Chapter 10. ENERGY

I. Introduction

1. The Philippine energy sector is committed to pursue the main strategies to achieve the National Development Agenda of President Gloria Macapagal-Arroyo. This agenda includes macroeconomic stability, job creation, social development, decentralized development, and good governance and national harmony.

2. The Medium-Term Development Plan covers energy independence and power sector reforms. Greater energy independence will be achieved by increasing oil and gas exploration, developing renewable energy, expanding the use of natural gas, forging strategic alliances, and promoting energy efficiency and conservation. Power sector reforms, intended to reduce electricity rates, include resolving the problem of the losses of the National Power Corporation, encouraging private sector participation in power generation, and achieving total barangay electrification by 2008.

3. Sustainable energy development and consumption are anchored on six dimensions, namely, economic, ecological, technological, political, socio-cultural, and institutional. On the economic dimension, sustainable energy development must benefit the greater majority. This means that cheap and affordable energy prices must be available for energy consumers. People can easily access energy services when they need them. The ecological dimension means that embracing sustainable energy concepts will not harm the environment and regeneration capacity of natural resources. Sustainable energy development also considers the use of environmentally sound technologies such as renewable energy and energy efficiency technologies.

4. The political dimension of sustainable energy development refers to empowering the Filipino people to participate in the planning and implementation of sustainable energy projects. By participating in these processes, the people own and share the benefits of sustainable energy. The values, beliefs, and worldview of a community which are consistent with human ecological principles (e.g. peacekeeping, life giving) will be enhanced when the socio-cultural dimension of sustainable energy is considered. To complete the requirements of sustainable energy development, the institutional dimension should be zeroed in. This involves the designation of responsible institutions which can sustain development activities.

II. Current Status and Trends

5. The Philippines has experienced several energy crises in the past 23 years. In 1972, 92% of the energy requirement of the country was supplied with imported oil as shown in Figure 10.1. Through the years, efforts were made to increase the level of energy self-sufficiency by increasing the supply of indigenous energy. In 2004, 140.99 million barrels of fuel oil equivalent (MMBFOE) were sourced from indigenous energy and 130.36 MMBFOE were imported energy, resulting in a 51.96% rate of energy self-sufficiency. Figure 10.2 shows the amount of indigenous and imported energy supply from 1973 to 2004.

Fig. 10.1 Oil Self-Sufficiency Level (1973-2004)

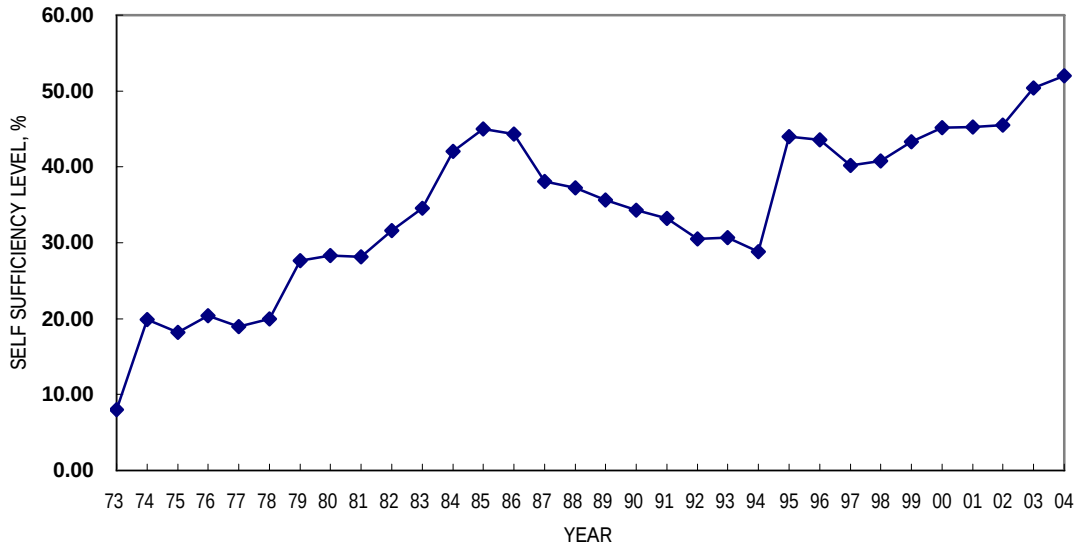
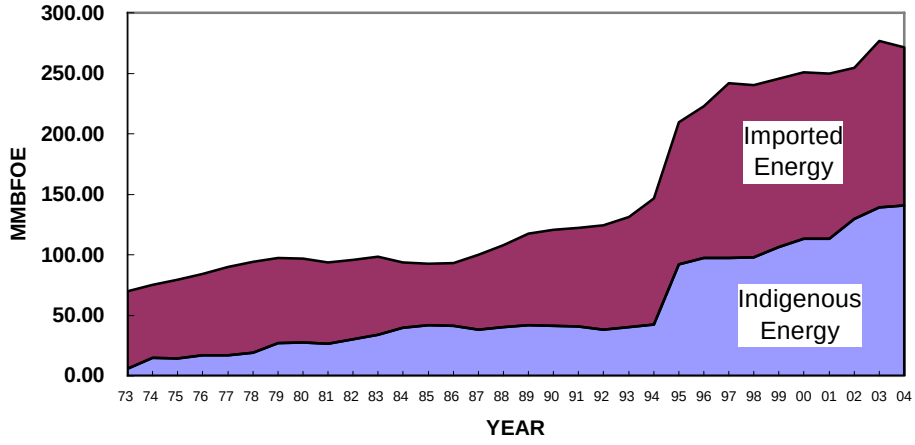


