Chapter 12

Myanmar Country Report

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CHAPTER 12

Myanmar Country Report

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1. Background

1.1. Country Profile

Myanmar is the largest country in mainland Southeast Asia. Its territorial area covers 676,577 square kilometres and it shares a border of 5,858 km with Bangladesh and India to the northwest, China to the northeast, and Thailand to the southeast. Approximately 48 percent of its total land area is covered with forest, and most of the land area is utilised for agriculture. Myanmar had a population of 52.8 million in 2012 with an average annual growth rate of 1.0 percent per year from 1990 to 2012.

Myanmar is geographically located at the tip of the Southeast Asia Peninsula and has three distinct seasons. It enjoys three to four months of heavy monsoon and abundant sunshine all year round, which makes it ideal for accumulating water resource for hydropower and for agriculture. Its topographic features favour the existence of numerous rivers, mountain ranges and sedimentary basins, where mineral deposits and energy resources have abundantly accumulated. The delta regions where the two major river systems enter the Bay of Bengal and the 2,832 kilometre coastal strip along the southern part is also a good area for the development of marine ecosystems and an abundant source for marine products and chemicals.

Myanmar is endowed with rich natural resources for production of commercial energy. The available current sources of energy found in Myanmar are crude oil, natural gas, hydroelectricity, biomass, and coal. Besides these, wind energy, solar, geothermal, bio-ethanol, biodiesel, and biogas are the potential energy sources found in Myanmar.

Myanmar's proven energy reserves comprise of 136 million barrels of oil, 10 trillion cubic feet of gas, and 466 million metric tonnes of coal. The country is a net exporter of energy, exporting substantial amounts of natural gas and coal to neighbouring countries. However, it imports around 50 percent of its total oil requirements.

1.2. Socio-economic Status

The population of Myanmar grew at 1.0 percent per year between 1990 and 2012, to 52.8 million in 2012. Myanmar's gross domestic product (GDP) was US$[1] 23.1 billion (constant 2005) in 2012 and its GDP per capita grew from around US$0.1 thousand in 1990

[1] All US$ in this report are in constant 2005 values unless otherwise specified.

to US$0.44 thousand in 2012. With the objectives of enhancing economic development in Myanmar, five-year short-term plans were formulated and implemented from 1992 to 2012. The first (1992–1995), second (1996–2000), and third plans (2001–2005) achieved average annual GDP growth rates of 7.5 percent, 8.5 percent, and 12.8 percent respectively. The last five-year plan (2006–2010) was formulated to achieve an average annual GDP growth rate of 12 percent.

1.3. Energy Consumption in the Base Year

Myanmar's total primary energy consumption was 15.6 million tonnes of oil equivalent (Mtoe) in 2012. Natural gas is mainly used for electricity generation and in industry. Myanmar has 4,041 megawatts (MW) of installed generation capacity and produced about 12.4 terawatt-hours (TWh) of electricity in 2012. During the same year, thermal (coal, natural gas, and oil) and hydro accounted for 23.9 percent and 76.1 percent of total electricity generation, respectively.

2. Modelling Assumptions

2.1. GDP and Population Growth

In this report, Myanmar's GDP is assumed to grow at an average annual rate of around 6.5 percent from 2012 to 2035, slowing from the 9.3 percent growth seen from 1990 to 2012. The population is assumed to increase by about 1.0 percent per year on average from 2012 to 2035.

2.2. Energy Consumption and Electricity Generation

Hydro and natural gas dominated electricity generation in Myanmar. Other fuels such as oil and coal also contributed to the country's generation mix, but less than 13 percent of the total in 1990. It is assumed that the share of coal in the generation mix will be more than 50 percent in 2035. The government's plan is to further increase the share of natural gas, coal, hydro, and other renewables in the total generation mix and reduce the share of oil. Myanmar has also plans to export electricity from its hydro power plants to neighbouring countries such as Thailand and China.

2.3. Energy and Climate Change/Environmental Policies

Myanmar's energy policy in general strives towards maintaining the status of energy independence by increasing indigenous production of available primary energy resources through intensive exploration and development activities. It also addresses electric power as the main driving power source for economic development and the need to generate and distribute it in terms of volume, density, and reliability. It also advocates the utilisation of water resources, a renewable energy resource for generating electricity to save non-renewable sources of energy such as fossil fuels for alternative and future use. Energy efficiency and conservation (EEC) is emphasised to save energy through effective energy management and to reduce energy consumption so as to minimise harmful environmental impacts. Utilisation of new and renewable energy sources is encouraged, especially solar and wind, which are abundantly available thanks to Myanmar's climatic condition. Myanmar's energy policy also accepts the fact that utilisation of traditional

energy sources such as fuel-wood and charcoal still needs to be practiced. Regulations and anticipatory actions are necessary for the sustained harvesting of this primary energy source.

Savings in Myanmar's energy consumption can be attained through the implementation of energy efficiency programmes in all energy-consuming sectors. In the industry sector, energy savings of at least 14 percent from Business-as-Usual (BAU) levels are expected from improvements in manufacturing technologies by 2020. In the residential and commercial ('others') sector, efficient end-use technologies and energy management systems are also projected to induce significant savings. In the transport sector, efficiency increases will be achieved by improved vehicle fuel economy and more effective traffic management.

Myanmar still lacks a national strategy and action plan for mitigating and adapting to climate change, but several ministries have been implementing sector-specific initiatives relevant to climate change. The government is encouraging the use of biofuel in the transport and agriculture sectors to reduce oil dependency and curb carbon dioxide (CO_2) emissions. These efforts are already in place, although the amount of biofuel used in the country remains small for the time being. The government through the Ministry of Energy has initiated the Clean Fuel Program to reduce carbon dioxide emissions by increasing the use of natural gas in the industrial sector and for power generation; this includes converting gasoline, diesel, and liquefied petroleum gas (LPG) vehicles to compressed natural gas (CNG) vehicles.

The Ministry of Environmental Conservation and Forestry (MOECAF), the designated national authority for clean development mechanism (CDM) has submitted one hydro power project to UNFCCC for consideration. The National Environmental Conservation Committee was formed in 2004 and re-formed in April 2011, replacing NCEA, and now serves as the focal organisation for environmental matters. It is chaired by MOECAF, formerly the Ministry of Forestry. The Committee's membership includes 19 ministries.

