PHILIPPINES

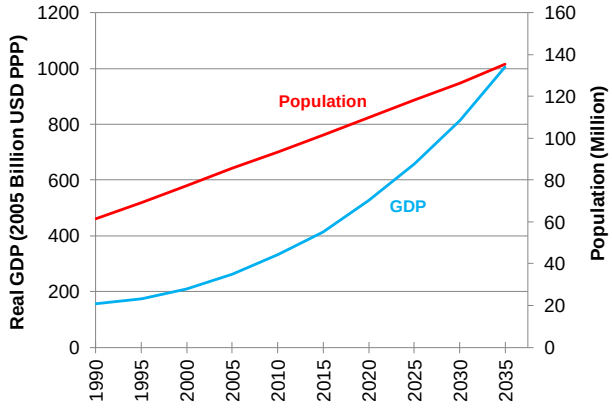
- *The Philippines is an economy which relies heavily on imported fossil fuel. The harnessing and use of renewable energy (RE) is a critical component of the Philippine Government's energy supply security strategy. The passing of the Renewable Energy Act of 2008 will ensure this challenge is addressed and the necessary RE polices put into action.*
- *Through its guiding vision, Energy Access for More, the Philippines Government hopes to put into action its national commitment to move energy access higher up the political and development agendas to become a key priority of the government.*
- *The government and the private sector will continue to forge strong partnerships to ensure the delivery of secure, sustainable, sufficient, quality and environment-friendly energy to all sectors of society.*

ECONOMY

The Philippines is an archipelago of 7107 islands surrounded by South-East Asia's main bodies of water. It covers a total land area of 300 000 square kilometres, including inland bodies of water, spread over the three main island groups: Luzon, Visayas and Mindanao. Its total population in 2010 reached 93 million, with only 49% living in urban communities.

The population will continue to grow at 1.5% annually, reaching 135.2 million by 2035. An estimated half of the population lives in Luzon, the largest of the three major island groups and home of the Philippines capital, Manila. The growth for this outlook period is slower than the 2.2% rate during the period 1990–2005. During this earlier period, more than half of the total population was rural: by 2035, 61% of the total population will be urban.

Figure RP1: GDP and Population



Sources: Global Insight (2012) and APERC Analysis (2012)

The Philippines economy grew a remarkable 7.6% in 2010 and will continue to show positive growth over the next 25 years—on average, 4.5% annually in real US dollars. This translates to real GDP of USD 1006 billion and a per capita GDP of USD 7450 by 2035. Overtaking Thailand, the second-largest economy in the Association of Southeast Asian Nations (ASEAN), the Philippines is seen as one of the fastest growing economies in the ASEAN region over the outlook period (Ward, 2012). However, its high population growth rate will be a challenge in the economy's fight against poverty.

The industry sector is likely to continue to propel the growth in the economy, backed by a revived and strong manufacturing sector and renewed construction projects in the private sector. Growth in the manufacturing sector will remain robust due to export demand. The food industry will continue to experience a high growth rate due to the improved performance in the agriculture sector.

Most industries are concentrated in the urban areas around metropolitan Manila. The economy's biggest export processing zones are located within the Cebu metropolitan area and in some parts of Luzon. These processing zones provide the economy with a promising future in international markets. Electronics as well as semi-conductor materials, woodcraft and furniture, apparel and clothing accessories are the economy's top exports. These are assembled and/or manufactured in these processing zones.

The Philippines is primarily an agricultural economy. Its main agricultural crops are rice, corn, coconut, sugarcane, bananas and other tropical fruits. However, the rapid rates of urbanization and economic expansion have resulted in deforestation and the indiscriminate conversion of agriculture land for residential, industrial and commercial uses. This may undermine the economy's food security and forest resources, and has prompted the formulation of the Philippine Strategy for Sustainable Development. One of the strategies identified includes the "integration of environmental considerations in decision making, proper resource pricing, property rights reform, conservation of Biodiversity, rehabilitation of degraded ecosystem, strengthening of residual management (pollution control), control of population growth and human

resources development, inducing growth in rural areas, promotion of environmental education and strengthening of citizens participation" (PA 21, 1989).

The Philippines is located within the circum-Pacific belt, which means the economy frequently experiences seismic and volcanic activities. The volcanic nature of the economy is beneficial for the successful harnessing of geothermal energy resources.

The Philippines has a tropical maritime climate which is usually hot and humid, especially during the summer. This has the result of increasing electricity consumption due to the extensive use of air conditioning units and other cooling devices. The Philippines also sits astride the typhoon belt. This means the economy experiences torrential rains and thunder storms, some of which prove costly and damaging, destroying lives and property. The economy's tropical climate, however, sustains a rich biodiversity, one of the richest in the world. Its lush forests, tropical islands, white sand beaches, lakes, rivers and mountains serve as the economy's major tourist attractions.

The economy relies heavily on its road network to handle most of its passenger and freight movements. Large parts of the road network continue to be in a poor condition and only a small part of the total network is paved (such as the national roads and thoroughfares). Inadequate connectivity and the lack of a sustainable road safety strategy reduce the efficiency of the road network in promoting growth and providing safe access. This is likely to improve in the future, with the current administration's vision of providing the public with quality infrastructure facilities by 2030 (DPWH, 2011).

Public transport services—mostly buses, jeepneys (the popular and inexpensive mass transport vehicles, originally made from US military jeeps left over from World War II and now part of the economy's culture), tricycles (motorcycles with sidecars) and taxis—are predominantly privately owned and operated. The economy will continue to produce a number of light vehicles locally. However, imported used cars fuelled with gasoline and diesel will continue to form a significant part of the economy's vehicle counts over the next 25 years. These imported used vehicles came mostly from Japan and Hong Kong, China which are converted to left-hand-drive vehicles in conversion bays and freeport zones in the municipality of Subic.

Three light rail transit lines provide some convenience to the riding public within the Manila metropolitan areas. The economy is attempting to revitalize its ailing heavy rail transit, but an inefficient ticketing system and rundown stations have resulted in its poor ridership (World Bank, 2011).

There are eight international airports in the Philippines. The premier gateway to other parts of the world is the Ninoy Aquino International Airport in Manila. The other international airports are located in Clark, Subic, Laoag, Cebu, Davao, General Santos, and Zamboanga.