Fig. 10.2 Imported Energy vs. Indigenous Energy



6. Recognizing the need to prepare the country for future energy curtailment, strategies have been identified and fleshed out into a five-point reform package plan that includes an energy sector framework anchored on energy independence and power market reforms.

7. With energy independence as its theme, the 2005-2014 Philippine Energy Plan Update calls for the development of the country's indigenous energy resources and promotion of clean technologies to sustain energy-efficient energy supply and demand chains that will eventually lead to increased self-reliance and provide the much-needed boost to the country's economic front. An energy self-sufficiency level target of 60% was set for 2010 through the following:

- increasing indigenous oil and gas reserves by 20% through the renewal of exploration and production efforts in existing sedimentary basins

- aggressively developing renewable energy resources and maximizing the contributions of geothermal, hydropower, biomass, solar, wind, and ocean energy sources by instituting favorable policies and incentive packages for industry participants

- increasing the use of alternative fuels such as natural gas, coconut methyl ester (CME), ethanol, and auto gas

- forging strategic alliances with other countries and increasing participation in energy activities, including technology and information exchange, trade and investment facilitation, and agreements on various energy issues, such as energy security, pricing, and sector reforms

- promoting a strong energy efficiency and conservation program aimed towards annual savings for the country and deferred construction of power-generating facilities

A. Primary Energy Supply

8. In 2004, the total primary energy supply reached 252.49 MMBFOE. Oil remains the major source of energy for the country despite its reduced share in the total primary energy supply from 92% in 1973 (64.22 MMBFOE) to 44.17% in 2004 (111.53 MMBFOE) as shown in Figure 10.3. Figure 10.4, on the other hand, shows the percentage share of fuel in the total primary energy supply.

9. The country's indigenous oil supply is sourced mainly from the cyclic production of the Nido and Matinloc fields. Oil supply from these fields reached only 148,582 barrels in 2003. In 2004, only 4.5% (5.03 MMBFOE) came from local production while 95.5% (106.50 MMBFOE) was imported.

10. Natural gas, on the other hand, is considered the fuel of choice for the 21st century. It continues to be the major indigenous petroleum resource in the country. The Malampaya gas field produces natural gas to fuel the Ilijan, Sta. Rita, and San Lorenzo onshore power plants in Luzon. Total gas production from the Malampaya and San Antonio fields was recorded at 94,803 million standard cubic feet in 2003. In 2004, natural gas contributed 12.36 MMBFOE to the primary energy supply.

Fig. 10.3 Total Primary Sources of Energy Supply (1973 -2004)

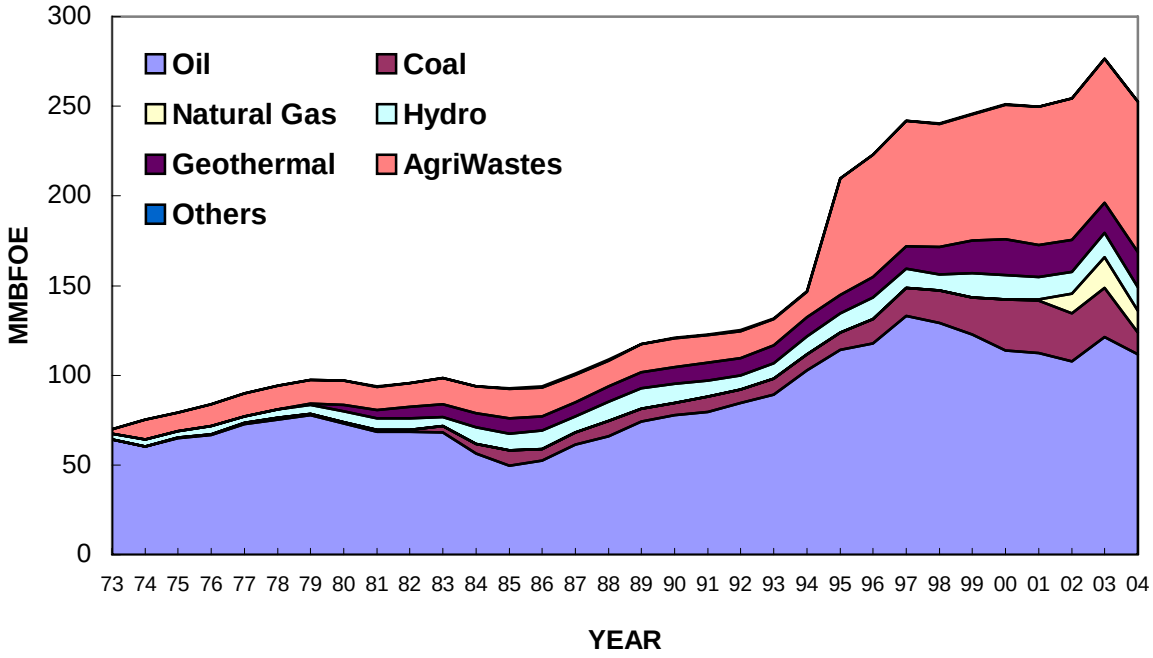
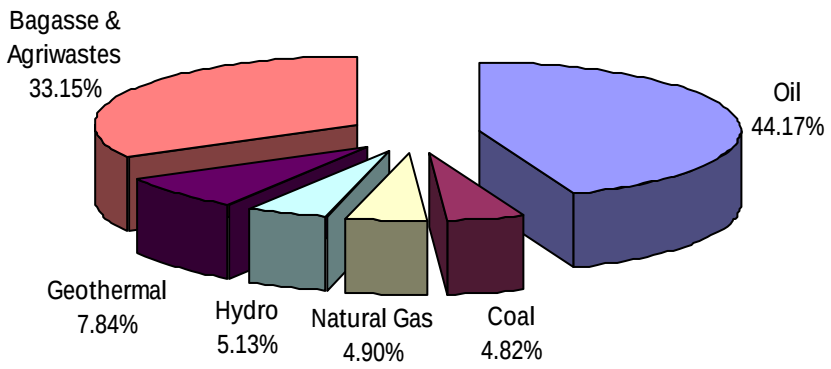