The Environmental Conservation Law was enacted by the government in March 2012. The law provides the legal basis for implementing a range of enhanced environmental management measures. Simultaneously, the draft Environmental Conservation Rule, which embodies regulations and technical guidelines, and creates the enabling conditions for their effective implementation is being drawn up and submitted to an authorised body.

Myanmar's primary energy saving goal is to reduce energy consumption by 5 percent in 2020 and 10 percent in 2030, relative to the BAU scenario. Specifically, the goals could be achieved by implementing the following strategies:

- In the industrial sector, improve energy efficiency by 10 percent against BAU and reduce energy related greenhouse gases by 2020.
- In the transport sector, have biofuel (E85, biodiesel) substitution of at least 8 percent by 2020.
- Increase the total installed power capacity of renewable energy to 15 percent by 2020.
- Improve energy efficiency in the commercial/residential sector by 8 percent by

2020.

In addition, the following measures are considered important in achieving the goals:

- To develop energy statistics and support systems to help improve energy efficiency in all sectors by encouraging information dissemination and cooperation between the public and private sectors.
- To develop voluntary action plans for the private sector by 2010–2015.
- To develop labelling systems for appliances and buildings by 2015.
- To increase research and development.
- To develop an energy management system through the ASEAN Energy Manager Accreditation Scheme (AEMAS) Program by 2010–2015.

On a sectoral basis, the energy efficiency and conservation measures in Myanmar are listed below:

- In industry, gradual replacement of low efficiency equipment with higher efficiency alternatives will be encouraged.
- In the transportation sector, the state will encourage fuel switching in the transport sector to biofuels and natural gas as alternative fuels. The state also aims to achieve energy saving through exploiting more efficient transportation networks, including road, waterways, rail, air, and seaway and develop high-capacity transportation with greater volume capacity for freight and passengers. Improvement of fuel efficiency in the transport sector is also considered.
- In the residential and commercial sectors, the following measures will be implemented:
  - Encourage the use of alternative energy and improve energy efficiency in existing buildings in the public and private sectors.
  - Promote the use of more energy efficient appliances and energy saving equipment in the residential and commercial sectors.
  - Launch the use of biodiesel (B 100) in rural communities.
- In the electricity sector, the following measures will be implemented:
  - Develop and expand the energy mix and supply sources through utilisation of the full energy potential of the country, including frontier exploration and development and intensive research on oil, natural gas, coal, hydropower, geothermal, energy efficiency and conservation, and new and renewable sources of energy.
  - Replace transformers and install capacitor banks in the main sub-stations. Optimise the voltage, conductor size, and loading of transformers.

2.4. The National Efficiency Policies

To reach a National Target for EEC plans and programmes, the government should implement the following actions:

- Disseminate knowledge about EEC to communities and encourage the use of local renewable energy resources instead of fossil fuels.
- Conduct workshops and seminars regarding EEC to increase public awareness.

- Market promotion of energy efficient equipment and labelling of energy saving appliances such as air-conditioners, motors and pumps, and electric appliances.
- Encourage the private sector to implement EEC programmes on a voluntary basis through recognition programmes.
- Provide financial assistance for transferring advanced technology.
- Adoption of best practices is an effective action plan for energy saving in the transport, residential, and commercial sectors.
- Consider EEC on both the demand and supply sides of electricity.
- Design proper policy measures and action plans to achieve energy savings targets.

2.5. Action Plan

The energy efficiency initiatives of Myanmar cover buildings, households, and the industrial and transport sectors. They are as follows:

Table 12-1. Energy Efficiency Initiatives

Sectors	Energy Efficiency Initiatives
Industrial	Promote the introduction of equipment and facilities with high-energy conservation capacity. Develop energy statistics Develop goals for voluntary action plans Develop R & D and AEMAS Program
Transportation	Raise fuel efficiency in terms of passenger-km, and km/litre, and Fuel substitution with biofuels
Electricity	Develop technology transfer and renewable energy, knowledge in rural areas Assist sustainable, renewable energy application in electricity generation
Household	Labelling systems for buildings and appliances Develop demand side management programmes Thorough management of energy and other resources

AEMAS = ASEAN Energy Manager Accreditation Scheme, R & D = Research and Development.
Source: Author's collection from various sources.

2.6. Alternative Policy Scenarios (APS)

In previous studies, two scenarios were formulated to analyse the impact of policy interventions on the energy sector. The BAU scenario, which serves as the reference case to project energy demand and CO_2 emission, and the Alternative Policy Scenario (APS) to evaluate the impacts of policy interventions in the development and utilisation of energy resources in the country. The APS as such can include policies to increase energy efficiency and conservation targets, expedite penetration of new and renewable energy and introduction of cleaner technology, including the option of using nuclear power plant. To better understand the impact of individual policy interventions, this year's study formulated five alternative policy scenarios:

1) APS1: Improved energy efficiency of final energy demand
2) APS2: Higher efficiency of thermal electricity generation
3) APS3: Higher contribution of new and renewable energy (NRE) (here NRE for electricity generation and biofuels in the transport sector are assumed)

4) APS4: Introduction or higher contribution of nuclear energy
5) APS5: Combined impact of scenarios APS1 to APS4.

In the case of Myanmar, there is no existing plan to introduce nuclear energy for power generation. As such, APS4 has not been considered in the analysis. Therefore, APS5 would consist only of APS1, APS2, and APS3.

