 0.03 percent per year between 2012 and 2035, compared with average growth of about 0.8 percent per year between 1990 and 2012.

Coal and natural gas are projected to be the largest energy sources for power generation. 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 are expected to be achieved through the implementation of energy efficiency programmes 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 programmes to promote public awareness of energy efficiency and energy efficiency labelling. In the transportation sector, further development of the Bangkok metro area railway network will contribute to energy savings. Significant improvements in energy efficiency in passenger vehicles are also expected, in line with new developments in car technologies and the introduction of the next phase of the Eco Car Program II.

Government policies will continue to encourage the increased use of alternative fuels, especially 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

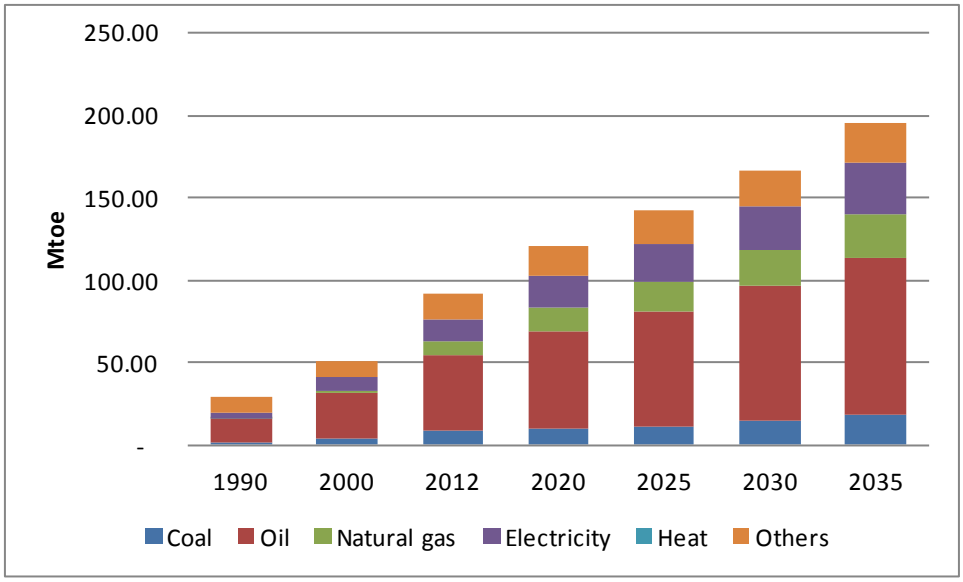
3.1. Business-as-Usual (BAU) Scenario

Between 1990 and 2012, Thailand's final energy consumption grew at quite a high rate, of 5.4 percent per year from 28.9 Mtoe in 1990 to 92.1 Mtoe in 2012. Given moderate economic growth and low population growth, final energy consumption is projected to grow at a moderate rate of around 3.3 percent per year between 2012 and 2035.

Oil has been the dominant energy source in final energy consumption, accounting for 45.5 Mtoe or a 49.4 percent share in 2012. Electricity was the second largest energy source, accounting for 13.9 Mtoe or a 15.1 percent share in 2012.

Oil is expected to remain the largest final energy source throughout the projection period. Its share is projected to decline a little from the 2012 level, to 48.4 percent in 2035. In 2035, the shares of electricity, natural gas, and coal in final energy consumption are projected to increase to 16.4 percent, 13.3 percent, and 9.6 percent, respectively.

