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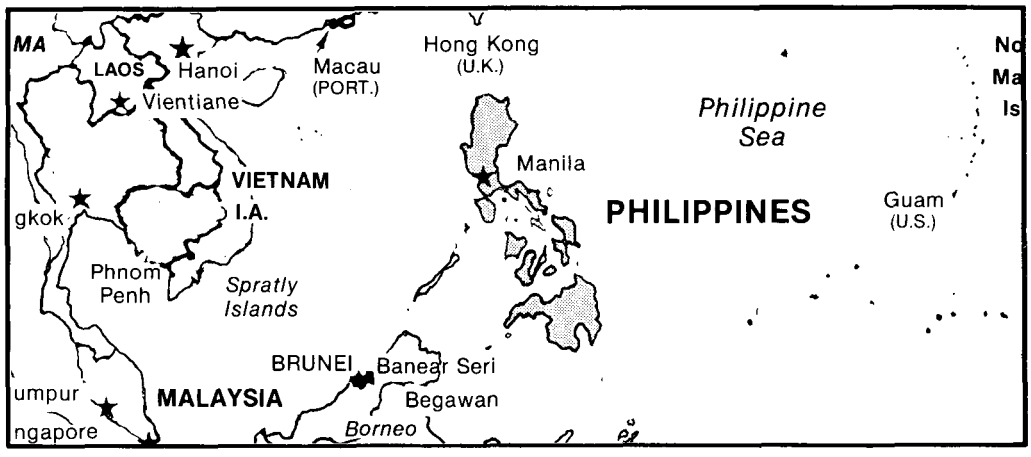
PHILIPPINES

Asia Pacific Energy Series ▪ Country Report



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DISCLAIMER

EXECUTIVE SUMMARY

GEOGRAPHY, POPULATION, AND POLITICS

- The Philippines is an archipelago that consists of over 7,000 islands and spans over 1,000 miles from north to south.

- The islands can be grouped into three major regions. The northern island is Luzon. It is the largest island and home to Manila, the center of government. The next chain of islands is the Visayan Island group, where approximately 35 percent of the population resides. The southernmost region is Mindanao, home to 20 percent of the Philippine people.

- The entire archipelago lies within the tropics. Topographically, the larger islands are mountainous as the islands comprise 65 percent of total land area. The archipelago nature of the Philippines has had strong geopolitical bearing. Due to the geographic distance between islands, local government has become very important.

- Relations with neighbors are generally friendly, but there is dispute with Taiwan, China, and Vietnam over the ownership of the Spratly Islands, which are strategically located in addition to possibly holding important reserves of petroleum and minerals. Geopolitically, the Philippines is important to the United States, as two large military facilities, Subic Bay Naval Base and Clark Air Force Base, are located there.

- Over 50 million people reside in the Philippines. They are primarily of Malay descent, although the Chinese and Spanish have had important influence. The population growth rate is now just above 2 percent per year. The official languages are Pilipino and English.

- After the ousting of Ferdinand Marcos, the Philippines still encounters political difficulties. Two insurgencies are active--the Moro National Liberation Front and the New People's Army, a Communist group. The armed forces of the Philippines attempts to quell disputes. President Aquino's Comprehensive Agrarian Reform Program may bring relief by redistributing land ownership.

THE NATIONAL ECONOMY

- Economic growth in the recent past has been negative. However, in 1986, a positive growth in GDP of 1.08 percent was experienced. In 1987 this growth increased to 5.1 percent.

- Major imports include crude oil and materials for the manufacture of electric equipment. Major exports include garments, textiles, and agricultural goods such as coconut and sugar.

- The United States is the Philippines' major trading partner. Japan is the second most important trade partner.

ENERGY POLICY

- After the oil shock of 1973, the Philippines set on a dramatic course away from oil imports. In the 1970s, the Philippines was about 80 percent dependent on foreign crude, by the mid-1980s this had dropped to less than 60 percent.

- The increase in indigenous energy production has been notable. The incorporation of geothermal hydro and biomass energy has served to decrease the demand for imported petroleum.

- During the 1970s, the Ministry of Energy (MOE) was formed. However, in 1987, the MOE was abolished and the Office of Energy Affairs (OEA) was mandated to assume part of its functions. A new policy is being planned whereby an executive energy coordinating council will be created to oversee execution and administration of energy projects and energy implementing agencies. The OEA will serve as secretariat of the council, which is expected to include the Philippine National Oil Company, National Power Corporation, the Energy Regulatory Board, and the National Electrification Administration.

ENERGY, THE ECONOMY AND ENERGY MIX

- Between 1973 and 1986, energy consumption grew at about the same rate as the population. Per capita consumption decreased due to higher oil prices.

- By the early 1980s the oil import bill accounted for about 40 percent of export revenues. However, as oil prices softened in the mid-1980s, the Philippines did not benefit totally because of the substantial devaluation of the peso against the dollar. Significant savings in foreign exchange has been very helpful to the country.

- In 1986 total energy consumption was 94.7 million barrels of fuel oil equivalent (MBFOE). About 40 percent of all energy consumed was for power generation. Imported oil accounted for 52 percent of overall energy needs in 1986. Imported coal accounted for just over 3 percent. Indigenous energy has played an increasing role as its contribution to Philippine energy supplies increased from 8 percent in 1973 to over 44 percent in 1986.

GEOTHERMAL SECTOR

- The total of installed capacity, and proven, probable, and potential reserves is approximately around 894 MW, 1,641 MW, 4,413 MW, and 6,168 MW, respectively.

- The Philippines is the world's second largest geothermal producer--at present there are four power plants. Two are located in Luzon and the others at Visayas. Total capacity is 894 MW.

- The National Power Corporation (NPC) will be developing more geothermal resources in Luzon and Visayas.

COAL SECTOR

- Coal deposits are concentrated mostly in Semirara, the Cagayan Valley, Surigao, and Cebu. Total resources of coal may be as large as 1.5 to 1.55 billion metric tons. Proven reserves lie within the range of 200 to 275 million metric tons. Coal quality ranges from semi-anthracitic and coking to bituminous and sub-bituminous.

- In 1987 over 2 million metric tons of coal were consumed. This represented a doubling of consumption from 1983. This was due to the shifting of the cement industry from oil to coal as well as the commissioning of the Naga and Calaca I plants. Coal is primarily used for power plants, followed by the cement industry.

- Almost half of primarily used Philippine coal requirements are met through indigenous production. In 1987 over 1.1 million metric tons were produced. Further domestic usage is impeded due to coal quality problems at Semirara. Quality is such that imports for blending purposes are necessary for the Calaca power plant.