Being an island nation, water transport plays a major role in the movement of people and commodities. The economy has seven international seaports located in Manila (South and North Harbour), Batangas, Puerto Princesa and Subic (Luzon), Cebu (Visayas), Davao and Zamboanga (Mindanao). Inter-island passenger vessels ferry passengers to the different islands of the Philippines, while cruise liners call regularly into the port of Manila (DOT, 2009).

ENERGY RESOURCES AND INFRASTRUCTURE

The Philippines has modest indigenous energy resources, accounting for the total production of 24 million tonnes of oil equivalent (Mtoe) in 2010 and projected to expand to 31.6 Mtoe in 2035. One-third of these resources are fossil fuels—3.5 Mtoe of coal (mainly lignite), 3 Mtoe of natural gas and 0.9 Mtoe of crude oil. The economy's local crude oil production comes mostly from four oilfields: the Nido, Matinloc, North Matinloc and Galoc fields. The economy, through the Department of Energy (DOE), is gearing up to drill 25 oil wells every five years or a total of 100 wells by 2030. Hence, in addition to its current indigenous resources, the expected discoveries could mean the production of an additional 2.4 million barrels of oil per year by 2025 (DOE, 2010b).

The Philippines, however, imports most of its oil and is likely to continue to do so during the outlook period, to sustain the economy's total petroleum requirements of 27.9 Mtoe by 2035.

The offshore Malampaya field is the largest producing gas field and the main source of gas in the economy, with an estimated daily production capacity of 450 million standard cubic feet (13 million cubic meters). It is also the main source of gas for the three large natural gas fired power plants in the Philippines. While gas production from this field is expected to be stable up to 2025, a potential gas discovery of 635 billion cubic feet (18.3 billion cubic meters) in the Sulu Sea is assumed to be developed and to produce gas during the same period.

While the demand for natural gas is mainly met by domestic production, efforts to ensure energy security will be enhanced. The economy will import natural gas to augment the projected demand beyond the production capacity from the Malampaya gas field. Feasibility studies are underway for potential locations for liquefied natural gas (LNG) import terminals (JICA, 2012, pp. 1–3).

Indigenous coal production accounted for 14% of the economy's demand for coal in 2010, and is estimated to reach 6.9 Mtoe by 2035. Domestic coal comes mainly from Semirara Island through the economy's only large-scale privately-owned coal producer, Semirara Mining Corporation. Indonesia is the economy's most significant coal trading partner, accounting for 96.7% of the total coal imported.

The Philippines' installed electricity generating capacity stood at 16 GW in 2010, and is projected to increase to over 58 GW by 2035. Fossil fuels will continue to dominate the economy's total power generation; coal thermal alone is expected to provide almost 70% of its electricity generation by 2035, followed by natural gas with a 16% share.

In view of the economy's abundant renewable resources, by 2035 more than 50% of its indigenous energy resources are expected to come from renewable energy, such as hydro and geothermal as well as other new and renewable energy (RE) sources. Other RE sources include biomass (like fuelwood and bagasse, the fiber left after juice has been squeezed from sugarcane stalks, etc.), which is mainly used in household and commercial applications. The Philippines benefits from its tropical maritime climate with its wind and solar sources of energy, and the economy is looking at the possibility of its first ocean energy facility by 2018 (Layug, 2012).

Among the renewable energy sources, geothermal energy is expected to provide the biggest contribution over the next 25 years. The economy's installed geothermal generating capacity of 1966 MW in 2010 placed the economy as the second-largest geothermal producer in the world behind the United States (US) (IGA, 2010). The passage of the Renewable Energy Act of 2008 (RE Act) will provide the direction for the economy to harness and utilize its renewable energy. A firm commitment from the private sector, particularly on funding, will likely provide the economy with an additional capacity of 9.2 GW from geothermal, hydro, biomass, wind, solar and ocean sources by 2035.

In 2010, the electrification level of the economy at a household connection level was 68% (NSO, 2010); at a barangay level (a village, district or ward, i.e. the basic political unit) it had reached 99.89%. The economy envisions a 90% household electrification level by 2017. Due to its geography, the economy has a complex energy system. Major power grids are separated according to its three major islands, Luzon, Visayas and Mindanao. In the Luzon grid, more than half of its capacity is coal-fired; Visayas is home to the economy's vast geothermal resources; while more than 50% of the Mindanao grid's energy requirement is sourced from hydro. The interconnection of the three major grids is not expected in the near future. Smaller islands are interconnected to the major island grids to provide service to remote areas. Where it is not economical to connect a small island to a major grid, separate local systems are being established around small generating plants (NGCP, 2011).

ENERGY POLICIES

The Philippines, through collaborative efforts with key economic development agencies, will continue to formulate plans and programs to maintain its positive growth for the next 25 years. The implementation of infrastructure projects by the Department of Public Works and Highways (DPWH) and the Department of Transportation and Communication (DOTC) will help to promote the economy's growth. Assuming the industry sector continues to show good performances over the outlook period, the economy will achieve its economic objectives (Navarro and Yap, 2012).

As the major instrument for realizing the energy sector's vision of achieving energy independence, the Department of Energy (DOE) is currently crafting the 2012–2030 Philippine Energy Plan (PEP). The 20-year plan will reflect the government's mission to ensure the delivery of secure, sustainable, sufficient, affordable and environment-friendly energy to all economic sectors. The energy sector's guiding vision, Energy Access for more, will ensure a larger population has access to reliable and affordable energy services, most importantly for local productivity and economy-wide development. With this guiding vision, the economy hopes to put into action its national commitment to move energy access higher up the political and development agendas to become a key priority of the government (DOE, 2010a).

To attract more investors into the exploration and development of its indigenous oil and gas resources, the economy conducts an annual Philippine Energy Contracting Round (PECR) or energy contracting round mechanism. As of 2009, 34 service contracts (SCs) have been supervised and monitored by the DOE and the number is likely to increase to 117 by 2030. Private companies enter SCs

with the DOE for the exploration of oil concession areas and natural gas deposits and for the development of geothermal resources and certain coal areas in the economy, subject to sharing their net proceeds with the government.