3. Outlook Results

3.1. Business-as-Usual (BAU) Scenario

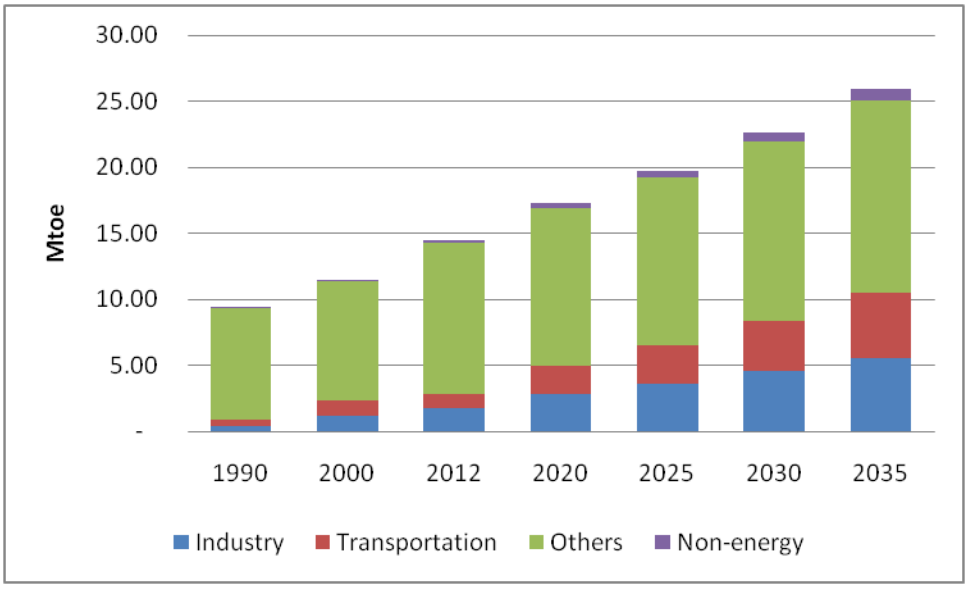
3.1.1. Final Energy Demand

Total final energy demand in Myanmar increased by about 2.0 percent per year on average, from 9.4 Mtoe in 1990 to 14.5 Mtoe in 2012. The industrial sector was the fastest growing sector with an average annual growth of 7.1 percent between 1990 and 2012. Consequently, the share of this sector in total final energy demand increased from around 4.2 percent in 1990 to 12.2 percent in 2012. The transport sector was the second fastest growing sector with an average annual growth rate of 4.1 percent over the same period and the share of this sector in total final energy demand increased from 4.7 percent in 1990 to 7.4 percent in 2012.

The others sector, which comprises the commercial, residential, and agricultural sectors, was the major contributor to total final energy consumption. The shares of this sector, however, declined, from 90.1 percent in 1990 to 78.8 percent in 2012. This indicates that annual growth of demand in this sector was slower than in the industry and transport sectors. The average annual growth rate of demand in the others sector was 1.4 percent between 1990 and 2012. Non-energy consumption grew gradually, at an average annual growth rate of 4.4 percent over the same period, from almost 0.1 Mtoe in 1990 to 0.24 Mtoe in 2012. Although the share of this sector in total demand was only 1 percent in 1990, it increased slightly, to 1.7 percent, in 2012.

Using the socio-economic assumptions stated above, final energy demand in Myanmar is projected to grow at an annual average rate of 2.6 percent under the BAU scenario, reaching 25.9 Mtoe in 2035. Final energy demand is projected to grow fastest in the transportation sector, at an annual average growth rate of 6.9 percent. In the industry and others sectors, energy demand is projected to grow at an annual average rate of 5.1 percent and 1.1 percent, respectively. The non-energy sector will grow at an average annual rate of 6.0 percent. Figure 12-1 shows final energy demand by sector to 2035 under the BAU scenario.

Figure 12-1. Final Energy Demand by Sector, BAU



Source: Author's calculation.

The respective growth of the sectors under the BAU scenario will result in a continuous increase in the shares of the transport, industrial, and non-energy sectors in total final energy demand and a decline in the others sector's share. The transport, industrial, and non-energy sector shares are projected to increase to 19.0 percent, 21.5 percent, and 3.6 percent, respectively, in 2035. The others sector's share will decline to 56.0 percent from 78.8 percent in 2012.

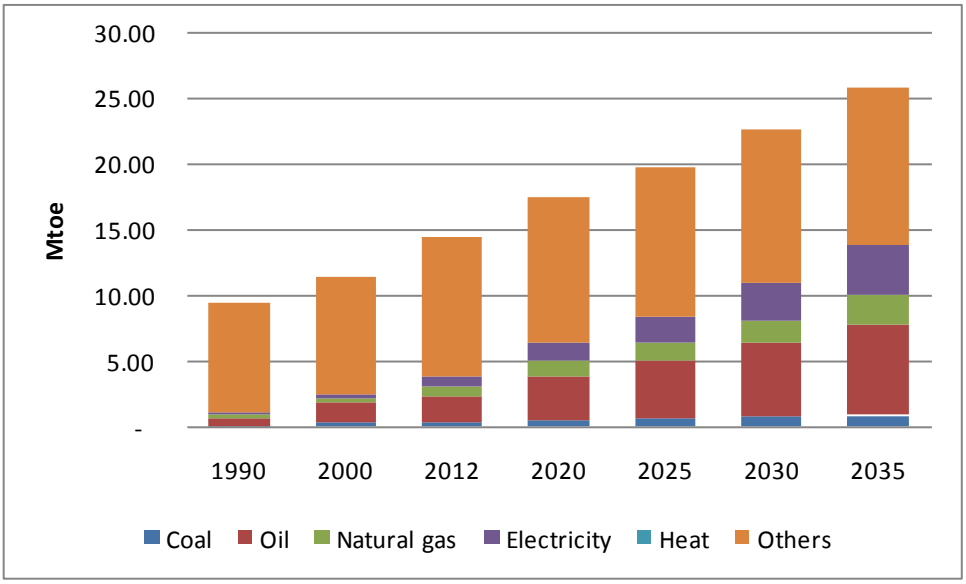
By fuel type, others, which is mostly biomass, consumed most fuel in 1990, having a share of 89.2 percent in Myanmar's total final energy demand. Its share decreased to 73.9 percent in 2012 due to higher growth of the other fuels. The demand for natural gas increased from 0.23 Mtoe in 1990 to 0.72 Mtoe in 2012, and that for electricity increased from 0.15 Mtoe to 0.71 Mtoe over the same period. Coal demand increased fastest, at an average growth rate of 8.4 percent per year from 1990 to 2012.

Under the BAU scenario, the share of other fuels is projected to decline to 46.7 percent in 2035, indicating that its future use will grow more slowly than the other fuels. In contrast, the share of oil will continue to increase and is expected to reach 26.8 percent in 2035 from 14.2 percent in 2012, with an average growth of 5.4 percent per year. This is due to the rapid increase of the transport sector's activities from 2012 to 2035. Figure 12-2 shows final energy demand by fuel type to 2035 under the BAU scenario. Coal and natural gas are projected to grow at an average annual growth rate of 4.9 percent and 5.0 percent, respectively, from 2012 to 2035; not as fast as oil (5.4 percent). Electricity demand will grow fastest, at an average annual growth rate of 7.5 percent during the same period. Its share will increase from 4.9 percent in 2012 to 14.6 percent in 2035.