Fig. 10.4 Sources of Primary Energy Supply (2004)

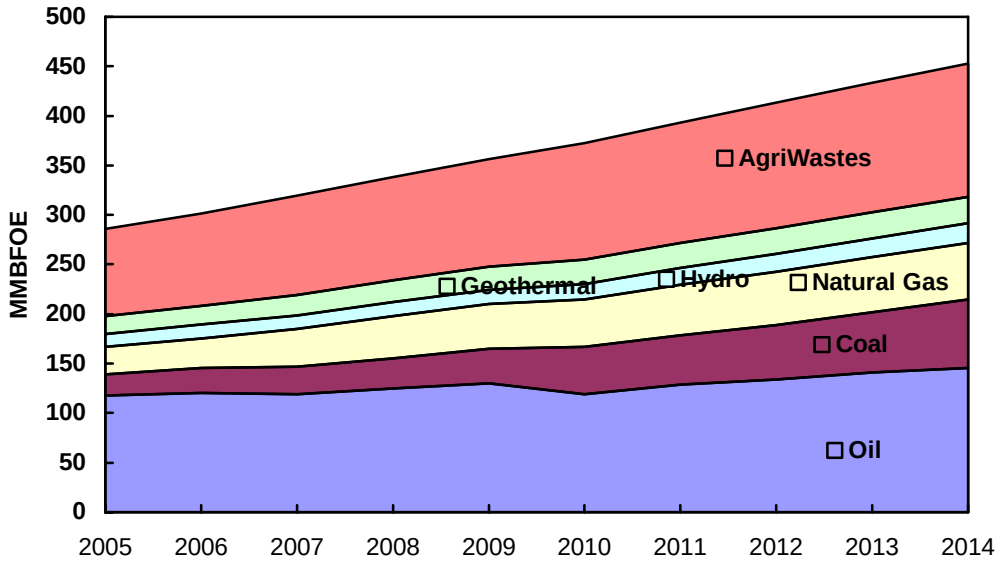


11. Coal contributes to the sustainable energy development goals of the country in achieving energy self-sufficiency. It does this through intensified sustainable exploration, development, and production of coal, and the establishment of a progressive coal industry that provides employment in host communities. In 2004, coal contributed 31.42 MMBFOE in the primary energy mix, 77.2% of which was imported.

12. Renewable energy makes up the rest of the primary energy mix. It has a percentage share of 46.12% and consists of geothermal, hydro, biomass, solar, and wind energy. This is due to the government's policy to expand the generating capacity of renewable energy resources. Geothermal and hydro energy contributed 19.80 MMBFOE and 12.95 MMBFOE, respectively, in 2004, while bagasse, agriwastes, and other biomass materials contributed 83.69 MMBFOE. Geothermal energy remains a significant source of power, while hydropower increased its generating capacity.

13. For the next ten-year planning period, primary energy demand will increase from 271.75 to 452.91 MMBFOE in 2014 as shown in Figure 10.5. This is an average annual increase of 6.6% for the primary energy supply.

Fig. 10.5 Primary Energy Supply (2005-2014)



B. Final Energy Use

14. In 2004, final energy consumption reached 205.53 MMBFOE. This is equivalent to a 4.93% increase from the final energy consumption in 2003 of 195.87 MMBFOE. The residential sector had the largest share of 38%, followed by the transport sector with 29%, and the industrial sector with 24%, as shown in Figures 10.6 and 10.7.