The economy hopes to achieve a production level of 8.59 million barrels of oil, 294 billion cubic feet (8.49 billion cubic metres) of gas and 87.58 million barrels of condensate by the end of 2030. Assuming these targets are realized, hydrocarbon resources level will reach 45% by 2035 from the 2010 production level of 30%. The economy has 16 sedimentary basins, the majority of which are in Luzon, particularly in Palawan.

Through the PECR, and the conversion of existing coal operating contracts from the exploration to the development stage, the entry of more investors is anticipated. Considering private coal exploration investors and the state-owned Philippine National Oil Company Exploration Corporation (PNOC EC) together, the economy's indigenous coal production is likely to increase from its 2010 level of 3.5 Mtoe to 6.9 Mtoe by 2035.

The Philippines is projected to rely heavily on imported fossil fuel, even after 25 years. The RE Act will ensure this challenge will be addressed and the necessary RE polices will be put into action. Through its National Renewable Energy Program, the economy's current RE based grid-connected installed capacity of 5440 MW is targeted to triple by 2030. Most of this capacity will come from hydro and wind power (DOE, 2011). The RE Act will likewise address possible bureaucratic constraints in developing RE by streamlining the registration process and promoting transparency and open competition. Future policy requirements to commercialize RE, such as the formulation of a feed in tariff (FIT) and bidding for its allocation, are being developed.

The Philippines' downstream oil industry was deregulated in 1998 and is currently dominated by two major oil refining and marketing companies; Petron Corporation and Pilipinas Shell. A third oil refiner and marketer, Caltex Philippines Inc., converted its 86 500 barrels per day refinery into an import terminal in 2003 and now operates as a marketing and distributing company under the name Chevron, but maintains its Caltex brand. Petron Corporation was jointly owned by PNOC, a state-owned company, and the Aramco Overseas Company, but it was privatized in 2010.

The Downstream Oil Industry Deregulation Act of 1998 allows oil companies to set their own unregulated prices based on competition in local markets. Oil deregulation does not guarantee lower prices but does guarantee fair prices. As mandated, the DOE monitors the prices of both the raw material crude oil and the refined petroleum products in the international market.

As embodied in the Electricity Power Industry Reform Act (EPIRA), the economy's electricity supply industry has been restructured paving the way for the privatization of the state-owned National Power Corporation (NPC). The restructuring calls for the separation of the different components of the power sector namely, generation, transmission, distribution and supply. Transmission and distribution exhibit natural monopoly characteristics which make the regulation of them appropriate. The generation and retail sale of electricity, on the other hand, can be efficient in the competitive environment as a result of the reforms introduced by the EPIRA. The privatization of NPC involves the sale of the state-owned power generation and transmission assets (e.g. power plants and transmission facilities) to private investors.

While oil pricing is deregulated, electricity pricing is a regulated energy commodity. The price for electricity is set by the Energy Regulatory Commission (ERC). Alongside the implementation of the EPIRA is the unbundling of electricity rates. The individual charges for providing specific electric services to any end-user, for generation, transmission, distribution and supply, are identified and separated. The ERC determines the rate-setting methodology taking into account the relevant considerations that will enable a specific entity to operate viably, with the end view of providing a reasonable price for electricity. Part of the EPIRA law is the birth of the Wholesale Electricity Spot Market (WESM) which serves as a venue where electricity made by power-producing companies is centrally coordinated and traded like any other commodity in a market of goods. After several months of trial operations, in June 2006 the WESM started commercial operations in the Luzon grid. Four years into its commercial operations in Luzon, the Visayas grid was integrated into the WESM and it commenced commercial operations in that grid in December 2010. The establishment of the WESM creates a level playing field for the trading of electricity among WESM participants; hence third parties are granted access to the power system. Although prices are still governed by commercial and market forces, customers may have the option to buy energy at a price lower than the regulated rate (WESM, 2012).

By virtue also of EPIRA, the energy sector through the DOE is mandated to formulate the Power Development Plan (PDP) which is integrated

into the PEP. The PDP outlines a strategic roadmap for the power sector to ensure and secure the delivery of a reliable and quality electricity supply in the short-term, medium-term and long-term planning periods.

In view of the Philippines' wide-ranging geographical situation, to fully connect the entire population to the national grid is a significant hurdle. Servicing the most remote and difficult to electrify rural areas will require significant resources; hence achieving a 100% electrification level over the outlook period remains a challenge for the economy. The government through DOE and other private and government agencies spearheads the development of various innovative service delivery mechanisms designed to increase access to electricity services. One of its efforts is the Expanded Rural Electrification Program which aims to at least provide some access to electricity for the marginalized and other off-grid areas. This will be done through decentralized energy systems such as battery charging stations (BCS), individual solar home systems, micro-hydro systems, and wind turbine energy systems (Salire and Muhi, 2010).

The National Electrification Administration (NEA), an attached agency of the DOE, is the economy's prime mover in rural electrification and the DOE's arm in the implementation of the decentralized energy systems. NEA currently supervises 96 electric cooperatives by providing quality financial, institutional and technical services to franchise areas not covered by the Manila Electric Company, the economy's biggest privately-owned utility.

Meanwhile, NPC remains as an economy-wide government-owned and controlled corporation which performs the missionary electrification function through the Small Power Utilities Group (SPUG). SPUG is responsible for providing power generation and its associated power delivery systems in areas not connected to the transmission system.

The Biofuels Act of 2006 provides the economy with a way of hedging against escalating oil prices and of reducing the economy's dependence on imported fossil fuels. The Act currently mandates a minimum 1% biodiesel blend in diesel and a 5% bioethanol blend in gasoline. The economy hopes to increase this to 20% coco methyl ester (CME) in diesel and 20% ethanol in gasoline by 2030. CME is domestically produced from coconuts, while 80% of the bioethanol supply will be sourced from imports due to the limited domestic production capacity.