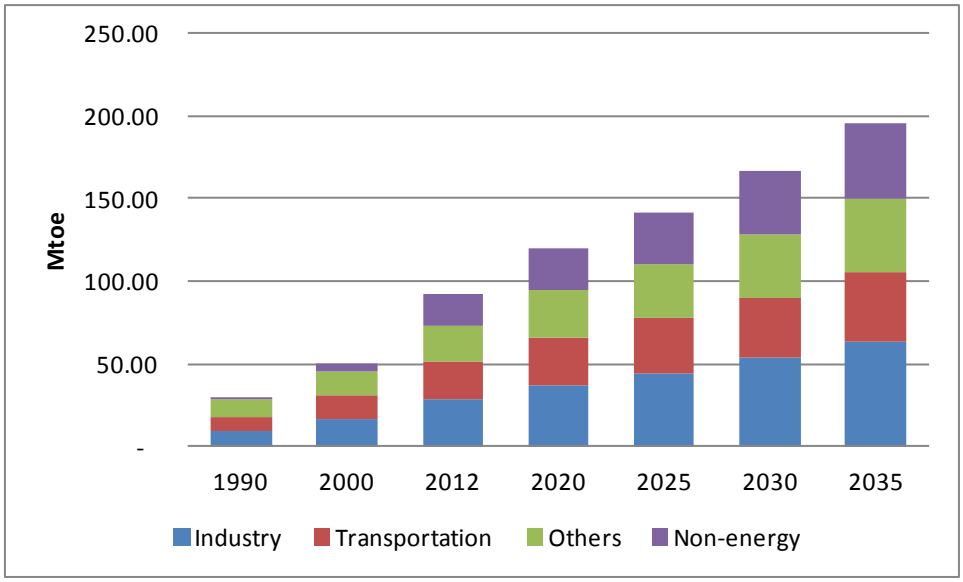
Figure 16-1. Final Energy Demand by Fuel, BAU



BAU = Business-as-Usual.
Source: Author's calculation.

The industry sector had the smallest share in total final energy demand in 1990, at a level of 8.7 Mtoe. With consumption in the sector increasing at an average annual rate of 5.6 percent between 1990 and 2012, the share of industry increased from 30.0 percent in 1990 to 31.5 percent in 2012, becoming the largest consuming sector. The industry sector is projected to remain the largest consumer over the projection period, accounting for 32.4 percent of final energy consumption in 2035. The transportation sector is projected to have the smallest share of final energy consumption in 2035, at 21.5 percent, continuing the decline of its share since 1990.

Figure 16-2. Final Energy Demand by Sector, BAU

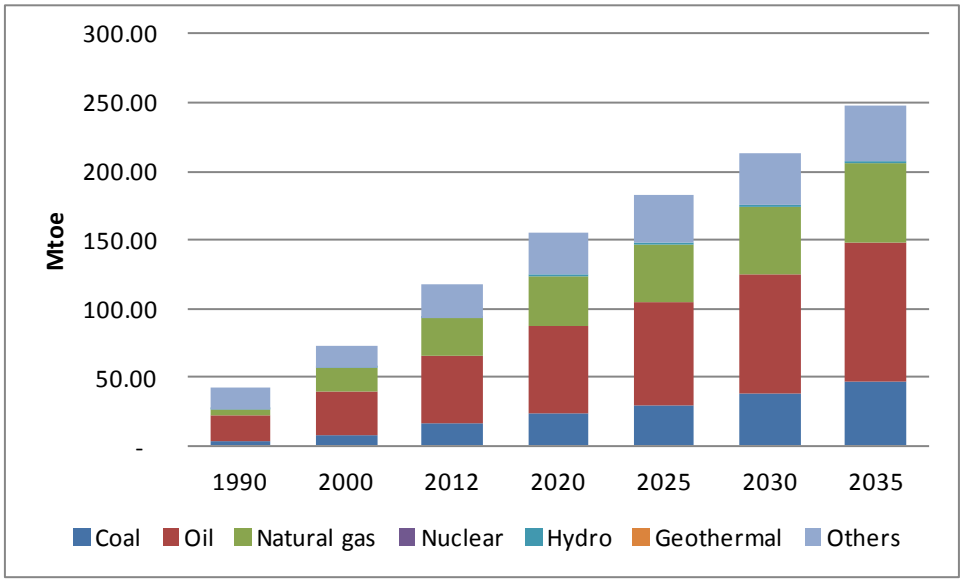


BAU = Business-as-Usual.
Source: Author's calculation.