3.1.2. Primary Energy Consumption

Primary energy Consumption in Myanmar grew at an average annual rate of 1.7 percent, from 10.7 Mtoe in 1990 to 15.6 Mtoe in 2012. Amongst the major energy sources, the fastest growing were hydro and coal with average annual growth rates of 9.8 percent and 9.4 percent, respectively.

Figure 12-2. Final Energy Demand by Fuel, BAU



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

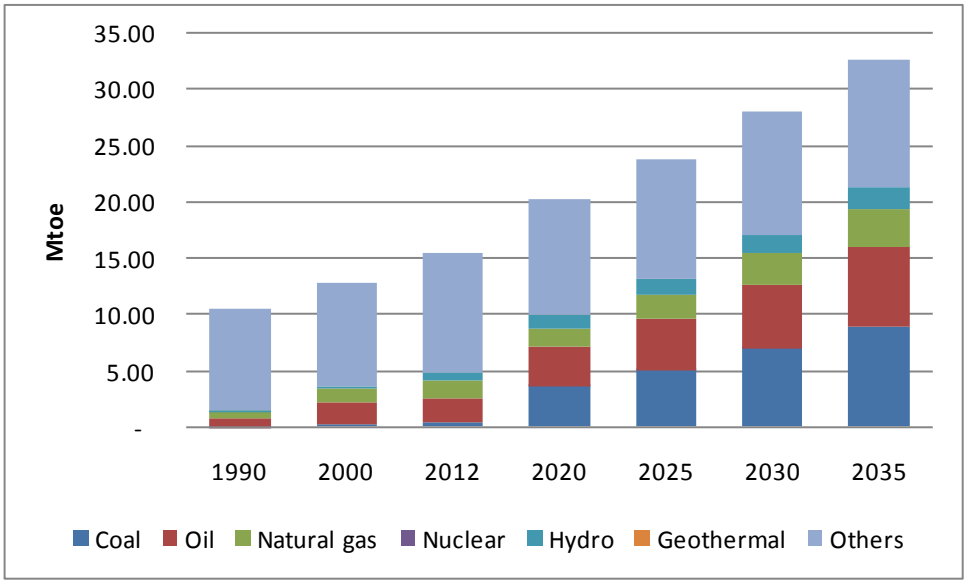
Natural gas consumption grew at an average annual rate of 3.5 percent over the same period and oil consumption at 4.9 percent. Others, such as biomass, dominated the primary energy consumption mix in 2012, with a share of 68.8 percent. Oil and natural gas, with respective shares of 13.4 percent and 10.3 percent, had the next largest shares of the major fuels over the same period.

In the BAU scenario, Myanmar's primary energy consumption is projected to increase at an annual average rate of 3.3 percent per year to 32.8 Mtoe in 2035. Hydro and natural gas are expected to grow at average annual rates of 4.2 percent and 3.2 percent, respectively. Coal will grow faster, at 13.6 percent over the period 2012–2035 and oil will grow at 5.4 percent per year.

The share of oil and hydro in the total primary energy mix of Myanmar are projected to increase, to 21.4 percent and 6.4 percent, respectively in 2035. The share of coal will also increase, from 3.1 percent in 2012 to 27.5 percent in 2035. The share of natural gas will remain more or less the same at around 10 percent in over the projection period. Notably, the share of biomass is expected to decrease due to its slow growth driven only by the growth of the rural population – from 68.8 percent in 2012, its share will decline to 37.1 percent in 2035.

Under the BAU scenario, oil-based power plants will cease operation by 2035 and natural gas-based power plants' share will decrease to around 6 percent during the same year. Consequently, the role of coal-based power plants will grow – the share of electricity generated from coal-based power plants will increase to 51.6 percent in 2035. Hydro will continue to dominate the power sector fuel mix, but with a reduced share of 42.5 percent in 2035, from 76.1 percent in 2012.

Figure 12-3. Primary Energy Consumption by Source, BAU

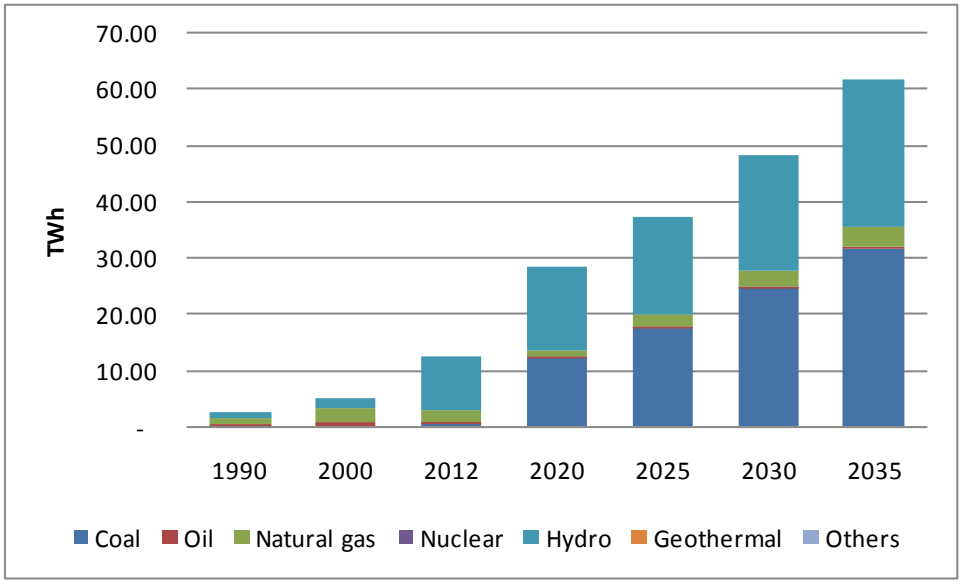


BAU = Business-as-Usual.
Source: Author's calculation.