Alongside its efforts to curb the economy's dependence on imported oil, the Philippines Government considers the use of alternative fuels in the transport sector a priority. As well as its target to replace the current number of conventionally fuelled vehicles with alternative technologies and fuels by 2035, the economy expects to add more infrastructure such as natural gas pipelines, refilling stations for CNG (compressed natural gas) buses and charging stations for electric vehicles. Operators who participate in the natural gas vehicle (NGV) program receive incentives such as an income tax holiday and a 0% rate of duty on imported NGVs, NGV engines and other NGV industry items. There is a proposal to enhance the existing incentives for the program to encourage more participants. Over the next 25 years, the economy has a target to increase the number of vehicle engines running on higher percentages of biofuels, while electric vehicles in both private and public transport will become mainstream.

Mass transport systems in some of the economy's biggest cities are likely to improve in the future. For example, a feasibility study on a bus rapid transit (BRT) system for Cebu is being done with the help of the World Bank and AusAID (DOTC, 2010).

The government also aims to attain a better interconnection between the economy's islands, to open up new economic opportunities, to reduce transport costs and to increase access to social services. Priority infrastructure projects include: the completion of the nautical highway system (an integrated network of highway and vehicular ferry routes), with several projects that will spread development and provide new opportunities for growth in other regions to decongest metropolitan Manila; better access to tourist sites; and improvements in underdeveloped regions and roads (World Bank, 2011).

Economic growth and increasing energy use clearly indicate the economy is likely to face the realities of high oil prices and greater competition for energy resources in the long term. As a way of hedging against the high cost of oil, the National Energy Efficiency and Conservation Program (NEECP) is seen as an essential strategy in rationalizing the economy's demand for petroleum products and eventually lessening the impact of escalating prices on the economy (DOE, 2009).

Through the NEECP, the energy sector will work on developing and promoting new technologies. It will also conduct a major information campaign to promote the practice of sensible energy habits in homes, businesses and motor vehicles. Specifically, activities under the program include: the Fuel Economy Run (which involves participating private vehicle manufacturers and assemblers showcasing the fuel efficiency of their vehicles); the

provision of awards to establishments observed to achieve significant energy savings in their operations; and educational campaigns in schools, households, and municipalities. To ensure wider coverage the economy conducts tri-media campaigns, with the hope of achieving an annual 10% reduction in its total energy demand by 2030 (Reyes, 2012).

In addition, the economy is implementing the Philippine Energy Efficiency Project which aims to demonstrate the societal benefits of a series of energy efficiency projects in the different sectors—such as the public, commercial and residential sectors. The project's key targets include: the retrofit of 135 government buildings with energy efficient lighting systems; the economy-wide distribution of compact fluorescent lamps (CFL) totalling 8.6 million CFL units; and the retrofit of public lighting (street and traffic lights) using light emitting diode (LED) lamps in three major cities. The project quantification of economic and environmental benefits showed a 243 MW deferment of power generating capacity additions, a reduction of oil imports by 83.1 kilotonnes of oil equivalent (ktoe), and the avoidance of 172 kilotonnes of CO_2 emissions.

BUSINESS-AS-USUAL OUTLOOK

FINAL ENERGY DEMAND

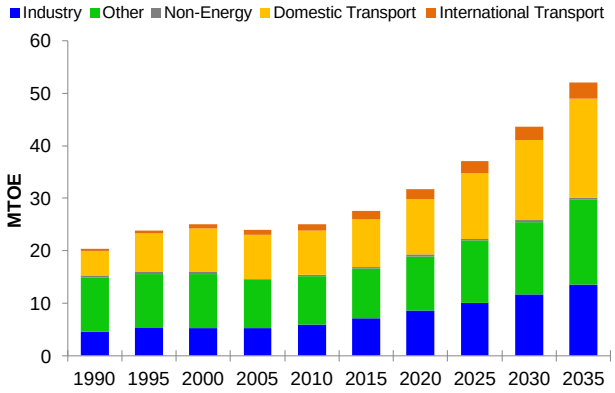
The Philippines' final energy demand is expected to expand at an average annual rate of 2.9% from 2010 to 2035. This translates to a total final energy demand of 49 Mtoe by 2035, from the 2010 level of 23.8 Mtoe.

Together with the economy's fast-paced growth, the industry and domestic transport sectors are both projected to grow at an average annual rate of 3.3% over the next 25 years. Growth in the industry sector will be driven by the projected expansion of the machinery industry, whose energy demand will increase by 5% annually during the same period.

The transport sector (includes international transport sector) is expected to dominate total final energy demand over the outlook period, accounting for a 42% share by 2035. The 'other' and industry sectors' energy demands are estimated to account for 26% and 31%, respectively, of the economy's final energy demand by 2035. The non-energy sector's demand is very small, with only a 1% share of the total final energy demand in 2035.

While oil consumption is projected to continue to dominate the economy's final energy demand through to 2035, gas consumption shows a positive boost of 4.8% annually over the 25-year outlook period.

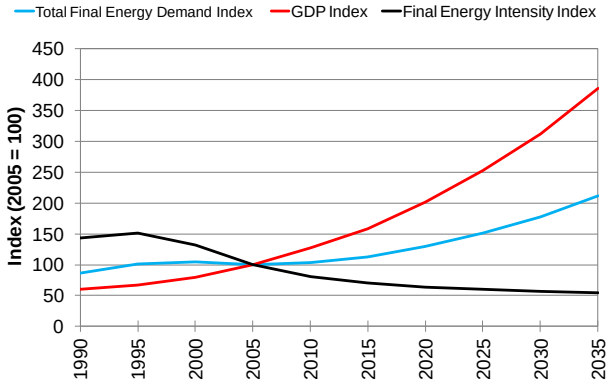
Figure RP2: BAU Final Energy Demand



Source: APERC Analysis (2012)
Historical Data: *World Energy Statistics 2011* © OECD/IEA 2011

Final energy intensity is expected to reduce by 45% from 2005–2035.

Figure RP3: BAU Final Energy Intensity



Source: APERC Analysis (2012)

Industry

The industry sector's fuel consumption of 6 Mtoe in 2010 will reach 14 Mtoe by 2035, which is almost one-third of the economy's final energy requirement in 2035. Heavy-use industries are dominated by food and tobacco products and non-metallic minerals—they are expected to collectively use more than 60% of the industry energy demand by 2035.