- Quotas exist for the use of domestic coal. International prices are lower than domestic prices causing some economic disallocations. Since imported coal is less expensive at present, policymakers need to look carefully at the advisability of expansion of the Semirara or Isabela mines.

THE OIL INDUSTRY

- The major forces in the oil industry are PNOC, Shell Philippinas, and Caltex, all of which own refineries. PNOC has expanded, becoming a diversified energy company involved in oil, coal, and geothermal energy as well as marine transport.

- The Philippines is a small oil producer. Only three fields of some importance are in production. In 1986 production levels averaged about 6,900 barrels per day. Oil exploration, after a period of decline, increased in 1987. Plans for the future, according to OEA, are to expand production.

- Three major refineries exist in the Philippines. The largest refinery is owned by Petron, a subsidiary of PNOC. The other two are owned by Shell Philippinas and Caltex. Total refining capacity is approximately 293,000 barrels per stream day.

- The refineries are balanced at present; however, capacity increases to accommodate projected demand increases may be necessary by the mid-1990s.

- A slate of products is produced by the refineries. Fuel oil is produced in the greatest quantity. In the first half of 1987, fuel oil comprised one-third of all production.

- The pricing policy of products has created a great deal of controversy. Levied taxes are progressive; thus, diesel, fuel oil, and kerosene are taxed at lower rates than gasoline. Distortions in demand have occurred as a result.

- The Oil Price Stabilization Fund (OPSF) has been the focus of a great deal of attention. It was introduced originally to stabilize domestic oil prices; its goal now appears to be to ensure oil company viability.

- While the oil companies would like greater payments from the OPSF, they are also pushing for deregulation of the oil industry.

- Given the decline in petroleum product prices, an increase in product demand has ensued. In 1986, products refined from over 58 million barrels were consumed. Over 21 million barrels of fuel oil were consumed, followed by over 16 million barrels of diesel.

- The forecast of future product demand appears to be very similar to the present demand configuration. Growth in product demand will be approximately 1.5 percent per year. Until 1992 fuel oil will comprise about one-third of the total projected demand of 63 million barrels.

ELECTRICITY

- Three major NPC electricity grids in the Philippines are the Luzon grid, with an installed capacity of over 4,000 MW, the Visayas Islands grid, consisting of five island grids with an aggregate capacity of 600 MW, and the Mindanao grid, with an installed capacity of over 1,000 MW.

- Luzon is the largest grid, accounting for 77 percent of total electricity demand. Each grid is different in overall characteristics. The Mindanao grid is heavily dependent on hydro. The Visayas Islands are largely dependent on geothermal, and the Luzon grid incorporates a mix of oil, coal, geothermal, and hydro.

- Increases in demand call for expansions in power supply, particularly on Luzon. Geothermal development will play a prominent role in meeting demand. For Visayas, expansion plans include interconnection of island grids. Mindanao is primarily supplied with hydro power; oil-powered facilities supplement hydro power. Mindanao is planning supply diversification, as geothermal development is foreseen for the late 1990s.

- At present, geothermal energy appears to be the most cost-effective approach to increasing capacity.

- Average electricity rates are highest on Luzon, lowest on Mindanao. Present pricing policies have been under debate. A consensus has emerged that electricity rates should be restructured, with the Energy Regulatory Board playing a more active role in the implementation of a rational tariff structure.

RENEWABLE ENERGY

- Renewable energy has become a significant component of the Philippine energy mix. In 1973 renewables accounted for 3 percent of total energy supply; by 1986 over 18 percent of energy used was renewable.

- The government has supported massive programs to nurture the renewable industry. Planners anticipated that by 1992 over 20 percent of total energy supply could be met by renewables.

- Institutional support was at a high level prior to 1987. With the restructuring of the energy policy arena, it is unclear what, if any, institutional support will be forthcoming.

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Preface

As part of our continuing assessment of the Asia-Pacific energy markets, the Energy Program has embarked upon country studies that discuss in detail the structure of the energy sector in each country within the region. The country studies also provide the reader with an overview of the economic situation and, when possible, of the political situation in the country under study. We have particularly highlighted petroleum and gas issues in the country studies and have attempted to show the foreign trade implications of oil and gas trade. Finally, as much as possible, we have provided the latest available statistics--more often than not, from unpublished sources. Staff members have traveled extensively in the countries under review and have spoken to top policymakers in government and industry. Thus, these reports provide not only information but the latest thinking on energy issues in various countries.

It is our hope that over the next few years these country studies can be updated and will provide a continuous, long-term source of energy sector analysis for the Asia-Pacific region.

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Table of Measurements

API	American Petroleum Institute
b/d	barrels per day
bpsd	barrels per stream day
BFOE	barrel of fuel oil equivalent
BTU	British Thermal Unit
BTU/lb	British Thermal Units per pound
CIF	cost, insurance, and freight
DWT	deadweight ton
ft	feet
FOB	free on board
GWh	gigawatt hours
HVDC	high voltage direct current
HVAC	high voltage alternating current
kcal/kg	kilocalories per kilogram
kWh	kilowatt hours
kv	kilovolt
MMBOE	million barrels of oil equivalent
MMBFOE	million barrels of fuel oil equivalent
MW	megawatts
P	Peso
P/ton	Peso per ton
$/b	dollars per barrel

Part One

THE NATIONAL ECONOMY

Geography of the Philippines

Over 7,000 islands form the archipelago known as the Philippines (Figure 1.1). These islands traverse over 1,000 miles from north to south along the southeastern rim of Asia, forming a land chain separating the Pacific Ocean on the east and the South China Sea on the west. Taiwan lies to the north; Malaysia and Indonesia lie to the south. To the west are China and Vietnam, separated from the Philippines by the South China Sea.