3.1.3. Power Generation

Hydro and natural gas dominated the power sector fuel mix in Myanmar. In 2012, the share of hydro in the power generation mix reached 76.1 percent and the share of natural gas was 17.3 percent. The remaining fuels (coal and oil) accounted for only 6.6 percent of the total generation mix.

Figure 12-4. Power Generation Mix-BAU Case



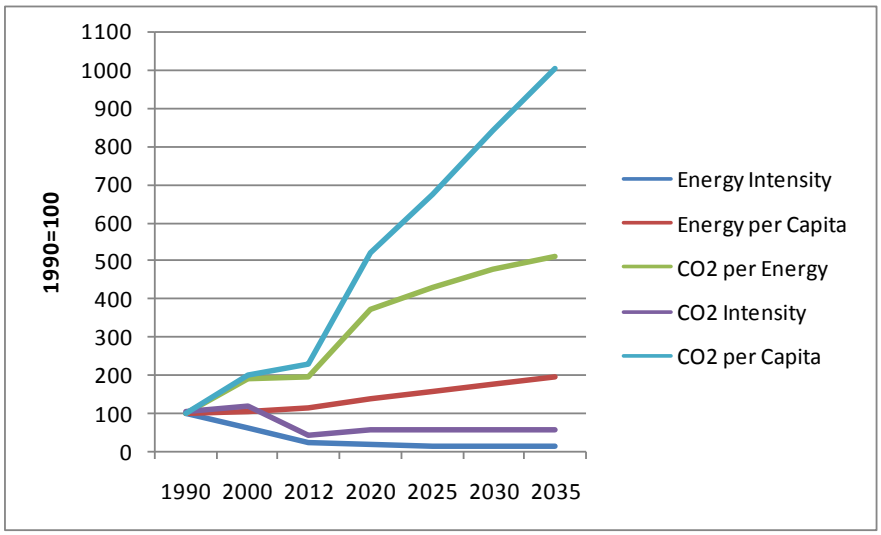
BAU = Business-as-Usual.
Source: Author's calculation.

Total electricity generation from the different plants is projected to grow at an average annual rate of 7.2 percent and coal-based power plants will grow at an average annual rate of 17.6 percent. Hydro power generation will also increase, at an average annual rate of 4.5 percent from 2012 to 2035, and natural gas based power plants are expected to grow at 2.3 percent.

3.1.4. Energy Intensity, Energy per Capita, and Energy Elasticity

Myanmar's primary energy intensity (TPES/GDP) has been declining since 1990. In 2012, primary energy intensity was 676 toe/million 2005 US$, lower than in 1990 when it was 3,243 toe/million 2005 US$. The intensity is projected to continue to decrease, to 335 toe/million 2005 US$ by 2035, at an average rate of 3.0 percent per year. Energy consumption per capita grew from 0.25 toe in 1990 to 0.30 toe in 2012, and will increase to 0.50 by 2035, at an average annual growth rate of 2.3 percent. CO_2 intensity was 334 t-C/million 2005 US$ in 1990 and decreased to 137 t-C/million 2005 US$ in 2012. CO_2 intensity is projected to increase to 177 t-C/million 2005 US$ in 2035, at an average annual growth rate of 1.1 percent. Figure 12-5 shows the evolution of these energy indicators from 1990 to 2035.

Figure 12-5. Energy Intensity, CO_2 Intensity, and Energy per Capita



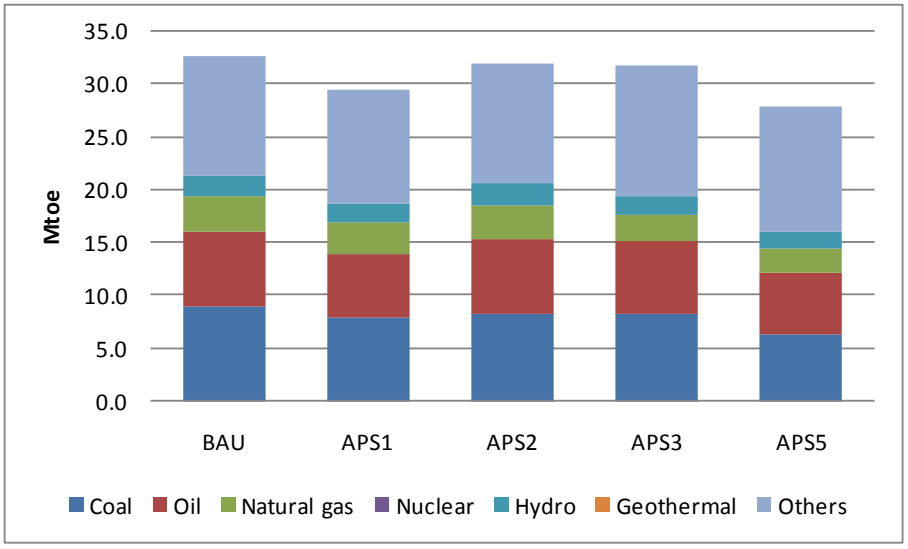
Source: Author's calculation.

3.2. Energy Saving Potential (APS)

The APS was analysed separately to determine the individual impacts of the policy interventions assumed in APS1, APS2, and APS3. The combination of all these policy interventions was further analysed in APS5. Figure 12-6 shows the changes in total primary energy supply in all the scenarios.

In Figure 12-6, APS5 has the largest reduction in total primary energy consumption due to the implementation of energy efficiency and conservation (EC) action plans, improvement of thermal efficiency of fossil-fuelled power plants, and higher penetration of new and renewable energy in the country's supply mix.

Figure 12-6. Total Primary Energy Supply, All Scenarios, 2035



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

The average annual growth rate of total primary energy supply under the APS5 will be around 2.6 percent over the projection period and coal will see the fastest growth, at 11.9 percent. In 2035, the reduction of primary energy consumption in APS5 as compared with the BAU scenario will be 4.9 Mtoe, or 15.0 percent. This reduction will be mainly due to a reduction in the use of coal (29.2 percent). Individually, implementation of only the energy efficiency targets and masterplan as defined in APS1, will reduce Myanmar's total primary energy consumption by only 3.3 Mtoe (10.1 percent) in 2035 compared with the BAU scenario. By fuel type, the main contributor to this reduction will also be the use of coal (almost 12 percent). The average annual growth rate of primary energy consumption in APS1 will be 2.8 percent, slightly faster than APS5, and with coal also seeing the fastest growth.