Primary energy demand grew at an average annual rate of 4.7 percent, from 42.6 Mtoe in 1990 to 117.7 Mtoe in 2012, 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 2012, the major sources of primary energy were oil, natural gas, and coal with shares of 41.3 percent (48.6 Mtoe), 22.8 percent (26.8 Mtoe), and 14.5 percent (17.1 Mtoe), respectively. Although oil remained the largest source between 1990 and 2012, its share in primary energy demand contracted slightly, from 42.1 percent in 1990 to 41.3 percent in 2012. 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 11.7 percent in 1990 to 22.8 percent in 2012. The share of hydropower declined from 1.0 percent in 1990 to just 0.6 percent in 2012.

In the BAU scenario, primary energy demand is projected to grow at about 3.3 percent per year from 2012 to 2035, reaching 248.4 Mtoe in 2035. The highest average annual growth rate is expected in coal (4.5 percent), with consumption expected to reach 47.1 Mtoe in 2035. Following very strong average annual growth in natural gas of 3.4 percent between 1990 and 2012, oil growth is expected to be slower than growth of primary energy demand. Although its average growth rate is projected at 3.2 percent per year between 2012 and 2035, its share in the total will remain above 40 percent.

Figure 16-3. Net Primary Energy Supply by Fuel, BAU

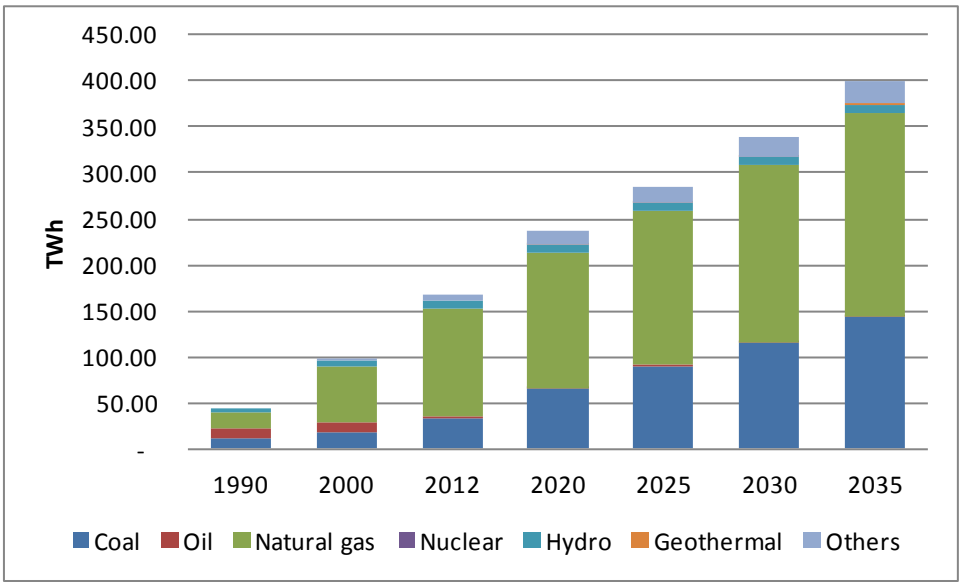


BAU = Business-as-Usual.
Source: Author's calculation.

In 1990, total power generation registered at 44.2 TWh and reached 166.6 TWh in 2012, with an average annual growth rate of 6.2 percent. As shown in Figure 16-4, natural gas has been a major fuel for power generation since 1990. It grew at a robust rate of 8.9 percent per year from 17.8 TWh (40.2 percent share) in 1990 to 117.1 TWh (70.3 percent share) in 2012. Coal had the second largest share, at 25.0 percent, in 1990, and it shrank to 20.0 percent in 2012. Oil was the fuel least used in power generation, at just 2.4 TWh in 2012.

In the BAU scenario, power generation is expected to grow at around 3.9 percent per year from 2012 to 2035 and will reach 400.5 TWh in 2035. Natural gas is expected to remain the fuel most used in power generation, with a share of 55.1 percent, or 220.7 TWh, in 2035. Coal is expected to remain the second largest source of power, with a 35.8 percent share or a level of 143.3 TWh in 2035. Power generation from hydro will increase slightly, by 0.4 percent, from 8.8 TWh in 2012 to 9.5 TWh in 2035.