1. Residential Sector

15. The residential sector is the largest energy consumer in the country. It used 78.30 MMBFOE in 2004, which was a 4.83% increase from 2003 consumption. The increase in consumption in the residential sector may be due to the growth in population and increase in income levels and electrical appliance use. The sector uses both commercially available fuels such as liquefied petroleum gas (LPG), kerosene, and electricity, and traditional fuels like firewood, rice hull, and charcoal. Figure 10.8 shows that the major fuels used in the residential sector are firewood and charcoal.

Fig. 10.6 Final Energy Consumption by Sector (2002-2004)

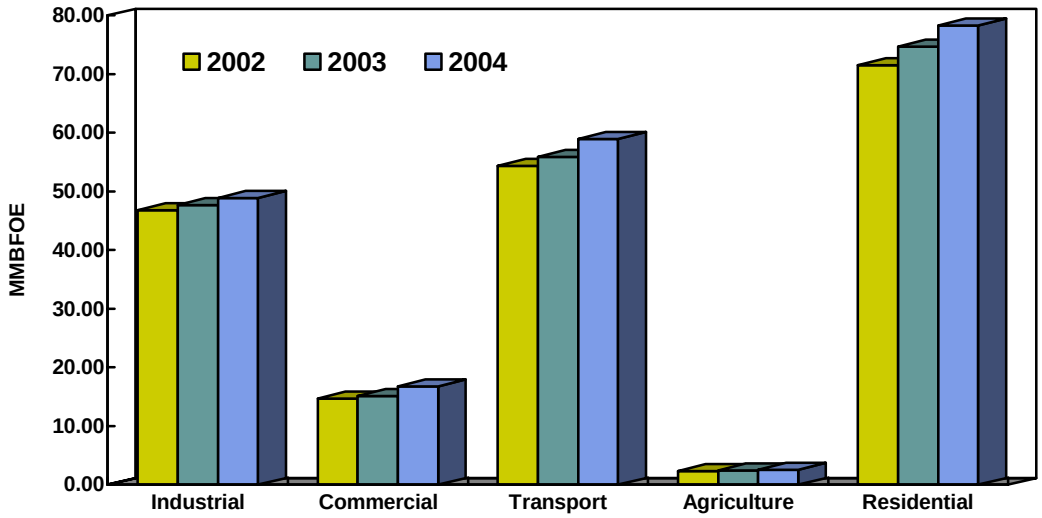


Fig. 10.7 Percentage Share of Different Sectors in Total Energy Consumption (2004)

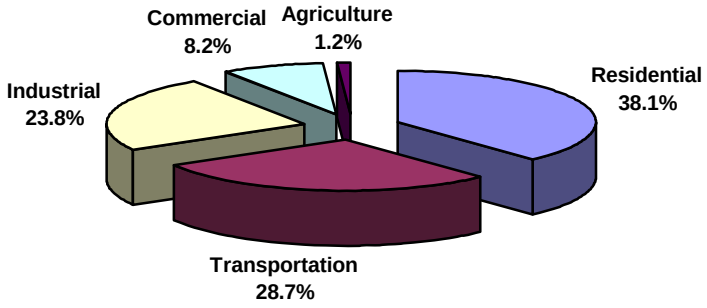
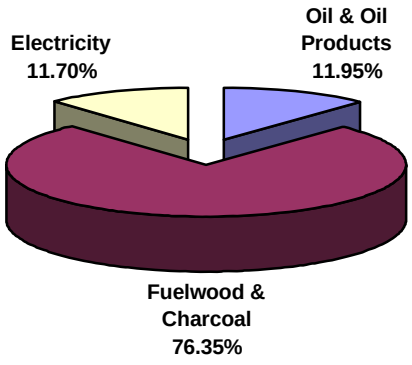


Fig. 10.8 Fuels Used in the Residential Sector



16. Based on the 2004 Household Energy Consumption Survey, 87.6% of the total number of households used electricity as shown in Table 10.1. Considering income, more than 70% of the households belonging to the lowest income group, i.e., with income less than 5,000 pesos, still used firewood, charcoal, and biomass residues. Meanwhile, middle-income households commonly use kerosene and LPG for their fuel needs while those in the upper income group use LPG and electricity.

17. Energy use in the residential sector is mainly for lighting, cooking, recreation (i.e., television viewing or radio listening), or heating bath water.