The demand for natural gas in the industry sector will grow the fastest, at an annual rate of 4.8% in the next 25 years. Coal consumption, which dominated the industry sector's energy demand in 2010, is likely to be displaced by a demand for electricity by 2035. It is estimated that electricity use will grow at a rate of 3.6% annually over the outlook period.

Transport

Energy demand in the domestic transport sector will grow alongside that in the industry sector.

Transport energy demand will absorb more than one-third of the economy's total fuel requirement during the 25-year outlook period. The sector's total demand will expand to 19 Mtoe by 2035 from the 2010 level of 8.4 Mtoe. Petroleum consumption in the sector is not expected to respond strongly to oil price increases. It accounts for 67% of the economy's total oil requirement by 2035.

The light vehicle fleet is expected to increase significantly, with an annual growth rate of 3.4% over the outlook period. By 2035, the fleet is projected to be made up of 40% conventional gasoline and 19% diesel vehicles, and about 6% all other types of vehicles, mainly LPG and conventional hybrids. The remaining 35% of the light vehicle fleet will be motorcycles.

Other

The 'other' sector will account about one-third of the economy's total energy demand and will grow at an average annual rate of 2.3% during the outlook period. This translates to an increase from the 2010 demand level of 9.2 Mtoe to 16 Mtoe by 2035. Electricity will be the dominant fuel used and it will grow the fastest, at an average annual rate of 4.4% over the next 25 years. It is assumed this growth will reflect the changing fuel preferences over the outlook period, as traditional biomass use in the sector contracts rapidly at a rate of 6% annually.

The residential sector's energy demand (60%) is likely to remain the main contributor in the 'other' sector's total energy consumption. This is due to the continuing growth of the economy's population and GDP in the next 25 years. Energy demand in this sector is expected to grow 1.7% annually during the outlook period.

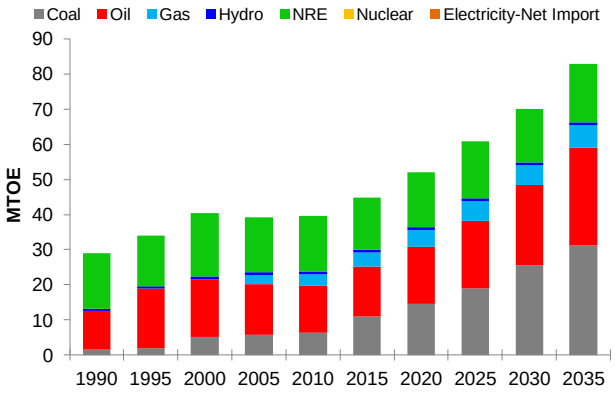
The commercial sector is projected to be one of the drivers of the Philippines economy due to the continuing expansion in the number of business process outsourcing companies (such as call centres) taking place in the economy (PhilBPO, 2011). With this in view, the energy requirement in this sector is likely to grow faster than that in the residential sector, at 3.5% annually over the next 25 years.

Agriculture plays a significant role in the Philippines economy. Its produce, such as fruits, vegetables and other crops as well as livestock and poultry, is projected to post strong export performances over the next 25 years (PIDS, 2009). The modest increase (1.9% annually) in energy consumption for the sector during the outlook period is driven by an increase in the demand for petroleum products, used mainly for farm machinery and implements, and for electricity, used largely in the livestock and poultry sub-sectors.

PRIMARY ENERGY SUPPLY

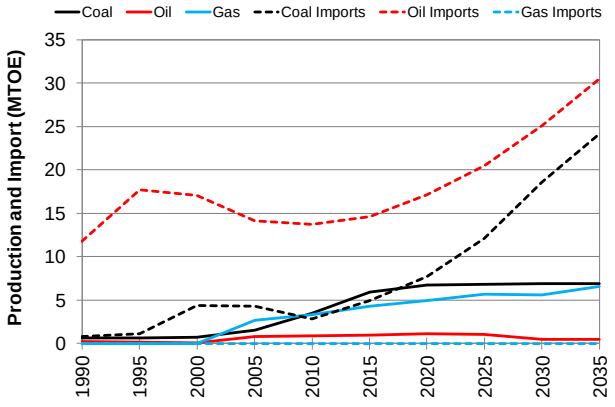
Oil will continue to dominate the economy's energy mix from 2010–2025, accounting for one-third of its total primary energy supply. This is mostly driven by the transport sector which will consume more than 60% of the economy's total oil supply during the period. In terms of growth, coal will grow the fastest at an average annual rate of 6.5% during the outlook period. By end of 2025, coal is likely to exceed oil in the primary energy supply, mainly as a result of coal use for electricity generation.

Figure RP4: BAU Primary Energy Supply



Source: APERC Analysis (2012)
Historical Data: *World Energy Statistics 2011* © OECD/IEA 2011

Figure RP5: BAU Energy Production and Net Imports



Source: APERC Analysis (2012)
Historical Data: *World Energy Statistics 2011* © OECD/IEA 2011

The Philippines' total primary energy supply is projected to grow moderately at an annual rate of 3% over the next 25 years. This translates to the 2010 supply level of 39.6 Mtoe expanding to 83 Mtoe by 2035. Its modest domestic production of energy resources will not sustain the economy's fuel requirements over the outlook period. Hence, the economy will continue to rely mostly on imports.

While new gas finds and other potential indigenous coal and renewable energy sources are projected to come into production within the outlook period, more than half of the economy's requirements will be imported. Consequently, most of the economy's oil supply will be imported, reaching 30 Mtoe of oil imported by 2035, from its 2010 level of 13.7 Mtoe.

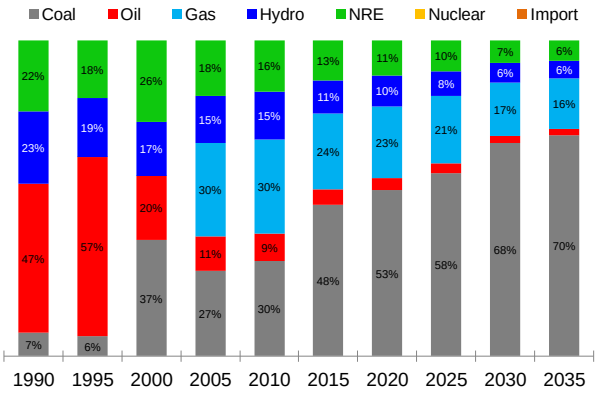
Due to the significant contribution of coal in the economy's energy mix, particularly with coal generation reaching about 70% of total electricity generation by 2035, a total of 28 Mtoe of coal will be needed over the outlook period. Indigenous coal production is estimated to increase at an average annual rate of 2.7% from its current level, to reach 7 Mtoe by 2035. However, the economy's coal imports will continue to grow over the outlook period.