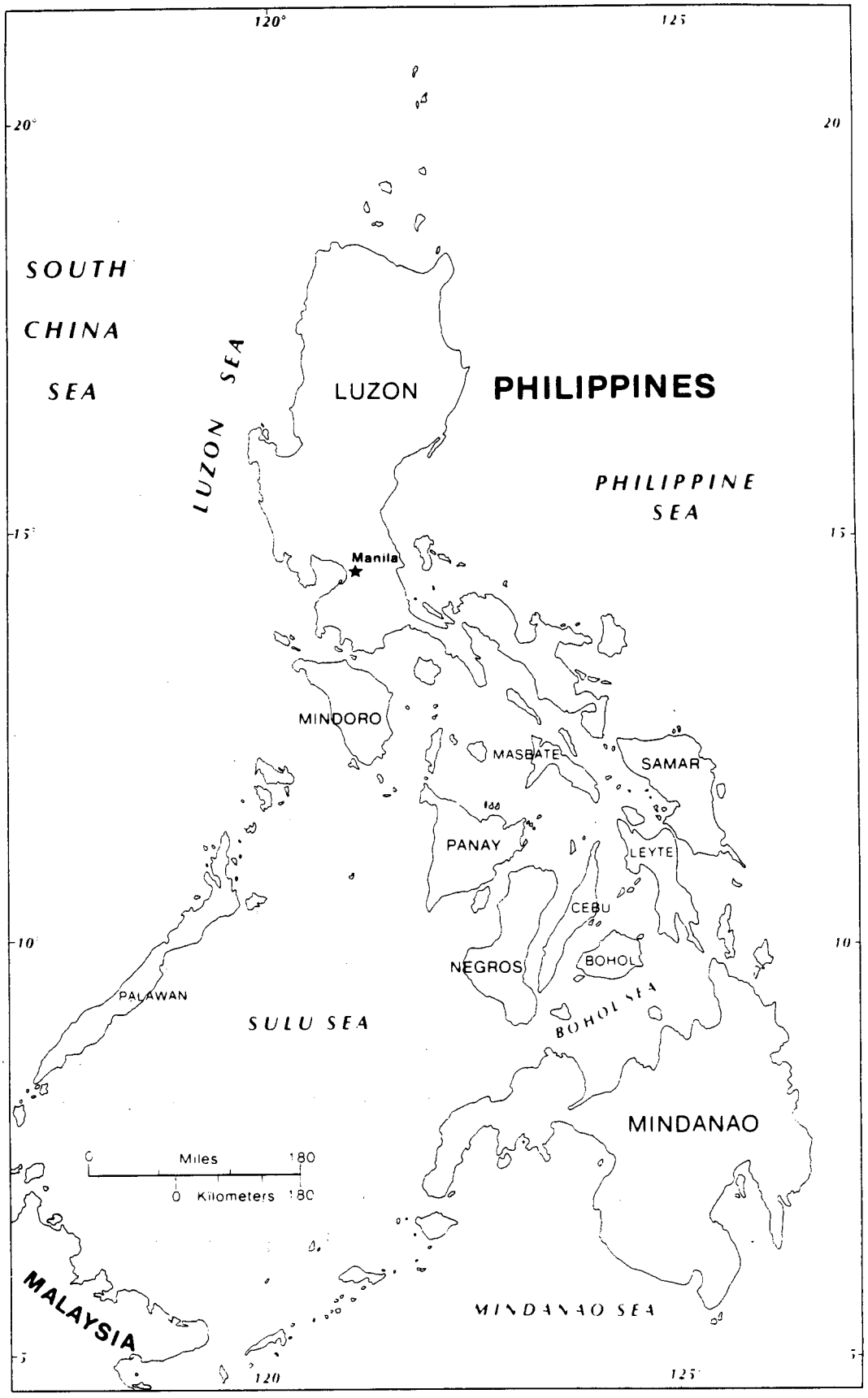
Only 154 of these islands have areas exceeding 5 square miles, and 11 of these islands are where about 95 percent of the population resides. The islands can be grouped into three major regions. The first region consists of the northern island Luzon. It is not only the largest island but also the location of Manila--the nation's capital and the Philippines' largest city. Almost half of the Philippines' population resides on Luzon, which is also distinguished as the heart of rice production in the country.

Further south along the archipelago, the next chain of islands are referred to as the Visayan island group. Comprised of Negros, Panay, Cebu, Bohol, Leyte, Samar, and Masbate, the Visayan group is home to approximately 35 percent of the population and is also an important agricultural region in terms of food production and commercial crops such as coconut and sugar.

The southernmost region is composed of Mindanao and the Sulu archipelago. This region is the poorest and most underdeveloped. Approximately 20 percent of the Philippine people reside here.

The larger islands are mountainous, and the uplands comprise 65 percent of total land area. Most have narrow coastal lowlands. There are extensive lowlands on

Figure 1.1
Map of the Philippines



Luzon, Mindanao, Negros, and Panay. The central plain of Luzon is the most important agricultural area in the country.

The entire archipelago lies within the tropics. The lowlands are warm and humid throughout the year, with only slight variations in temperature. Temperatures average approximately 80°F. Rainfall varies geographically because of wind direction and the shielding effect of the mountains. In Luzon, however, rainfall varies from 35 to 216 inches (.9 mm to 5.5 mm) per year; the average in Manila is 82 inches (2.1 mm) yearly. The monsoon season in Manila occurs between June and November.

The Philippines is situated within the typhoon belt, and typically an average of 15 cyclonic storms affect the country yearly. There are active volcanoes and earthquakes occur.

Geopolitics

The archipelagic nature of the Philippines has had an important role in shaping the lives of the people there. The islands are connected by a narrow waterway between southeastern Luzon and Samar and Samar and Leyte to Mindanao. While this "land bridge" assists in transport between the islands, geographic distance still plays a key role in local government, with central government policies being greatly influenced by regional demands.

While relations with its neighbors are generally friendly, the Philippines is involved in a dispute with Taiwan, China, and Vietnam concerning the ownership of the Spratly Islands in the South China Sea. These islands, near the Philippine island of Palawan and east of Vietnam, are important to all parties involved. The islands command a strategic position over the sea passage from Japan to Singapore and encompass large fisheries and potential sources of petroleum and minerals in the ocean seabeds.

The dispute over these islands actually began as early as 1883. In 1956, a Philippine expedition surveyed and occupied some of the islands. More importantly, oil was discovered at Reed Bank (midway between the Spratly Islands and Palawan) and has

been developed by the Philippines since 1979. The Philippines has claimed it will not use or threaten force to settle this conflict.

Another land dispute exists with Malaysia over Sabah. In 1962 President Marcos made a claim on Sabah, and in 1969 passed a law that declared Sabah to be within the jurisdiction of the Philippines. Between 1968 and 1969, diplomatic ties between Malaysia and the Philippines were suspended for this reason. In 1977, Marcos announced his intention to renounce any claim on Sabah and to create an agreement with the Malaysian prime minister to establish a border patrol between the two nations to reduce piracy, smuggling, and drug trafficking. Malaysia was to stop the smuggling of guns from Moslem separatists and Filipino refugees to the southern Philippine islands. Neither nation carried through on the agreement and no Malaysian head of state has visited the Philippines in over ten years.