Table 10.1 Fuel Used in Households

Fuel	Number of Households (in thousands)	Percentage of the Total Number of Households
Electricity	14,571	87.6
Liquefied petroleum gas	8,617	51.8
Kerosene	9,372	56.3
Firewood	9,196	55.3
Charcoal	5,685	34.2
Biomass residues	3,151	18.9

Total number of households = 16,640,000
Source: National Statistics Office

2. Transportation Sector

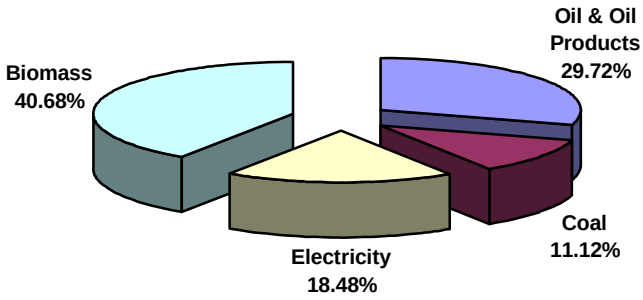
18. The transportation sector is the second-largest consumer of energy. Almost all sectors of the economy depend on the transport sector for the delivery of goods, development of commercial networks, and integration of market structures. Road, air, railway, and water transport consumed 59 MMBFOE in 2004. This was an increase of 5.6% from the 2003 consumption data. Oil products, such as diesel and gasoline, remain the dominant fuel used in the transportation sector and have a 99.92% consumption share. The use of CME or biodiesel has also been introduced as an alternative fuel.

19. Energy use in road transport increased due to the increase in the number of registered motor vehicles. Likewise, electricity use in the railway system increased due to the growing demand for an efficient transportation system, as shown by the increase in the number of passengers.

3. Industrial Sector

20. The industrial sector, which consists of the manufacturing, mining, and construction sub-sectors, is the second-largest contributor to the country's economic output and the third-largest sector in terms of energy consumption. Electricity, petroleum products, coal, and biomass are the major fuels used as shown in Figure 10.9. In 2004, final energy consumption reached 48.92 MMBFOE. This figure shows a 2.5% increase from the 2003 consumption. Biomass, such as bagasse, supplied 40.68% of the total consumption, while oil products supplied 29.72%. Major industries include cement, iron and steel, food and beverages, sugar, semiconductor, pulp and paper, and glass.

Fig. 10.9 Fuels Used in the Industrial Sector



21. In September 2005, the Value of Production Index (VaPI) for the manufacturing industry on a year-on-year basis registered an increase of 9.7% from a double-digit growth of 17.9% in August 2005, according to the preliminary results of the Monthly Integrated Survey of Selected Industries. Sectors that significantly attributed to the increase were furniture and fixtures, petroleum products, leather products, chemical products, miscellaneous manufactures, and rubber products.

22. However, VaPI on a monthly basis improved by 1.8% in September 2005. Notable increases were shown by furniture and fixtures and beverages sectors. Year-on-year growth rates are computed by dividing the current month index by previous year same month index less one. Month-on-month growth rates are computed by dividing the current month index by previous month index less one.

23. On the other hand, Volume of Production Index (VoPI) on a year-on-year basis showed a decrease of 5.0% in September 2005 from a 5.0% increase in the previous month. This was due to lesser production demand in the sectors of wood and wood products, machinery excluding electrical, electrical machinery, basic metals, and publishing and printing. On a month-on-month comparison, VoPI dropped by 1.8% in September 2005. This was brought about by the slowed performance in production of the non-metallic mineral products sector.

24. Tables 10.2 and 10.3 show the VaPI and the VoPI as of September 2005 on a year-on-year basis and a month-on-month basis, respectively, for selected manufacturing industries.

Table 10.2 Value of Production Index (VaPI) and Volume of Production Index (VoPI) on a Year-on-Year Growth Basis

Selected Industries	VaPI (1994 = 100)		VoPI (1994 = 100)	
	September 2005	August 2005	September 2005	August 2005
Food manufacturing	4.9	11.2	2.0	7.2
Beverage	-0.1	1.1	-3.8	-2.5
Chemical products	23.2	26.8	15.3	18.3
Non-metallic mineral products	-0.7	21.8	-8.7	13.3
Rubber products	10.9	5.2	9.7	4.9
Textile	5.7	15.3	4.3	12.7
Basic metals	-3.9	7.9	-15.2	-7.2
Paper and paper products	-9.1	7.5	-9.1	7.9

Source: National Statistics Office, 2005

Table 10.3 Value of Production Index (VaPI) and Volume of Production Index (VoPI) on a Month-on-Month Growth Basis

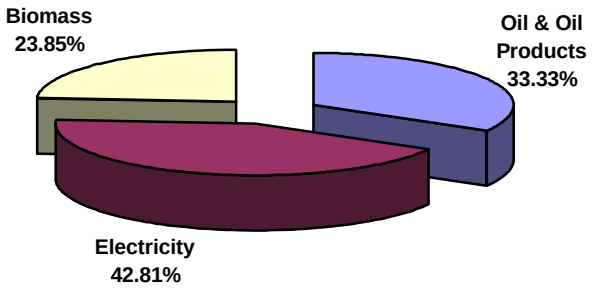
Selected Industries	VaPI (1994 = 100)		VoPI (1994 = 100)	
	September 2005	August 2005	September 2005	August 2005
Food manufacturing	2.2	2.3	2.3	2.5
Beverage	12.7	-10.6	12.7	-10.6
Chemical products	5.5	-0.9	4.9	-0.9
Non-metallic mineral products	-8.7	1.9	-10.6	0.0
Rubber products	7.6	-3.8	6.8	-3.8
Textile	-7.5	9.8	-7.0	10.4
Basic metals	-4.2	7.2	-3.9	6.4
Paper and paper products	-5.2	2.9	-5.9	4.2

Source: National Statistics Office, 2005

4. Commercial Sector

25. The commercial sector is becoming a growing consumer of energy. Final energy consumption in 2004 reached 16.77 MMBFOE. Oil products, biomass, and electricity are the major forms of energy used, as shown in Figure 10.10.