The economy's new renewable energy (NRE) supply is expected to continue to contribute significantly to the total primary energy supply. Despite a modest annual growth rate of 0.2%, NRE will likely account for about 20% of the economy's total primary energy supply by 2035.

ELECTRICITY

The economy's total power generation will increase by 4.2% during the outlook period. This translates to an increase from the 2010 level of 67 TWh to 187 TWh by 2035.

Figure RP6: BAU Electricity Generation Mix



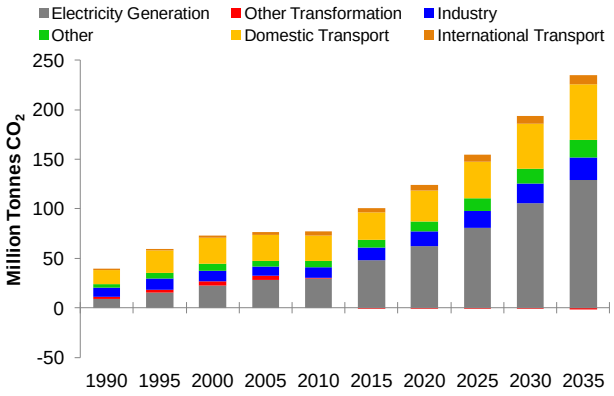
Source: APERC Analysis (2012)
Historical Data: *World Energy Statistics 2011* © OECD/IEA 2011

Electricity output from coal is likely to dominate power generation, accounting for more than half of the economy's total gross generation by 2035. The output from coal generation will reach 130 TWh by 2035, up from 20 TWh in 2010. Electricity generated from hydro and NRE will increase modestly by less than 1% annually from 2010 to 2035, posting a combined output of 22 TWh by 2035. Currently, natural gas accounts for almost 30% of the economy's power generation and is expected to increase moderately by 1.7% annually over the next 25 years.

CO_2 EMISSIONS

APERC's projection showed the economy's CO_2 emissions increasing 4.5% annually during the outlook period. This translates from CO_2 emission levels of 75.9 million tonnes in 2010 to 230.2 million tonnes by 2035. This is due to the projected increase in fossil fuels consumption, especially in coal for power generation. Emissions from electricity generation grow by 6% per year and from coal-fired generation by 7.4% per year.

Figure RP7: BAU CO_2 Emissions by Sector



Source: APERC Analysis (2012)

The Table RP1 shows the total change in CO_2 emissions from fuel combustion will be influenced largely by the change in GDP, and the reduction in energy intensity of GDP (energy efficiency) will be mostly offset by the CO_2 intensity of energy (fuel switching to increase the use of fossil fuels, especially coal).

Table RP1: Analysis of Reasons for Change in BAU CO_2 Emissions from Fuel Combustion

(Average Annual Percent Change)

	1990-2005	2005-2010	2005-2030	2005-2035	2010-2035
Change in CO_2 Intensity of Energy	2.4%	-0.2%	1.3%	1.2%	1.5%
Change in Energy Intensity of GDP	-1.3%	-4.3%	-2.1%	-1.9%	-1.5%
Change in GDP	3.4%	4.9%	4.6%	4.6%	4.5%
Total Change	4.6%	0.3%	3.8%	3.8%	4.5%

Source: APERC Analysis (2012)

CHALLENGES AND IMPLICATIONS OF BAU

Under business-as-usual assumptions, the Philippines projections reflect positive economic growth, in line with the economy's own projections. This will be matched by a corresponding growth in energy demand. The Philippines Government has a vision to achieve energy independence, and a goal to ensure the delivery of secure, sustainable, sufficient,

affordable and environment-friendly energy to all economic sectors.

The birth of a natural gas industry brings the Philippines closer to the government's goal, and has earned the economy a place alongside other significant Asian economies in the APEC region's natural gas markets. It remains to be seen whether the extent of the economy's natural gas supply will be sufficient for its domestic requirements. The Philippines' natural gas industry can still be considered young, meaning there is a vast opportunity for developing policies to ensure the full achievement of its goal.

Despite its low per capita emissions of 1.7 tonnes of CO_2 by 2035, the BAU projection indicates that the growth rate of CO_2 emissions in the Philippines will be high at 4.5% annually from 2010–2035. This alarming rate should spur the economy into taking measures to ensure environmental sustainability. Since the electricity sector has the highest emissions growth, it is proposed that improvement measures should focus on this sector. This will happen by improving energy efficiency in the electricity generation, transmission and distribution sub-sectors as well as intensifying the implementation of the RE Law which would consequently reduce fossil fuels consumption.

ALTERNATIVE SCENARIOS

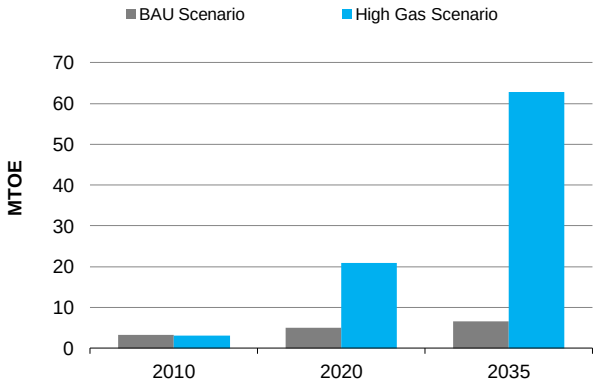
To address the energy security, economic development, and environmental sustainability challenges posed by the business-as-usual (BAU) outcomes, three sets of alternative scenarios were developed for most APEC economies.