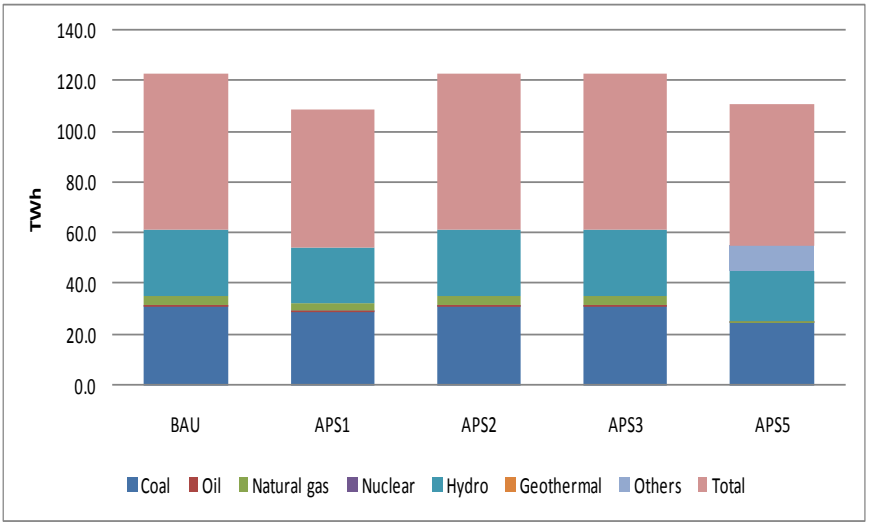
APS2, which assumes higher efficiency in thermal electricity generation, will reduce total primary energy supply by 0.7 Mtoe or 2.2 percent compared with the BAU scenario. The country's total primary energy supply under APS2 will grow at an annual average rate of 3.2 percent, reaching 32 Mtoe in 2035. Since no final energy demand efficiency measures were assumed for APS2, the impact on the primary energy supply will be lower than under APS1 or APS5. Of all the fossil fuels considered, implementation of this higher efficiency in thermal power generation policy intervention will reduce the use of coal and natural gas for power generation, resulting in a higher reduction of coal use by almost 8 percent in 2035.

If policy for higher penetration of new and renewable energy (NRE) is implemented, there will also be a reduction in total primary energy consumption compared with BAU, but only by 0.89 Mtoe or 2.7 percent. By fuel type, coal and natural gas consumption will decline, but the use of 'others' fuel, consisting of biofuels and other NRE, is projected to increase (9 percent).

The impacts of implementing policy intervention APS3 will also be reflected in Myanmar's power generation. Figure 12-7 shows total electricity generation in 2035 in all scenarios. Under APS1, due to lower electricity demand, power generation will also be reduced, by 7 Mtoe or 11 percent compared with BAU. The reduction will be from natural gas, coal, and hydro plants; with the highest reduction expected for hydro power plants (16.3 percent).

Under APS3, the total amount of electricity generated will be similar to the BAU scenario because no efficiency measures was also imposed on the final sector. The differences, however, lie in the fuel mix for power generation. More 'others' renewable power plants such as solar, wind, biomass, etc., will be in operation over the projection period, replacing the fossil-fuelled power plants, (natural gas–fuelled plants), which are supposed to be in operation up to 2035.

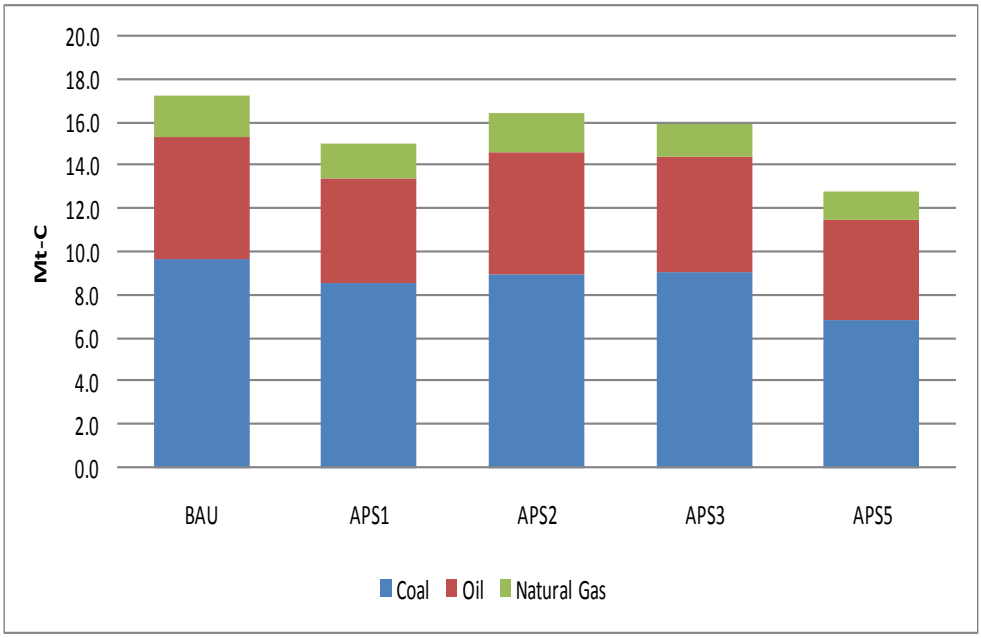
Figure 12-7. Electricity Generation, All Scenarios, 2035



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

In terms of CO_2 emission reduction, the energy efficiency assumption in APS5 is expected to reduce emissions most, by around 4.4 million metric tonnes of carbon (Mt-C), or 25.7 percent lower than under the BAU scenario. The decrease in CO_2 indicates that the energy saving goals, action plans and policies to promote the government's programmes, switching to less carbon intensive technologies such as renewable sources in the supply mix will be effective in reducing CO_2 emissions. Figure 12-8 shows the projected CO_2 emissions in 2035 under all scenarios.