Fig. 10.10 Fuels Used in the Commercial Sector



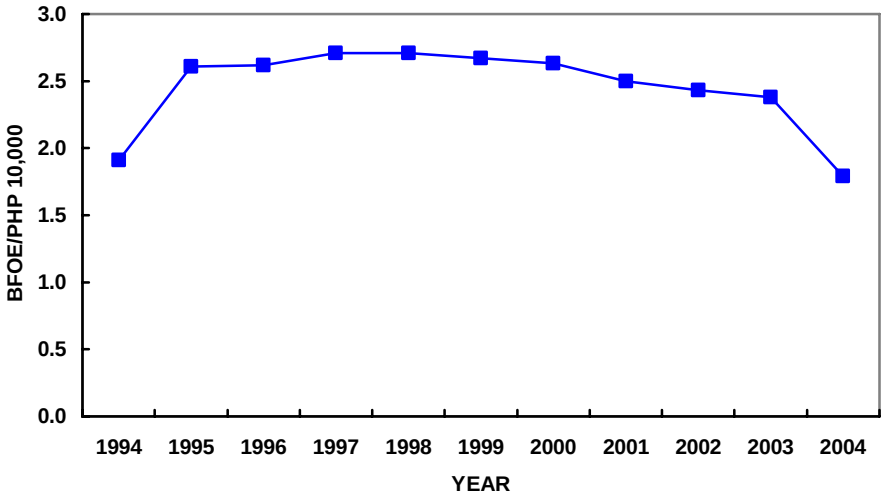
5. Agricultural Sector

26. The agricultural sector consumed the least amount of energy among the sectors of economy. It consists of the fishery, livestock, unmilled rice, corn, and sugar sub-sectors. It consumed 2.54 MMBFOE in 2004, 98.03% of which came from oil and oil products.

C. Energy Intensity and Energy-to-GDP Elasticity

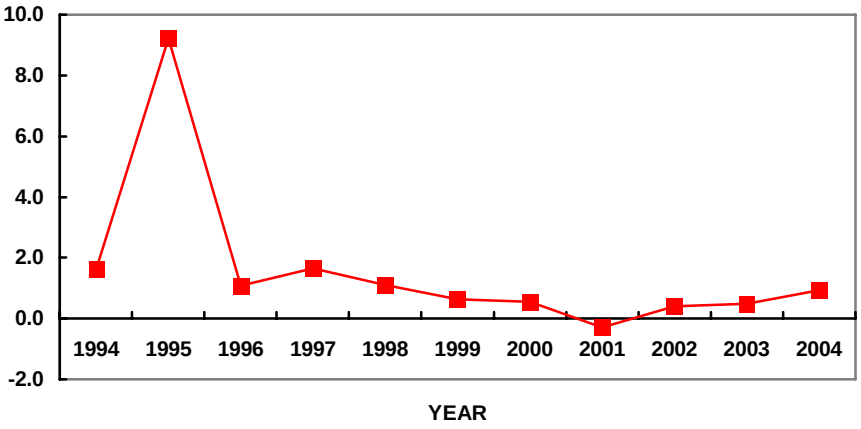
27. Energy intensity is a measure of the amount of energy consumed for each unit of Gross Domestic Product (GDP). The energy intensity in 2004 is 1.79 barrels of fuel oil (BFOE) equivalent per 10,000 pesos of GDP as shown in Figure 10.11, relatively lower from the 2003 level of 2.39 BFOE. This is due to increasing Gross Value Added of less energy-intensive sectors such as the services sector.

Fig. 10.11 Energy Intensity in the Philippines



28. The energy-to-GDP is another measure of the behavior of how energy is consumed. It indicates how energy consumption responds to a change in real GDP. In 2004, the energy-to-GDP slightly increased to 0.937 from 0.48 in 2003 as shown in Figure 10.12.

Fig. 10.12 Energy-to-GDP Elasticity



III. Critical Issues, Challenges, and Opportunities

29. Sustainable energy development has been a part of the Philippine national energy framework for the last 25 years. Recognizing the need for the country to sustain its energy supply, efforts have been made to develop and promote the use of indigenous energy resources such as oil, coal, natural gas, and renewable forms of energy. Increased use of indigenous energy resources will lessen dependency on imported fuel.

30. In recent years, an environmental dimension has been added to the Philippine national energy framework. Responding to the global call to lessen the effects of climate change, policymakers have considered the adoption of clean and renewable energy and the promotion of the efficient use of energy.

31. Nowadays, the use of alternative fuels such as biodiesel and bioethanol are being actively encouraged because of the continuing increasing in energy prices in the world market. Alternative energy systems such as biogas and biomass energy systems are also being given attention.