HIGH GAS SCENARIO

To understand the impacts higher gas production might have on the energy sector, an alternative 'High Gas Scenario' was developed. The assumptions behind this scenario are discussed in more detail in Volume 1, Chapter 12. The scenario was built around estimates of gas production that might be available at BAU scenario prices or below if constraints on gas production and trade could be reduced.

The High Gas Scenario in the Philippines assumed natural gas production would reach 62.7 Mtoe in 2035, 10 times more than the production level under BAU (see Figure RP8). This potential production scenario was taken from a joint study done in cooperation with the Japan International Cooperation Agency (JICA, 2012). The increase in production will begin to take place in 2017, with production levels twice those under the BAU scenario in that year. This additional gas production will mostly likely come from the Malampaya gas fields.

Figure RP8: High Gas Scenario – Gas Production



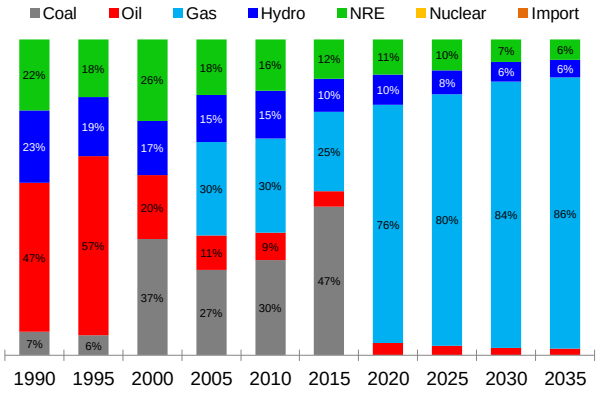
Source: APERC Analysis (2012)

An increase in natural gas production will likely spur the development of additional infrastructure, such as the expansion of natural gas fired power generation capacity, LNG (liquefied natural gas) terminals and several pipelines to extend the use of gas in other sectors, and the construction of additional CNG refueling stations for natural gas vehicles (NGVs).

In the High Gas Scenario, additional gas production will not be exported through gas pipelines. For gas pipeline exports to take place, the Philippines will need to commit to the Trans-ASEAN gas pipeline project requirements (ASCOPE, 2010).

Additional gas in the High Gas Scenario was assumed to replace coal in electricity generation in the Philippines from 2019. As shown in Figure RP9, the electricity generation from the assumed gas production will reach 161 TWh in 2035, which is 86% of the total electricity output of the economy.

Figure RP9: High Gas Scenario – Electricity Generation Mix

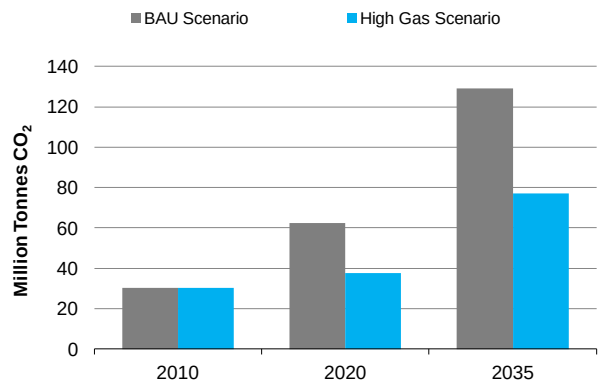


Source: APERC Analysis (2012)
Historical Data: *World Energy Statistics 2011* © OECD/IEA 2011

Figure RP9 may be compared with the BAU case graph in Figure RP6. It can be seen that the gas share has reached more than 70% of the total electricity generation input by 2035, completely displacing the coal share in the Philippines electricity generation mix.

Since gas has roughly half the CO_2 emissions of coal per unit of electricity generated, this had the impact of reducing CO_2 emissions in electricity generation by 40% by 2035. This is compared to the BAU emissions level of 129 million tonnes CO_2 (see Figure RP10).

Figure RP10: High Gas Scenario – CO_2 Emissions from Electricity Generation



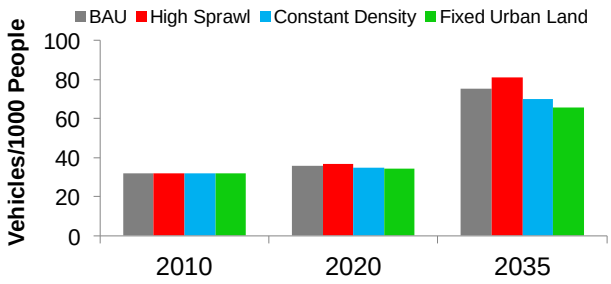
Source: APERC Analysis (2012)

ALTERNATIVE URBAN DEVELOPMENT SCENARIOS

To understand the impacts of future urban development on the energy sector, three alternative urban development scenarios were developed: 'High Sprawl', 'Constant Density', and 'Fixed Urban Land'. The assumptions behind these scenarios are discussed in Volume 1, Chapter 5.

As urbanization in the Philippines increases rapidly in the next 25 years, so will vehicle ownership. Figure RP11 shows this change in vehicle ownership under BAU and the three alternative urban development scenarios.

Figure RP11: Urban Development Scenarios – Vehicle Ownership

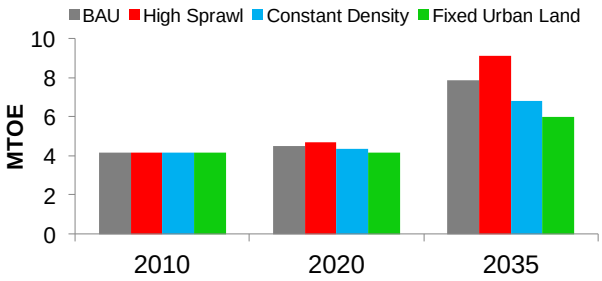


Source: APERC Analysis (2012)

Vehicle ownership in the High Sprawl scenario will be 8% higher than BAU in 2035, but 13% lower than BAU in the Fixed Urban Land scenario. This means that significant urban planning would have a direct effect on vehicle ownership in the long run, specifically in metropolitan Manila which was identified by the World Bank as one of 120 largest cities in the world.

Consequently, the oil consumption of light vehicles changed considerably under BAU and the three alternative urban development scenarios. Figure RP12 shows light vehicle oil consumption will be noticeably higher in the High Sprawl scenario, at 16% compared to BAU in 2035. On the other hand, light vehicle oil consumption in the Fixed Urban Land scenario is 24% lower than BAU by 2035, as travel distances per vehicle and vehicle ownership in more compact cities are both significantly reduced.