Figure 12-8. CO_2 Emission, All Scenarios, 2035



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

In APS1, total final energy demand will be lower, so that CO_2 emissions from energy consumption will also be lower, reaching around 15 Mt-C. This is a reduction of CO_2 emission by around 2.2 Mt-C, which is 13.0 percent lower than under the BAU scenario. In APS3, higher contributions from renewable energy could reduce emissions by 8.0 percent compared with the BAU scenario. Total CO_2 emissions under APS3 will be around 15.9 Mt-C, which is around 1.3 Mt-C lower than for BAU. The decrease in CO_2 indicates that increasing renewable energy shares in total supply will reduce CO_2 emissions, although not by as much as under APS1 or APS5.

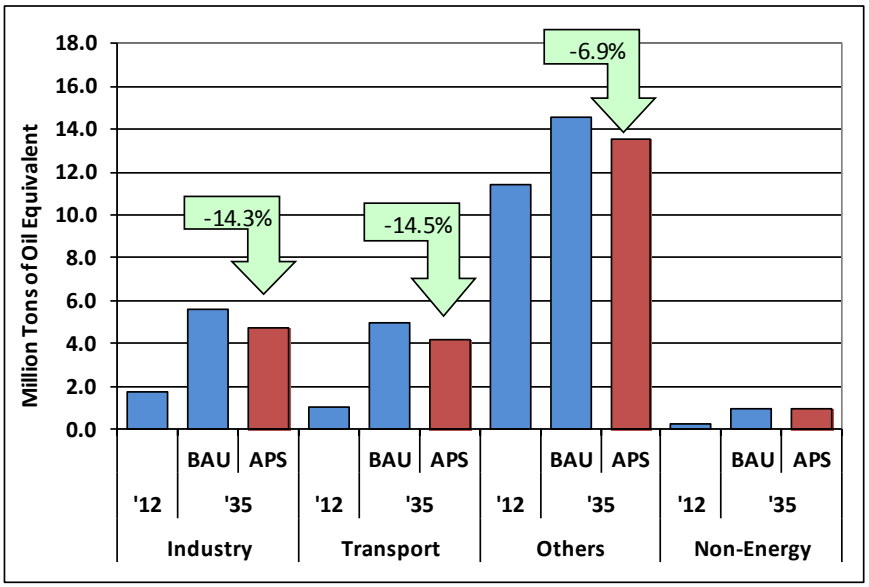
3.2.1. Final Energy Demand

In the APS, which is the combined APS (APS5), growth in final energy demand is projected to be lower, at an average annual rate of 2.1 percent compared with the 2.6 percent annual growth under the BAU scenario. The reason for the slower growth rate is technological improvements in manufacturing processes and the reduction in final energy demand of electricity and oil in the residential and commercial (other) sector. Figure 12-9 shows the differences in final energy demand in 2035 by sector in the BAU scenario and the APS.

Primary Energy Consumption

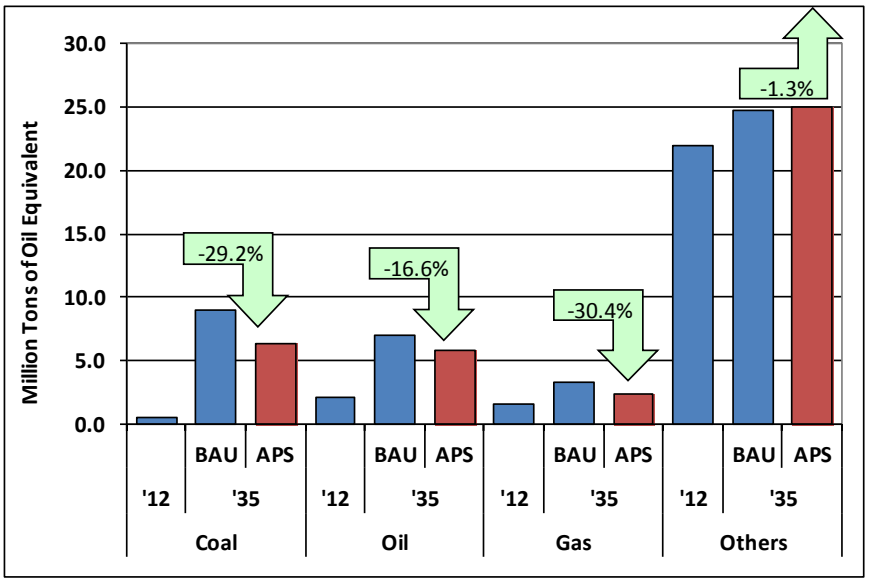
In the APS, Myanmar's primary energy consumption is projected to increase at a slightly lower rate than under the BAU scenario, at 2.6 percent per year, from 15.3 Mtoe in 2012 to 27.8 Mtoe in 2035. Coal will be the fastest growing, at 11.9 percent per year, followed by oil at 4.6 percent per year, between 2012 and 2035. Natural gas is expected to grow at an average annual rate of 1.6 percent over the same period, lower than hydro, which is expected to grow at 2.9 percent per year. Figure 12-10 shows primary energy consumption by source in 2035 under the BAU scenario and APS.

Figure 12-9. Final Energy Demand by Sector, BAU and APS



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

Figure 12-10. Primary Energy Consumption by Source, BAU and APS



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

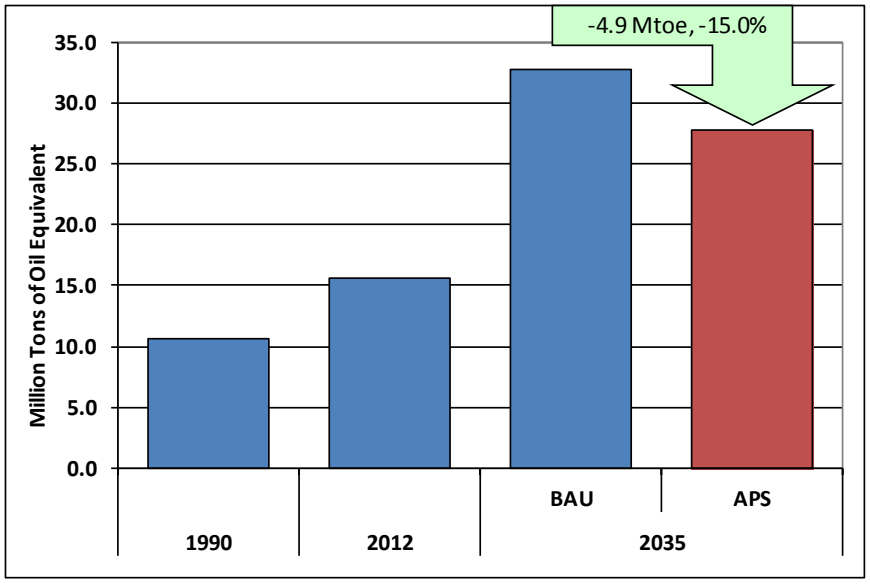
Projected Energy Savings

In Myanmar, commercial energy consumption is projected on the basis of energy requirements of the major sectors (industry, transport, agriculture, and households). The choice of fuel type is determined by available supply, since energy demand has to be met mainly from domestic sources. Obviously, there is a gap between demand and supply, but on the other hand, demand is much higher than the actual requirement. Due to these