32. Despite the efforts to promote sustainable energy development in the Philippines, however, 49% of the country's energy requirements are still sourced from abroad. The challenge to reduce this energy dependency still remains. In the near future, the energy sector must address critical issues to effectively carry out sustainable urbanization. Several opportunities exist for the promotion and adoption of sustainable energy.

A. Energy Security Issues

33. The country has experienced many energy crises—in terms of energy supply and increased local energy prices—in the past. The country is vulnerable to the ups and downs of the world oil market. There also exists a high potential for conflict, sabotage, disruption of production and trade, and reduction in strategic energy reserves in the global scene. These potential disruptions can threaten local energy supply and result in sudden price spikes and disruptions in economic growth. With almost 50% of the country's energy requirements coming from imported fuel, the country is highly vulnerable to such energy supply and economic disruptions.

34. Energy security is the availability of energy at all times in various forms, in sufficient quantities, and at affordable prices, without unacceptable or irreversible impact on the environment.[1] These are the conditions that have to be met in addressing sustainable development. While the country has put energy security on top of the agenda, certain issues still need to be threshed out to fulfill the conditions of sustainable development.

35. One of the key policy issues of sustainable energy is the presence of strong support from the government through policies, laws, and regulations encouraging the adoption of sustainable forms of energy such as renewable energy. At present, there are pending energy bills in both the upper and lower houses of the legislative branch of the government which need to be passed to address energy security concerns. These bills include the proposed Renewable Energy (RE) Bill and the Biofuels Bill. Both bills will address energy supply and will prevent excessive dependence on fossil fuel imports.

36. The RE Bill aims to establish the framework for the accelerated development and advancement of renewable energy resources through the granting of fiscal and non-fiscal incentives to all RE activities, as well as the development of a strategic program to increase the use of RE. The proposed non-fiscal incentives in the bill consist of the introduction of the renewable portfolio standards (RPS), renewable energy market (REM), renewable energy certificates (RECs), Green Energy Option program, distributed generation, and net metering.

37. RPS is a cost-effective ad market-based policy that requires electric suppliers to meet a specific portion of their energy supply needs with eligible forms of renewable energy, such as geothermal, hydro, wind, solar, and biomass energy. The introduction of RECs and the REM will provide opportunities to procure and support renewable energy. RECs represent the amount of electricity generated from renewable energy resources. For example, one unit of REC is equivalent to one megawatt-hour (mWh). For every mWh of power generated from renewable resources, this will displace one mWh of power generated from conventional sources, most of which burn fossil fuels. The proposed Green Energy Option program will provide end-users the option to choose renewable energy resources.

[1] World Energy Assessment, 2004

38. Distributed generation and net metering are gaining wide acceptance in other countries as strategies for increasing the introduction of renewable energy in the country. Distributed generation refers to the placement of individual and smaller electric generation units, which use renewable sources of energy as fuel, at residential, commercial, and industrial sites. With net metering, the end-users are provided with an opportunity to generate their own power from renewable and clean sources of energy. When they generate more electricity than they consume, this electricity can be credited to their account and can be used during the periods when they are not producing as much as they need. Net metering is a low-cost and easily administered way of promoting direct customer investment in renewable energy.

39. The Biofuels Bill, on the other hand, aims to develop and use indigenous renewable energy sources such as biomass to reduce dependence on imported oil, lessen toxic and greenhouse gas emissions, and increase rural employment and income. This bill will provide for the mandatory blending of locally produced biofuels (i.e., biodiesel and bioethanol).

40. Another path to diversifying energy supply is increasing end-use efficiency. End-use efficiency includes the introduction of energy-efficient technologies for appliances and equipment in all sectors of economy with the end view of reducing energy consumption and use. Energy efficiency and conservation have not been fully integrated into the business management systems of industrial and commercial establishments and into the everyday lives of the Filipino people. This is due to the insufficient policies and laws on energy efficiency and conservation. There is still lack of willpower on the part of the policy makers to put a stop to the increasing trend of energy consumption and use.

B. Energy and Technological Issues

41. The lack of awareness about sustainable energy technologies has hampered the introduction of new technologies in all sectors of economy. Management, business owners, transportation operators, and household heads often find existing technologies sufficient for their needs. There is a general reluctance to implement new and unproven technologies in industry. This is probably caused by the perception of high technical risk with only a minor competitive advantage.

42. While there are several sustainable energy technologies available in developed countries, there are key issues policy makers need to consider in selecting appropriate sustainable energy technologies. These issues include:

- whether technologies to extract, harvest, and convert the vast energy resources into useful applications can be developed in time to meet the growing demand for energy and reduce production from conventional reserves, particularly of oil and gas
- whether the technologies have adverse implications to the environment
- whether the energy services generated from these sustainable energy resources will be affordable

43. The adoption of sustainable energy technologies can be supported if there are policy mechanisms, laws, or standards set by the government, which will drive the different economic sectors to implement these technologies.