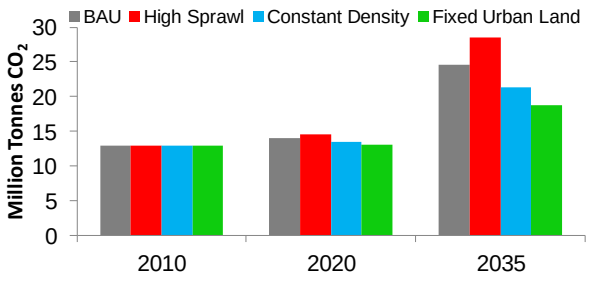
Figure RP12: Urban Development Scenarios – Light Vehicle Oil Consumption



Source: APERC Analysis (2012)

Figure RP13 shows the change in light vehicle CO_2 emissions under BAU and the three alternative urban development scenarios. The impact of urban planning on CO_2 emissions is similar to the impact of urban planning on energy use, since there is no significant change in the mix of fuels used under any of these scenarios. Light vehicle CO_2 emissions would be 16% higher in the High Sprawl scenario compared to BAU in 2035, and about 24% lower in the Fixed Urban Land scenario.

Figure RP13: Urban Development Scenarios – Light Vehicle Tank-to-Wheel CO_2 Emissions



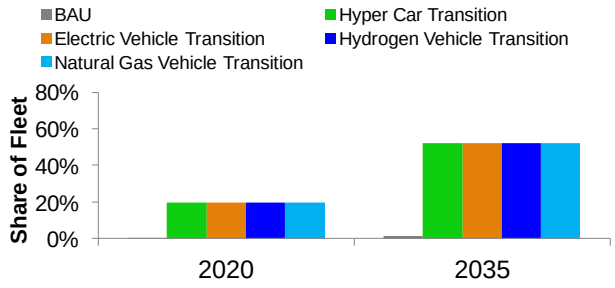
Source: APERC Analysis (2012)

VIRTUAL CLEAN CAR RACE

To understand the impacts of vehicle technology on the energy sector, four alternative vehicle scenarios were developed: 'Hyper Car Transition' (ultra-light conventionally-powered vehicles), 'Electric Vehicle Transition', 'Hydrogen Vehicle Transition', and 'Natural Gas Vehicle Transition'. The assumptions behind these scenarios are discussed in Volume 1, Chapter 5.

Figure RP14 shows the evolution of the vehicle fleet under BAU and the four 'Virtual Clean Car Race' scenarios. By 2035, the share of the alternative vehicles in the vehicle fleet is assumed to reach about 52% compared to about 1.6% in the BAU scenario. The share of conventional vehicles in the fleet is thus only about 48% compared to about 98.4% in the BAU scenario.

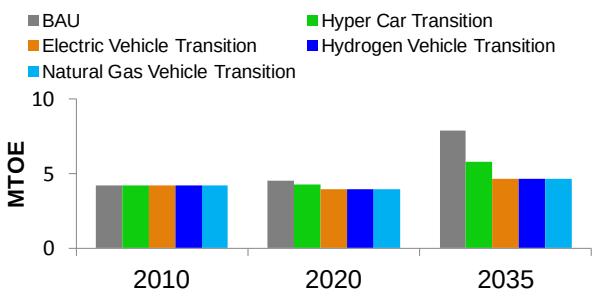
Figure RP14: Virtual Clean Car Race – Share of Alternative Vehicles in the Light Vehicle Fleet



Source: APERC Analysis (2012)

Figure RP15 shows the change in light vehicle oil consumption under BAU and the four alternative vehicle scenarios. Oil consumption drops significantly by 41% in the Electric Vehicle Transition, Hydrogen Vehicle Transition, and Natural Gas Vehicle Transition scenarios compared to the BAU scenario. The drop is large as these alternative vehicles use no oil. Oil demand in the Hyper Car Transition scenario is also significantly reduced by 26% compared to BAU by 2035, even though these highly-efficient vehicles still use oil.

Figure RP15: Virtual Clean Car Race – Light Vehicle Oil Consumption

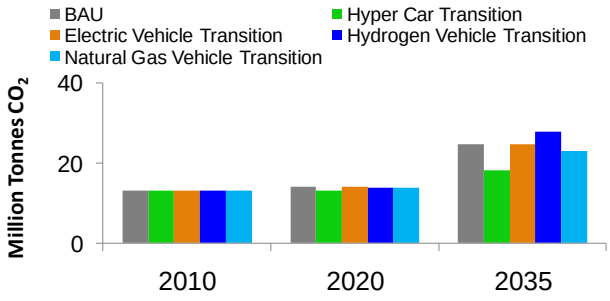


Source: APERC Analysis (2012)

Figure RP16 shows the change in light vehicle CO_2 emissions under BAU and the four alternative vehicle scenarios. To allow for consistent comparisons, in the Electric Vehicle Transition and Hydrogen Vehicle Transition scenarios, the change in CO_2 emissions is defined as the change in emissions from electricity and hydrogen generation. The emissions impacts of each scenario may differ significantly from their oil consumption impacts, since each alternative vehicle type uses a different fuel with a different level of emissions per unit of energy.

In the Philippines, the Hyper Car Transition scenario is the clear winner in terms of CO_2 emissions reduction with emissions reduced by 26% compared to BAU in 2035. The Natural Gas Vehicle Transition scenario reduced emissions slightly, by 6% compared to BAU. The CO_2 emissions from the Electric Vehicle Transition scenario showed no difference compared to BAU in 2035. This may be caused by the high prevalence of coal in the electricity generation mix. The Hydrogen Vehicle Transition scenario offers no emissions reduction benefits—emissions increased by 13% compared to BAU in 2035. (To facilitate fair comparisons, the Electric Vehicle Transition and Hydrogen Vehicle Transition scenarios assumed no additional non-fossil utilization for their energy production.)

Figure RP16: Virtual Clean Car Race – Light Vehicle CO_2 Emissions



Source: APERC Analysis (2012)

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