Figure 16-4. Power Generation by Fuel, BAU



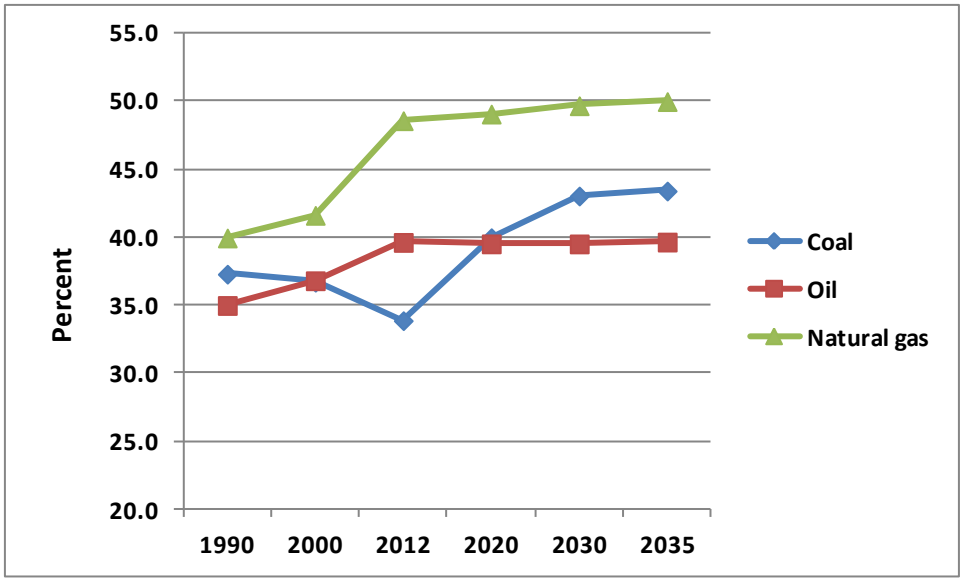
BAU = Business-as-Usual; APS = Alternative Policy Scenario.
Source: Author's calculation.

Natural gas had the sharpest thermal efficiency improvement from 1990 to 2012, increasing from 40.0 percent efficiency in 1990 to 48.6 percent in 2012, and it is expected to increase to 50.0 percent by 2035. Coal thermal efficiency declined by 0.4 percent from 1990 to 2012, but is projected to improve from 33.9 percent in 2012 to 43.4 percent in 2035 (Figure 16-5).

Energy intensity reached 407.0 toe/million at 2005 US$ in 2012. In the BAU case, energy intensity is projected to decline by 0.5 percent per year to reach 363.0 toe/million 2005 US$ in 2035. Energy per capita is projected to increase from 1.8 toe per person in 2012 to 3.7 toe per person in 2035.

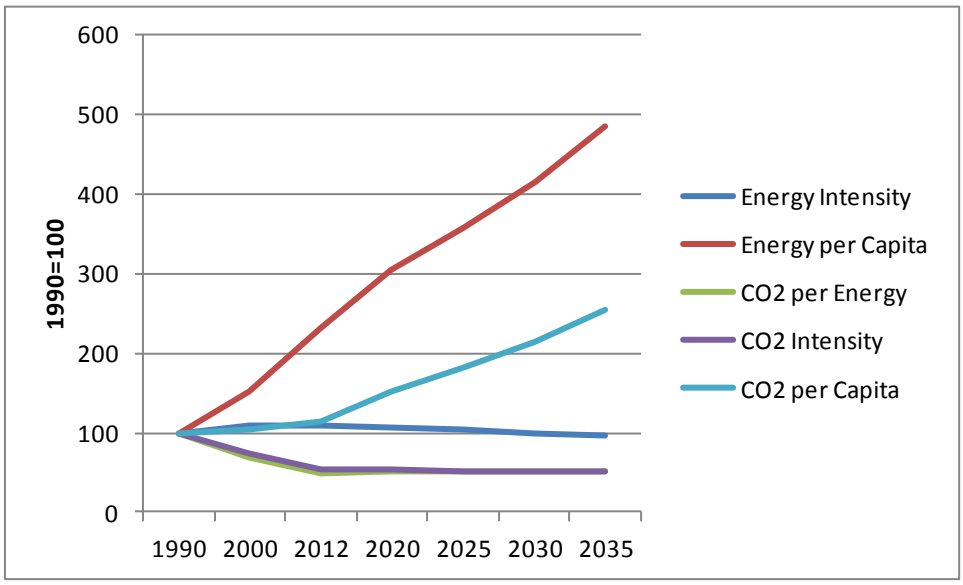
Energy elasticity between 1990 and 2012 registered at 1.1, which indicates that energy demand rose at a faster rate than economic output. In the BAU scenario, energy elasticity is projected at 0.8 from 2012 to 2035, meaning that energy demand will grow at a slower rate than economic output.