C. Energy and Economic Issues

44. Energy use is often measured side by side with the GDP of a certain country, city, or municipality. Increased energy use is brought about by changes in lifestyle made possible by

rising personal incomes, coupled with higher population growth rates and a shift from traditional to commercial energy. It may also be due to a shift towards less energy-intensive production and consumption patterns.

45. More energy is needed to fuel the economic growth of the country and to help deliver opportunities to the millions of Filipino people who lack access to sufficient energy services. The amount of additional energy needed to provide adequate energy services in the future will depend on how efficiently energy is produced, delivered, and used. Energy efficiency improvements can help reduce and defer financial investments for new energy supply systems.

46. Energy prices often influence policy decision makers on the type and level of energy policies, programs, and activities they will implement for a given time. These prices also influence consumer choices and behavior and can affect economic development and growth. High energy prices can stimulate the exploration and development of additional indigenous resources, create demand for new innovation, and provide incentives for efficiency improvements.

47. Much capital investment is needed for energy development. The Philippine energy sector required a total investment of 1,990 billion pesos in 2005. This figure included energy resource development, oil and natural gas downstream development, power and transmission development, expanded rural electrification, and energy efficiency and conservation. Despite the efforts of the government to provide investor-friendly policies and guaranteed incentives and benefits, few energy investments are flowing into the country. The lack of investments slows down economic growth and development.

48. Several factors hinder the entry of foreign investments in the country. Investors perceive risks as being too high. Traditional financing, which is more concerned with capital return and less sensitive to the country's needs, still prevails. Energy financing is inadequate for energy projects. Time frames for evaluating returns on large infrastructure investments are often too long to attract investment capital seeking short-tem financial returns.

49. The high initial costs of renewable energy and energy-efficient technologies hamper the adoption of sustainable and alternative forms of energy. Most power generation systems still rely on imported and cheap fuel. Industrial and commercial establishments, particularly the small and medium enterprises, cannot cope with their production needs because they cannot invest in energy-efficient technologies. The residential sector, particularly the low- to middle-income households, cannot afford to buy high-efficiency lamps or refrigerators. More often than not, high initial costs entail a long payback period. Also, there is a common notion that the implementation of energy-efficiency projects will increase industrial production costs. Hence, management focuses only on low- or no-cost investments. In many instances, parties interested in investing in sustainable energy projects find it difficult to access financing for renewable energy and energy efficiency projects.

D. Energy and the Environment

50. The government and the Filipino people are now seriously considering the environmental impacts of energy use, such as the threatening effects of climate change which are being felt in the country. They are beginning to recognize the close link between conventional energy production and consumption to environmental degradation that threatens human health and affects ecological balance. Poor air quality resulting from solid fuel use for cooking and heating has significant health and environmental impact at the household, local, regional, and global levels. The presence of industrial establishments which are emitting toxic fumes and combustion gases within residential locations is creating

air quality problems, which are now being associated with increased sickness and premature deaths.

E. Energy and Social Issues

51. Energy and social issues are intertwined. Social issues are concerned with the quality (i.e., cleanliness, reliability, and convenience) and level of access (i.e., availability, affordability, and variety) of energy services. The ability of the people to pay for energy services and their knowledge of what is available and how best to apply it affects the level of demand and type of energy services used. The lack of access to energy services is closely linked to a range of social concerns, including poverty, lack of opportunities, urbanization, and poor health.

52. Poverty is the overriding social consideration in the country today. It results in a lack of access to energy services, such as provision of electricity to households, and the absence of choice for clean and sustainable forms of energy. For low-income households, firewood is still the dominant fuel. At higher incomes, commercial fuels such as LPG and electricity have replaced firewood, resulting in greater convenience, energy efficiency, and cleanliness. Because convenient and affordable energy can contribute to a household's productivity and income-generating potential, its availability can help families and communities break out of the cycle of poverty.

53. It is widely known that population growth has a direct impact on energy by increasing demand. However, it is less widely known that access to adequate energy services is associated with increased life expectancy, reduced child mortality, and a lower number of desired births in a family.

54. Energy technology choices have important equity implications. Investments in centralized power generation systems, such as coal-fired power-generation and large dams, largely benefit high- and middle-income urban communities, commercial establishments, and industries through electricity distributed through power grids. Poor and dispersed rural communities that are far from the grid rarely benefit from access to electricity.

IV. Recommendations

55. Efficient, affordable, and reliable modern energy services are recognized as essential for sustainable development. Several options exist for using energy in ways that support sustainable development, which requires a consistent focus on social, economic, and environmental processes. These options include:

- more efficient use of energy, especially at the point of end use in buildings, transportation, and production processes
- promotion of increased reliance on renewable energy sources through information exchange, capacity-building, and technical advisory services
- accelerated development and deployment of new energy technologies, particularly, next-generation fossil fuel technologies that produce near-zero harmful emissions
- improved access to reliable and affordable energy services

- promotion of energy efficiency and sustainable consumption and tapping the vast potential for efficiency increase in production and consumption of energy, which can be realized through a combination of regulatory, institutional, and behavioral changes

- adoption of clean energy technologies and climate change