constraints, coefficients, derived from time series regression, had been applied to allocate energy. These allocations are made in accordance with the priority of the State organisations and enterprises. For the private sector, allocations are made in accordance with the registered licensed capacity of the firm in question.

Future energy savings could result from savings in primary energy consumption in the residential, commercial, transportation, and industrial sectors. In this regard, Myanmar has implemented a range of energy efficiency and conservation goals and action plans, which target energy savings in all sectors of the economy and in cooperation with both the private and public sectors. There is an estimated saving of 4.9 Mtoe in 2035 in the APS, relative to the BAU scenario. This is equivalent to a 15 percent saving on primary energy consumption in 2035 under the BAU scenario (Figure 12-11). Myanmar has plans to decrease the growth in primary energy consumption by implementing a range of energy efficiency and conservation measures on the demand side.

Figure 12-11. Evolution of Primary Energy Consumption, BAU and APS

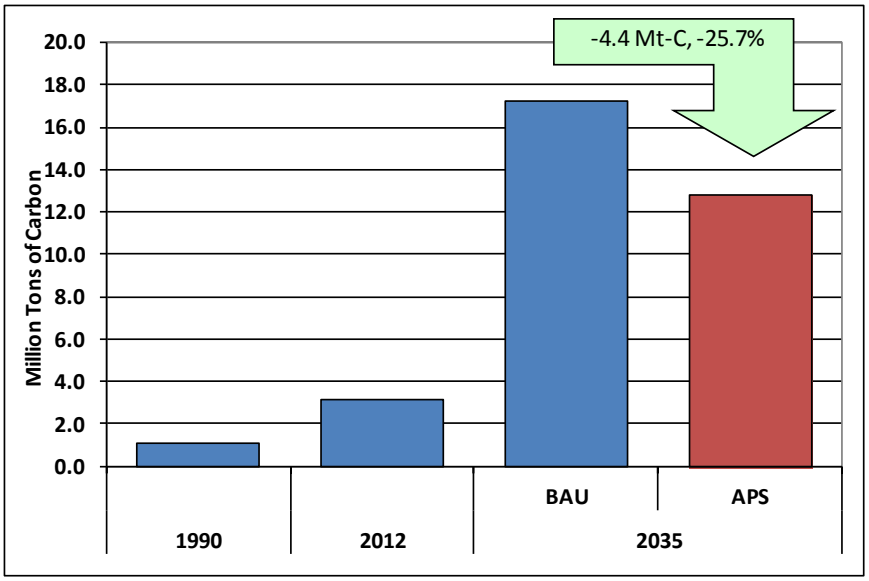


BAU = Business-as-Usual; APS = Alternative Policy Scenario.
Source: Author's calculation.

CO_2 Reduction Potential

In the APS, the energy efficiency policy of Myanmar is projected to reduce growth in CO_2 emissions from energy consumption. In 2035, in the APS, CO_2 emissions from energy consumption are projected to reach about 4.4 million tonnes of carbon (Mt-C), which is about 25.7 percent below the BAU level (Figure 12-12).

Figure 12-12. CO_2 Emission from Energy Consumption, BAU and APS



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

4. Conclusions and Policy Implications

Although energy intensity will decline, energy consumption is still increasing due to economic, population, and vehicle population growth. Myanmar should increase adoption of energy efficient technologies to mitigate growth in energy consumption and should also diversify energy availability. The energy saving programme will target the residential, commercial, transport, and industry sectors.

In this regard, the following proposed actions could be considered:

- An integrated national energy policy including energy efficiency should be formulated by the National Energy Management Committee (NEMC).
- Coordination mechanisms, institutional arrangements, and a legal framework need to be adopted.
- Better energy statistics would be needed for better analysis of energy saving potential in Myanmar.
- Myanmar needs to conduct a demand-side survey on energy consumption, which can be done by combining this survey with existing surveys.
- Given the continuing dominance of the transport sector in final energy consumption, an energy efficiency target should be set for the transport sector in addition to those that have already been set for the industrial, commercial, and household sectors.
- A detailed policy mechanism for the renewable energy sector should be established to implement the potential programmes and projects. This mechanism should be developed and planned in conjunction with external stakeholders, who can offer experience, advanced technologies, new markets, and investment.
- Energy management practices in the industrial and commercial sectors should be

improved.

- A dedicated energy efficiency body needs to be established to oversee Myanmar's EE programme.
- The current EE targets need to be refined to include all sectors' numerical targets and detailed action plans.
- Myanmar needs to establish a comprehensive integrated energy plan to guide the development of the sector, including an energy efficiency labelling programme for energy service companies and appliances.
- As the electrification rate remains low, the government needs to formulate schemes to increase private participation, including by foreign companies, to accelerate power sector development including transmission and distribution system to ensure a reliable electricity supply to consumers.
- The National Energy Management Committee (NEMC) should formulate a renewable energy policy to encourage the private sector and foreign investors to invest in renewable energy.
- NEMC should set specific targets for each sector on energy efficiency and the government should enforce implementation to achieve these targets.
- Consider the import of LNG in floating terminals for the short-term to meet the projected rapid growth of electricity demand while new domestic natural gas resources are being undertaken.
- Consider a civilian nuclear energy policy and exploration of geothermal energy potential for electricity generation.
- As biomass consumption is increasing continuously, the government should remove taxes on LPG and kerosene to reduce expenses in the residential sector.
- Encourage private companies to invest in new refinery capacities to meet domestic demand for petroleum products.