Figure 16-5. Thermal Efficiency by Fuel, BAU



BAU = Business-as-Usual.
Source: Author's calculation.

Figure 16-6. Energy Indicators



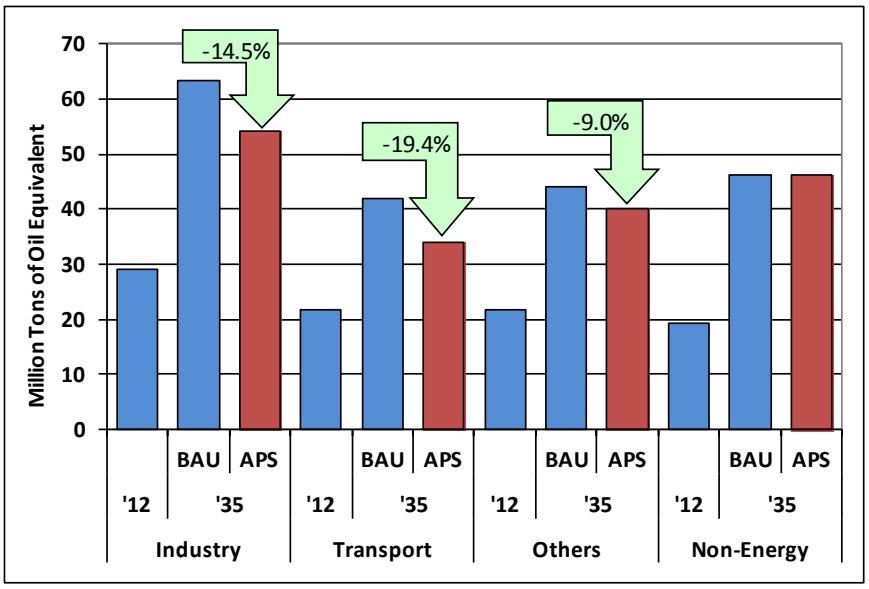
Source: Author's calculation.

3.2. Energy Saving and CO_2 Reduction Potential

Final Demand

In the APS, final energy consumption is projected to grow by 2.8 percent per year, from 92.1 Mtoe in 2012 to 174.5 Mtoe in 2035. This is 10.9 percent lower than the BAU scenario, in which growth is projected at an average annual rate of 3.3 percent from 2012 to 2035. The bulk of energy savings will be achieved through energy efficiency improvement programmes implemented in the industry (14.5 percent) and transportation (19.4 percent) sectors. Improvements will also be achieved in other sectors (9.0 percent), as shown in Figure 16-7.