Geographically, the Philippines, which was a U.S. colony between 1901 and 1946, is strategically important to the United States. The ties between the two countries are economic and cultural and are enhanced by a defense treaty. Strategically, the Philippines is the gateway to Asia. For this reason the United States has two large military facilities, Subic Bay Naval Base and Clark Air Force Base, located there. About 15,300 U.S. military personnel are stationed in the Philippines (excluding Seventh Fleet personnel when on shore leave), together with nearly 1,000 defense civilians and about 24,100 military dependents.

Population

Over 50 million people reside in the Philippines; the majority, of Malay stock, descended from the Indonesians and Malays who migrated to the islands long before the Christian era. Since the ninth century when they first came to the Philippines to trade, the Chinese have been an integral minority group, playing a significant role in the demographic and commercial development of the country. Spanish rule, which

began in the 1500s, also has had a bearing on the present-day population profile, as many Filipinos have some Spanish, as well as Chinese ancestry.

Today the overall population density is approximately 433 persons per square mile. This figure is far greater in central Luzon, as Manila alone has over 7 million people. Table 1.1 indicates overall population statistics. The Philippines has always experienced positive population growth; in the 1960s yearly growth was about 3 percent. By the end of the 1970s, the growth rate fell to around 2.4 percent and was not seen as favorable by the Marcos administration. In 1970, an official policy of family planning was instituted. At present, the growth rate is just above 2 percent per year.

Approximately 90 percent of the people are Christian; most are Hispanicized people who converted to Christianity and were Westernized to a certain extent during Spanish and American rule. The major non-Hispanicized groups are the Muslim population, which is concentrated in the Sulu Archipelago and western Mindanao, and the mountaineer groups of northern Luzon.

There is a wide variety of languages in the Philippines; over 87 native languages and dialects are spoken. All belong to the Malay-Polynesian linguistic family, and eight languages in specific are the primary language for more than 85 percent of the people. The three principal spoken languages are Cebuano, which is predominant in the Visayas; Tagalog, which is used in the area around Manila; and Ilocano, which is spoken in northern Luzon. Pilipino and English are the official languages. Pilipino is based on Tagalog and is taught widely. Despite the fact that a wide array of languages are spoken, the Philippines has a high literacy rate, with 88 percent of the population 10 years of age and older literate.

Philippine Politics

The Philippines cannot be studied without examining the political changes that have occurred in the past several years, both before and after the exile of former President Marcos in 1986. The problems and difficulties of that regime have become

Table 1.1
POPULATION STATISTICS

Year	Millions	Growth from Previous Year (%)	Other Growth-Related Indicators (% for 1986)	
1980	48.32	1.11	For 1986	
1981	49.54	2.52	Annual Growth Rate	2.4
1982	50.78	2.50	Urban Population	40.0
1983	52.06	2.52	Urban Growth	3.9
1984	53.35	2.48	Literacy	88.0
1985	54.67	2.47		
1986	55.62	1.74		
1987	56.88	2.27		
1988	58.17	2.27		
1989	59.49	2.27		
1990	60.84	2.27		
1991	62.11	2.09		

Sources: Foster and Sullivan, *Political Risk Service*; Asian Development Bank, *Key Indicators of Developing Member Countries of ADB*, October 1986; Chase Econometrics, First Quarter 1987, Far East.

well known. Aside from the management issues directly attributed to the Marcos regime, there are several other factors that led to the decline of the Philippines. The oil price shocks of the 1970s took a heavy toll. The country's oil import bill rose from US$187 million in 1972 to US$651 million in 1974 and to US$2.5 billion in 1980. While this represents an enormous strain on the economy, further stress was imposed by the burgeoning population. When Mr. Marcos became president the Filipino population was about 38 million. By 1983, the population was 50 million, and the number living below the poverty line had doubled to 35 million.

Marcos further compounded these problems with his style of leadership. By 1972 the economy was worsening; monsoons wiped out the rice crop and the Communist insurgency was growing. His solution called for the detention of opposition politicians such as Senator Benigno Aquino (who was later assassinated); the closing of newspapers and radio stations; the presidential decrees curtailing civil liberties; and the development of a new constitution in 1973 to extend the president's rule. While friends and family of the first couple amassed enormous wealth, the country's foreign debt rose from US$2.6 million in 1975 to US$10.5 billion in 1980 and to US$26 billion in 1984.

Through presidential decrees and stock market manipulations, Marcos' associates and relatives became a new oligarchy. Unfortunately, the wealth was not invested in their homeland; they chose to use it elsewhere for personal gain only. The extent of the piracy may never be fully known. The Presidential Commission on Good Government, created by President Aquino, was set up to recover "all ill-gotten wealth" accumulated by Marcos' family and friends. The commission estimates that over US$10 billion was siphoned out of the country.

After the assassination of Benigno Aquino in 1983 and the economic collapse that later ensued, the people had finally reached their tolerance limit, as was evident by the "people power" demonstration on 25 February 1986. Through this mass demonstration at EDSA (the capital's arterial highway of Epifano de los Santos Avenue) Marcos was

forced to flee Malacanang Palace, first by American helicopter to Clark Air Base and then by military aircraft to Hawaii.

In the post-Marcos era, the important issue revolves around what President Corazon Cojuangco Aquino can do to bring political and economic vitality to the Philippines. A new Filipino constitution was put into place in February 1987. Since then, the Aquino government has had three important goals: to deal with or defeat the Communist rebels and insurgents and decrease the hostilities that they provoke; to discipline the military and accustom it to the idea of serving a civilian regime; and finally, to restore the economy.

The Aquino government is working to accomplish the goal of restoring democratic institutions in the Philippines. To this end, Aquino has removed restrictions on the press, restored civil liberties, and released political prisoners detained by Marcos.

The new administration has, however, inherited many obstacles. Two insurgencies are active. The largest insurgency has been led by the Moro National Liberation Front (MNLF), with roots in a long-standing cultural-religious dispute. Some Filipino Muslims in Muslim areas would like to secede from the republic. Other Muslim groups seek regional autonomy for Mindanao rather than secession. The government has responded to Muslim needs through political and economic programs, which have reduced support for the insurgency. This insurgency does not now pose as large a problem as the Communist movement.

The New People's Army (NPA) is the armed wing of the illegal Communist Party of the Philippines (CPP). The NPA started out slowly in the early 1980s, yet today it operates to some degree in almost every province, although rural areas are still the loci of activity. Fighting between the NPA and Philippine government troops continues, particularly in Mindanao. Tactics employed by the NPA include murder, bombings, and extortion. Examples include the assassination of a pro-vigilante government minister in 1987 and the killing of three Americans near Clark Air Base two months later.

The Armed Forces of the Philippines (AFP) has not been able to quell this insurgency. In 1987, there were more than 3,000 violent incidents involving government forces and Communist rebels. Over 1,500 NPA guerrillas, almost 1,000 civilians, and over 1,000 military persons died. Despite the fact that the AFP is 156,000 men strong (having more than doubled its size since the start of martial law), it suffers from poor pay and inadequate equipment. Fortunately, the NPA is not better off.

While an attack by the NPA is reported almost daily, it is usually balanced by the increasingly frequent arrests of Communist Party leaders. The Communist Party in the Philippines thrives because of the poverty and feudalism that exist. Eliminating them is no small task. Land reform is a major step towards ameliorating poverty, but the concept is not novel to the Philippines.

In the 1930s President Quezon had a "land for the landless" program as did President Magsaysay in the 1950s. In 1963, the Land Reform Act was passed under President Macapagal. By 1972, at the start of martial law, President Marcos decreed that rice and corn lands should be owned by the tenants who worked them. Unfortunately, none of these plans succeeded in eliminating feudalism or poverty. President Aquino's Comprehensive Agrarian Reform Program (CARP) may have greater success. CARP distinguishes itself from many of the past programs in that it covers all arable land, including sugar and coconut plantations.

CARP is supposed to benefit over 2 million peasants by completing the Marcos program and then moving on to cover idle private, and public land, and the sugar, coconut, and banana plantations. Originally, the estimated cost was set at about 50 billion pesos (about US$2.5 billion) over 10 years--money that the government does not have. By the end of 1987, it was reported that some 8.1 billion pesos were raised by selling Marcos' assets. However, bureaucratic infighting has resulted in little hard cash from the efforts to locate the Marcos' money.

It is not surprising that land reform is a slow and difficult process. It is not easy to persuade those who have land to give it to those who do not, especially when the

major part of the landowner's compensation is through government bonds that, in the case of the Philippines, could lose value. Furthermore, once the government succeeds in redistributing land, there are additional issues to contend with. In particular, many peasants born into feudal dependency only have agricultural skills. The knowledge of how to finance, when to plant, and how to sell have not typically been a part of their education. Problems such as these lend support to the notion of "nucleus estates," whereby small holdings would be gathered around a central estate that would handle services such as financing, spraying, etc.

The question on everyone's mind now is whether "Cory magic" has faded. Her determination to restore democracy has survived several coup attempts. However, the Philippines needs more than her devotion. It needs more people to actually execute the promises made. Aquino's administration came to power with sound economic objectives: to end monopolies, liberalize trade, reform agriculture, and promote exports of manufactures. These objectives have been achieved to a certain extent. In 1986 fertilizer prices dropped by a third and prices of copra at the farm gate almost doubled. Despite the coup attempts and the October 1987 crash, brokers claim that the Manila and Makati stock exchanges were the world's best performers. While these are positive indicators, the Philippines' financial troubles are clearly far from being resolved. The administration may be able to continue to live up to the high ideals they have set forth and continue on a path toward renewed prosperity and justice.

The Economy

Historically, the economy of the Philippines grew rapidly during the period of rehabilitation and expansion after World War II. The pace slowed somewhat in the 1950s and early 1960s, with real gross national product (GNP) rising only about 5.3 percent annually from 1955 to 1965. In the late 1960s, under the stimulus of expansionary monetary and fiscal policies, the real GNP growth rate rose again, reaching 10 percent in 1973. In recent years, however, these trends reversed as the Philippine

economy plunged into recession. The real GNP growth rate was -5.3 percent in 1984 and -3.8 percent in 1985.

These economic difficulties were in large part due to policy decisions made shortly after independence. Measures were taken to pursue import substitution rather than export diversification. To support this policy, import restrictions were enacted and preferential allocation of subsidized credit was given. The result was an overly capital-intensive industrial sector that was not competitive in world markets. In addition, this industrial sector was largely dependent on imports of raw materials and capital equipment.

In the 1970s, there was a demonstrated effort to move into labor-intensive exports, and success was attained in the garment and electronics industries. However, by 1979 it was evident to the government that past policies were not effective. With the help of the World Bank, a program was undertaken whereby the trade and financial sectors were liberalized. However, this program did not help greatly as a balance-of-payments problem already existed due to the earlier, overly ambitious capital spending.

The Philippine economy finally did reverse its long decline, and in 1986 growth in gross domestic product (GDP) of 1.08 percent was realized. Table 1.2 provides data on GDP along with other key economic indicators. Most of the growth occurred in the second half of the year, and by the third quarter all sectors of the economy had experienced positive growth.

In 1986, inflation was brought under control, as consumer prices rose by an average of only .76 percent. Lower world oil prices helped the Philippine economy, as prices fell during the second quarter. As inflation diminished, interest rates fell.

In 1986 imports of US$5.044 billion represented a decrease from 1985 of 1.3 percent (Table 1.3). This was largely due to the reduced oil import bill, as the average price for crude oil dropped between 1985 and 1986. This translated into a US$549 million drop in spending in comparison to 1985. This decline offset increased imports of intermediate and capital goods and raw materials. The sectors in which import

Table 1.2
PHILIPPINES: KEY ECONOMIC INDICATORS
(in US$ millions unless otherwise noted)

	1984	1985	1986	1987[a]
Domestic Economy				
GDP in current dollars[b]	32,367	32,754	30,752	32,569
GNP in current dollars[b]	31,582	31,951	30,133	31,863
Per capita GDP, current dollars[b]	607	599	549	568
Consumer prices, % change	50.3	23.1	0.8	5.2
Employment				
Labor force ('000s)	20,863	21,329	21,499	22,205
Unemployment (avg. %/year)	10.7	11.1	11.8	10.6
Balance of Payments				
Exports (FOB)	5,391	4,629	4,842	5,275
Imports (FOB)	6,070	5,111	5,044	6,000
Trade balance	(679)	(482)	(202)	(725)
Current account balance	(1,116)	(77)	1,022	370
U.S.-Philippine Trade				
U.S. exports to Phil. (FOB)	1,627	1,283	1,256	NA
U.S. imports from Phil. (FOB)	2,048	1,652	1,717	NA
U.S. trade balance with Phil.	(421)	(369)	(461)	NA
U.S. share of Phil. exports (%)	38.0	35.7	35.5	NA
U.S. share of Phil. imports (%)	26.8	25.1	24.9	NA
U.S. Bilateral Aid (fiscal year)				
Economic (includes food aid)	107.5	182.3	385.9	337.1
Military (includes training)	51.5	42.2	105.1	52.6

Principal U.S. exports (1986): Materials/accessories for manufacture of semi-conductors (consignment basis), $380M; mach./transport, $245M; food $174M; chemicals $134M; manufactured goods, $66M; textiles (consignment basis), $59M.