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



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

Primary Supply

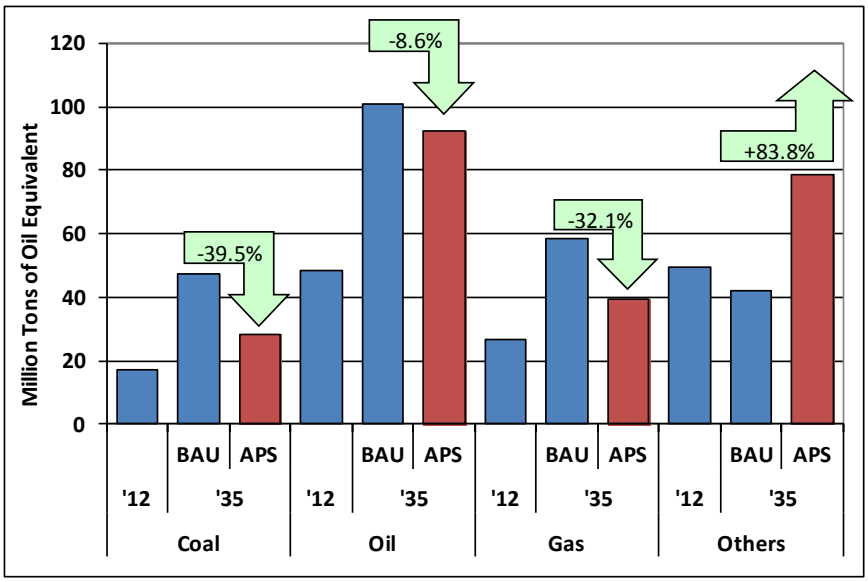
In the APS, growth in primary energy demand growth is projected to be much slower than in the BAU scenario, increasing at 3.1 percent per year (compared with 3.3 percent in BAU) to reach 238.9 Mtoe in 2035. Primary energy demand is expected to be about 3.8 percent lower in the APS than in the BAU scenario in 2035 – an energy saving of about 9.4 Mtoe.

Coal and oil are projected to increase at slower annual average rates of 2.2 percent and 2.8 percent, respectively (4.5 percent and 3.2 percent, respectively, in the BAU scenario). Natural gas use is projected to increase at an annual average rate of 1.7 percent (3.4 percent in the BAU scenario), from 26.8 Mtoe in 2012 to 39.6 Mtoe in 2035. The lower growth rates compared with the BAU scenario are mainly achieved through energy efficiency and conservation measures on the demand side. However, new and renewable energy are projected to grow at a faster rate, of 5.0 percent, in the APS compared with the 2.4 percent annual growth rate expected under the BAU scenario. This will result in 83.8 percent higher non-fossil energy in the APS compared with BAU. The differences in the projections between the two scenarios are shown in Figure 16-2.

3.3. Projected Energy Savings

The difference between primary energy demand in the BAU scenario and the APS in 2035 is 9.4 Mtoe (Figure). This represents the potential energy savings that could be achieved if energy efficiency and conservation goals and action plans were implemented. Natural gas and coal will contribute the largest energy savings at 18.7 Mtoe and 18.6 Mtoe, respectively, and energy saving from oil will reach 8.7 Mtoe in 2035. However, the contribution of non-fossil energy sources will be 36.5 Mtoe higher than in the BAU scenario.

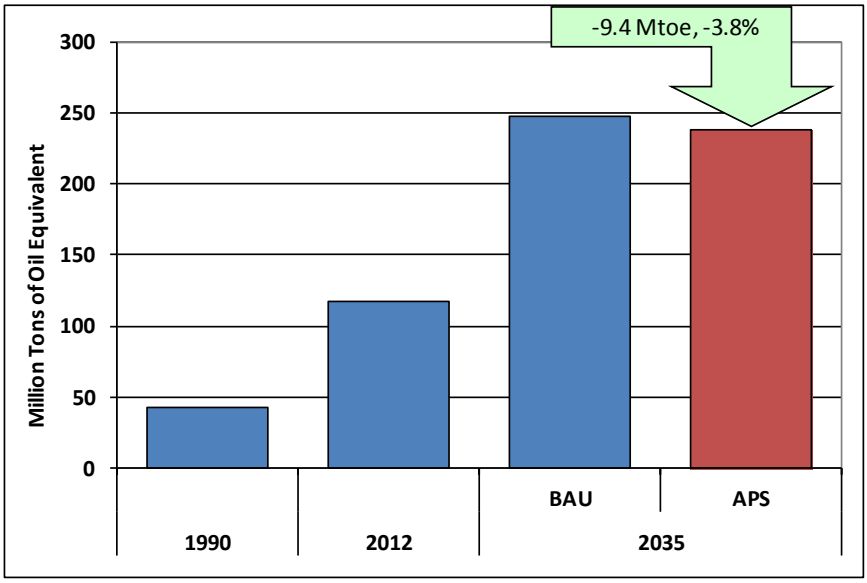
Figure 16-8. Primary Energy Demand by Source, BAU and APS



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

In terms of final energy consumption, the savings in the APS compared with the BAU scenario in 2035 will reach 21.3 Mtoe. The largest savings are expected to be achieved in the industry sector, at 9.2 Mtoe. The transport and other sectors are expected to achieve energy savings of 8.2 Mtoe and 3.9 Mtoe, respectively.

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



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

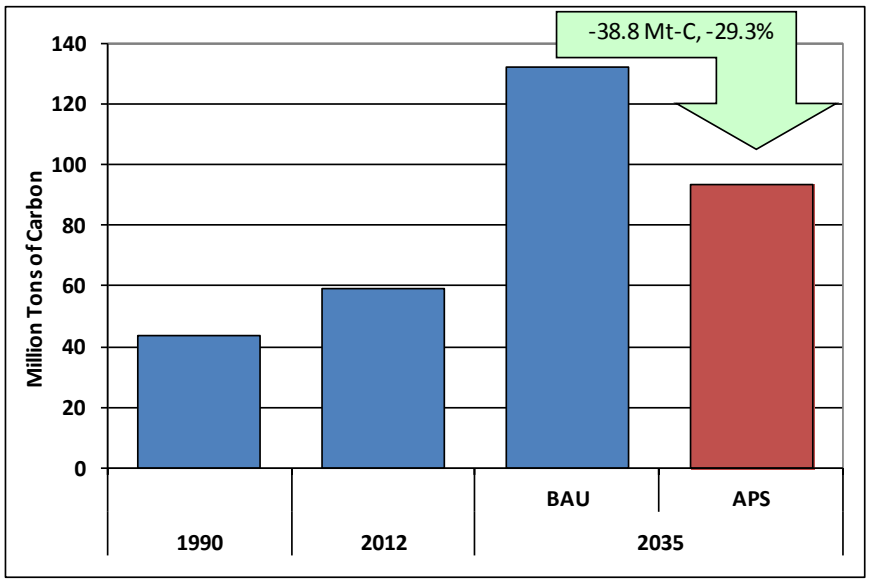
3.4. CO_2 Emissions from Energy Consumption

CO_2 emissions from energy consumption are projected to increase by 3.6 percent per year on average, from 59.3 Mt-C in 2012 to 132.5 Mt-C in 2035 under the BAU scenario.

Under the APS, the average annual growth in CO_2 emissions from 2012 to 2035 is

projected to be 2.0 percent, with an emissions level of 93.7 Mt-C in 2035. The difference the in CO_2 emissions between BAU and the APS is 38.8 Mt-C or 29.3 percent. This reduction in CO_2 emissions highlights the range of benefits that can be achieved through energy efficiency improvements and savings via action plans (Figure 16-4).

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



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

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 2011. But since it recovered from the crisis, the energy intensity of the economy has declined. Thailand's energy efficiency programmes in a wide range of areas (including industry, transportation, and residential sectors) and high oil prices in the world market are projected to contribute to a continuing decline in the energy intensity of the Thai economy.

Improving energy efficiency will also help Thailand (an oil importer) address the challenges resulting from high world oil prices. Thailand is committed to reducing the intensity of energy consumption, particularly oil consumption, and to finding more sustainable energy sources and environmentally friendly fuels. It was recognised that the more Thailand saves energy, the less sensitive it will be to fluctuations in world energy prices and supply. In short, Thailand has realised the importance of energy savings and that it should make greater efforts to achieve them.

Although Thailand has an alternative policy for the next 23 years, oil will remain a major energy source for its economy. Oil is one of the most sensitive energy sources in terms of price and security. Thailand should focus more on oil savings in the future to become less dependent on this fuel. Energy use in the transportation sector will be lower than that in other sectors in future. This sector is also less productive than the others, meaning it consumes more energy but produces less value added. The greater the energy saving efforts in the transport sector, the more the Thai economy as a whole will benefit.