Principal U.S. imports (1986): Garments, $352M; manufactured goods, $354M; food $312M; semi-conductor devices and other electrical equipment, $266M.

Notes: NA Not available.
[a]Government targets.
[b]Peso values converted to dollars, using average exchange rate for the period.
Source: U.S. Department of Commerce, "Foreign Economic Trends and Their Implications for the United States, Philippines," July 1987.

Table 1.3
PRINCIPAL IMPORTS OF THE PHILIPPINES
(FOB value in US$ millions)

Product	1985	1986	Percent Change
Capital goods	788	864	9.6
Non-elec. machinery	366	395	7.9
Elec. mach. and apparatus	293	333	13.6
Transport equipment	48	54	12.5
Other	81	82	1.2
Raw materials and intermediate goods	2,198	2,671	21.5
M/A for mftr. elec. eqmt.[a]	584	640	9.6
Chem. elements and compounds	219	272	24.2
Iron and steel	135	204	51.1
Textile mar./embroideries[a]	196	253	29.1
Textile yarn, fabric and M-U art	140	207	47.8
Wheat	106	129	21.7
Other	818	966	18.1
Mineral fuels and lubricants	1,452	869	(40.1)
Petroleum crude	1,277	728	(43.0)
Other	175	141	(19.4)
Consumer goods	441	397	(10.0)
Other transactions	232	243	4.7
Total, all imports	5,111	5,044	(1.3)

Note: [a]Mostly raw material imported on consignment.
Source: U.S. Department of Commerce, "Foreign Economic Trends and Their Implications for the United States, Philippines," July 1987.

growth was observed include textiles (increase of US$124 million) and iron and steel (increase of US$69 million).

While imports for 1986 decreased, exports increased to US$4.842 billion (Table 1.4). Most of this growth was due to increased exports of nontraditional exports, including garments and textiles, chemicals, raw coffee, bananas, shrimp, prawns, and copper cathodes. In contrast, total export earnings for traditional exports declined. However, gold--the country's most important mineral product--produces revenues that largely offset export earnings from traditional exports.

As Table 1.5 indicates, the United States is clearly the Philippines' largest trading partner. United States goods and sources constitute about 25 percent of Philippine imports while about 35 percent of Philippine exports are typically absorbed by the United States. In 1986, the Philippines posted trade surpluses with the United States and the EEC and a small deficit with Japan.

Foreign Relations

While the Philippines has had a special relationship with the United States, it has been reshaping its foreign policy over the past decade. Emphasis is still placed on maintaining a positive relationship with the United States; however, the Philippines is strengthening its ties with other nations. In particular, this effort has been mostly directed to its neighboring countries in Southeast Asia, although the Philippines has extended its hand of friendship to other Third World nations and to most Communist governments. Diplomatic relations have been established with Romania, Yugoslavia, Bulgaria, Czechoslovakia, the German Democratic Republic, Hungary, Poland, and Mongolia. In 1974 relations were established with China. In 1975 and 1976 relations were established with Cuba, the Soviet Union, and Vietnam.

Specifically, with the United States the Philippines has a mutual defense treaty (1951), a military bases agreement (1947), and a military assistance agreement (1953). These commitments form the foundation of a bilateral mutual security relationship. In

Table 1.4
PRINCIPAL EXPORTS OF THE PHILIPPINES
(FOB value in US$ millions)

Product	1985	1986	Percent Change
Nontraditional exports	3,275	3,447	5.2
Elec. and elec. eqpmt.[a]	1,056	919	(13.0)
Garments and textiles[b]	662	795	20.1
Copper/nickel/iron ore	327	272	(16.8)
Bananas/raw coffee	183	249	36.1
Fish and processed food	205	259	26.3
Chemicals	150	243	62.0
Other nontraditional	692	710	2.6
Traditional exports	1,302	1,275	(2.1)
Coconut producers	459	470	2.4
Mineral ores and conc.	243	267	9.9
Sugar products	185	103	(44.3)
Forest products	199	201	1.0
Fruits and vegetables	136	137	0.7
Other traditional	80	97	(21.2)
Other transactions	52	120	130.8
Total, all exports	4,629	4,842	4.6

Notes: [a]Mostly semiconductors made from consignment imports.
[b]Regular apparel exports and consignment exports.
Source: U.S. Department of Commerce, "Foreign Economic Trends and Their Implications for the United States, Philippines," July 1987.

Table 1.5
DIRECTION OF TRADE, 1986

Country	Exports	Imports	Balance	Total Trade
United States	1,717	1,256	461	2,973
Japan	851	868	(17)	1,719
ASEAN	352	511	(159)	863
ESCAP[a]	433	666	(233)	1,099
EEC	914	569	345	1,483
Mid-East	97	502	(405)	599
Socialist[b]	123	134	(11)	257
Other	355	538	(183)	893
Total	4,842	5,044	(202)	9,886

Notes: [a]Excluding ASEAN.
[b]Includes China.
Source: U.S. Department of Commerce, "Foreign Economic Trends and Their Implications for the United States, Philippines," July 1987.

addition, the Philippines, the United States, and six other nations signed and ratified the 1954 Southeast Asia Collective Defense Treaty, also called the Manila Pact.

The Philippines is a charter member of the United Nations and is active in most of its specialized agencies. In 1979 the Philippines became a full member of the General Agreement on Tariffs and Trade. As mentioned earlier, the Philippines has sought to expand its relations with its Asian neighbors. In this capacity, it was the leader in the formation of the Asian Development Bank, which opened in Manila in 1966. The Philippines was also key in the formation of the Association of South East Asian Nations (ASEAN), established in 1967.

Part Two
ENERGY POLICY AND ECONOMICS

Energy Policy

Like other countries in the Asia-Pacific region, the first oil shock of 1973 caused the Philippine government to assess the effectiveness of its energy policy mechanisms. Prior to 1973, when petroleum flowed freely and inexpensively, there appeared to be little reason to have to institutionally prepare to handle energy crises. However, as the Philippines was heavily dependent on imported petroleum at the time, it very quickly saw the wisdom in formulating clear energy policies to manage and prevent future supply disruptions. As Table 2.1 illustrates, the Philippines had little in the way of conventional resources.

The initial reaction of the energy policy sector to the oil shock focused predominantly on the short-term problem, namely securing a stable and adequate supply of crude petroleum. As the Philippines was so import dependent, one of the first tasks was for the government to seek direct government-to-government supply agreements with non-OPEC oil producers. From a share of only 4.4 percent in 1974, non-Middle East sources had increased their share to 19.2 percent by the following year. By 1978 this figure had reached 28.8 percent. To further cushion the domestic economy from supply disruptions, crude petroleum and product inventories were established. In 1974 there was an equivalent supply of 62 days, 34 for crude petroleum and 28 for petroleum products. By 1976, a supply of 101 days had been reached.

One measure taken at the onset of the crisis was the formation of the Philippine National Oil Company (PNOC). Its primary purpose was to transport, refine, and market crude oil and products. Since then, however, it has been involved in establishing government-to-government crude supply arrangements. It is also capable of transporting much of the nation's oil imports with its seven ocean-going tankers. PNOC owns the largest refinery, oversees 75 percent of the inter-island oil product

Table 2.1
ESTIMATES OF INDIGENOUS COMMERCIAL ENERGY
RESOURCES IN THE PHILIPPINES

Conventional (MMBOE)	Proven	Potential
Petroleum	30	100
Coal	780-2,000	2,000-6,000
Uranium (probable)	--	9
Renewable (MW)	**Available**	**Theoretical**
Hydro	7,500	10,000
Geothermal	3,500	8,000

Source: Desai, V. V., "Energy Resource Balances and Supply," in R. Bautista and S. Naya, eds., *Energy and Structural Change in the Asia Pacific Region* (1984); Ministry of Energy, *Philippine Energy Development Program, 1982-1987.*

movements through its fleet of coastal tankers, barges, and floating pump stations, and holds nearly 40 percent of the domestic petroleum market. It has also moved into the development of indigenous energy resources, and is now the second largest producer of coal and geothermal resources.

As for other longer-term policy initiatives, by 1977, a Ministry of Energy had been created to coordinate the implementation of the government's energy policy and programs. Its primary agenda focused on the goals of indigenous resource development and energy demand management. The Ministry of Energy operated through two major bureaus, the Bureau of Energy Development and the Bureau of Energy Utilization. The National Power Corporation (NPC), responsible for power generation and transmission, and the National Electrification Administration (NEA), responsible for rural electrification, were also strengthened at this time.

While separate from the ministry, both the PNOC and the NPC were attached to the ministry for program and policy coordination, and were handled by an internal committee chaired by the Minister of Energy. In addition, the minister served as chairman of the boards of the PNOC and the NPC so that comprehensive planning and implementation were possible.

To stimulate indigenous resource development, the old concession scheme was replaced by a production sharing scheme. In addition, diversification away from oil was encouraged. Coal development was emphasized in 1976 and geothermal exploration and development in 1978. The government's role in nonconventional energy was primarily in providing fiscal incentives for research and development. Nonconventional energy has emerged as a highly significant contributor to energy supplies, responsible for almost half of indigenous energy production by 1986.

The second goal of the post-1973 oil shock energy policy was demand management. During times of crisis, fuel allocation and rationing systems were devised. Pricing policy was utilized for long-term management, as a rapid and full adjustment of domestic petroleum prices to world prices was set into motion. On top of the full cost

recovery policy, taxes were levied on petroleum prices. While these taxes were useful in generating additional income for the government, they were also used to discriminate among different customers. For instance, customers of gasoline and avturbo were assumed to be higher-income users and thus were forced to pay much higher taxes per fuel liter than consumers of kerosene and diesel, who were assumed to be in the lower-income strata. While energy consumption as a whole decreased, distortions in the slate of petroleum products did result, as diesel demand increased due to price effects. This had further ramifications as it posed refinery balancing problems, which became more prominent when the second oil crisis occurred in 1979.

This second oil shock did not create any radical policy changes. In fact, energy policy continued on the steady course that had been set earlier. In 1980, two new energy agencies were created. The National Coal Authority was established to act as the central agency for coal supplies, and the National Alcohol Commission was established to formulate and implement a national fuel alcohol program.

These efforts have achieved positive results. After growing at an annual rate of over 5 percent during 1975-1979, commercial energy consumption has been more or less stable at around 95 million barrels of fuel oil equivalent per year. Dependence on imported energy has been greatly reduced. In the 1970s, the Philippines was about 80 percent dependent on foreign crude; by the mid-1980s this figure had dropped to less than 60 percent, due in large part to the increased production of indigenous energy resources.

The change in government in 1986 occasioned many institutional changes within the Philippine energy policy framework. The Ministry of Energy was abolished, and its functions temporarily assumed by the Office of the President. The two major bureaus in the ministry were placed under a Deputy Secretary for Energy in the President's Office.

In July 1987, Executive Order 1933 established that the Office of Energy Affairs (OEA), was to assume most of the functions of the former Ministry of Energy. How-

ever, it was to be institutionally distinct from the PNOC and the NPC. The Ministry of Energy's regulatory functions were reallocated to the Energy Regulatory Board under Executive Order 173. In addition, the environmental and watershed management functions were transferred to the Department of Environment and Natural Resources through Executive Order 131.

The current administration has focused on the decentralization of decision making with a view to eventual privatization of the commercially viable public enterprises. As the geothermal, coal, and power subsectors are closely intertwined, it seems that close coordination will always be necessary. The government is now adopting a World Bank plan for the creation of an executive energy coordinating council that will oversee the execution and administration of energy projects and energy implementing agencies. The OEA will serve as the secretariat of the council, which is expected to include the PNOC, the NPC, the Energy Regulatory Board, and the National Electrification Administration.

Energy and the Economy

Table 2.2 illustrates the impact of energy on the Philippine economy from 1973 to 1986, when energy consumption grew at about the same rate as the population. Per capita consumption exhibited a decreasing trend over the same period, as higher oil prices translated into lower consumption. This is not surprising, given conservation and fuel substitution measures established after 1979.

The positive effects of decreased petroleum consumption were not actually realized until the mid-1980s, as a lack of alternative fuels forced the Philippines to continue importing petroleum during times of soaring prices. With the oil import bill comprising up to about 40 percent of export proceeds in 1981, the Philippines suffered continuous trade deficits.

When petroleum prices finally softened in the mid-1980s, the Philippines did not reap all the benefits. A substantial devaluation of the Philippine peso against the U.S.

Table 2.2
ENERGY-ECONOMY INTERACTION

	1973	1979	1981	1983	1986
Energy consumption (MMBFOE)	69.79	97.42	93.45	98.47	94.70
Population (MM)	40.00	47.04	49.54	52.06	56.02
Energy per capita (BFOE)	1.74	2.07	1.89	1.89	1.69
Real GDP (BP, 1972 prices)	61.30	88.00	96.20	99.90	90.60
Peso-Dollar exchange rate	6.76	7.38	7.90	11.11	20.39
Crude prices ($/b)	3.20	30.00	34.00	29.00	16.90
Oil import bill (CIF, MM$)	231.00	1,597.00	2,534.00	2,116.00	797.00
Oil fraction of import bill (%)	12.90	24.10	29.90	26.10	16.00
Oil share of total energy (%)	92.00	72.40	71.90	64.50	52.60
Indigenous share of total energy (%)	8.00	27.60	28.10	35.40	44.00
Power share of total energy use (%)	26.00	28.50	32.50	35.40	40.80

Source: 14th ESCAP-CNR Session, "The Philippine Energy Scenario," 1987.

dollar aggravated the rapid escalation of international crude oil prices in the earlier years and offset later benefits.

Supply/Demand Balance

Like most other oil-importing nations, the Philippines has aspired to lessen their dependence on petroleum, and to a certain extent has been successful at this task. In 1973, petroleum dependency was over 90 percent, but by 1986, this had dropped to 52 percent. Table 2.3 illustrates the contrast in the energy mixes between these two years. It is also evident that the Philippines backed away from imported oil by producing more domestically and by developing greater supplies of nonconventional sources, such as bagasse and agriwaste. In addition, there has been a large increase in the use of hydropower and geothermal energy.

Total energy consumption in 1986 was 94.7 MMBFOE. About 40 percent of all energy consumed was devoted to power generation. On a sectoral basis, industrial use accounted for about 47 percent; transport, 34 percent; residential, 10 percent; and commercial, 9 percent.

In terms of individual fuel sources, imported oil accounted for 52 percent of overall energy needs while imported coal accounted for only 3.39 percent. Second in importance to imported oil is agriwaste, which contributes 13.74 percent, and hydropower, 11.06 percent. Still, the Philippines imports over half its energy supply, although the increase in indigenous fuel use is impressive. In 1973 less than 8 percent of energy consumed was produced inside the country; presently almost half of all energy consumed is indigenous.

This trend of increased self-sufficiency is expected to continue. The medium-term energy plan (1987-1992) aims to reduce energy import dependence from almost 56 percent in 1986 down to 48 percent by 1992. Table 2.4 provides the expected configuration of energy use for the future.

Table 2.3
HISTORICAL ENERGY MIX
(MMBFOE)

	1973		1979		1986	
	Volume	%	Volume	%	Volume	%
Indigenous	5.57	7.98	26.92	27.63	41.71	44.04
Conventional	3.32	4.76	13.86	14.23	24.18	25.53
Oil	0.00	0.00	7.18	7.37	2.85	3.01
Coal	0.13	0.19	0.82	0.84	2.94	3.10
Hydro	3.19	4.57	4.80	4.93	10.47	11.06
Geothermal	0.00	0.00	1.06	1.09	7.92	8.36
Nonconventional	2.25	3.22	13.06	13.41	17.53	18.51
Bagasse	2.25	3.22	6.35	6.52	4.09	4.32
Agriwaste	0.00	0.00	6.71	6.89	13.01	13.74
Others	0.00	0.00	0.00	0.00	0.43	0.45
Imported energy	64.22	92.02	70.50	72.37	52.99	55.96
Oil	64.22	92.02	70.50	72.37	49.78	52.57
Coal	0.00	0.00	0.00	0.00	3.21	3.39
Total energy	69.79	100.00	97.42	100.00	94.70	100.00

Source: 14th ESCAP-CNR Session, "The Philippine Energy Scenario," 1987.

Table 2.4
FUTURE ENERGY SUPPLY MIX
(MMBFOE)

	1986*		1989		1990		1992	
	Volume	%	Volume	%	Volume	%	Volume	%
Indigenous energy	41.71	44.04	52.90	48.63	54.90	48.10	64.43	51.49
Conventional	24.18	25.53	30.53	28.07	31.28	27.41	38.00	30.37
Oil	2.85	3.01	0.77	0.71	0.20	0.18	1.26	1.01
Coal	2.94	3.10	8.86	8.15	10.04	8.80	14.20	11.35
Hydro	10.47	11.06	11.93	10.97	12.03	10.54	12.14	9.70
Geothermal	7.92	8.36	8.97	8.25	9.01	7.89	10.40	8.31
Nonconventional	17.53	18.51	22.37	20.57	23.62	20.70	26.43	21.12
Bagasse	4.09	4.32	5.20	4.78	5.48	4.80	6.13	4.90
Agriwaste	13.01	13.74	16.58	15.24	17.50	15.33	19.57	15.64
Others	0.43	0.45	0.59	0.54	0.64	0.56	0.73	0.58
Imported energy	52.99	55.96	55.87	51.37	59.23	51.90	60.70	48.51
Oil	49.78	52.57	53.44	49.13	56.71	49.69	57.74	46.14
Coal	3.21	3.39	2.43	2.23	2.52	2.21	2.96	2.37
Total energy	94.70	100.00	108.77	100.00	114.13	100.00	125.13	100.00
Growth rate (%)		2.86		4.34		4.93		3.00
Power use, % of total volume	38.61	40.77	45.51	41.84	48.94	42.88	54.29	43.39
Oil share in power use	13.77	35.59	14.80	32.52	17.23	35.21	16.87	31.07

*Actual.
Source: 14th ESCAP-CNR Session, "The Philippine Energy Scenario," 1987.

This will not require such drastic efforts as in the past decade, when indigenous energy resources were being developed. Over the plan period, total energy demand is projected to grow at an annual rate of 4.8 percent, and by 1992 overall consumption is expected to be approximately 125.1 MMBFOE. Of this total, indigenous coal is seen to supply 11 percent, hydro, 10 percent, and geothermal, 8 percent. Agriwaste and bagasse are viewed as the continued major sources of nonconventional indigenous energy, contributing a total of 20 percent to energy requirements in 1992.

Of course, these forecasts depend on crude oil price assumptions. Generally speaking, the perception in the Philippine energy community is that there will be an upward trend in crude oil prices. Coupled with the uncertain political situation in the Middle East, increased self-sufficiency is highly desirable. Promotional campaigns to attract exploration investors have been launched. In terms of crude, which will still have to be imported, greater security considerations may dictate increases in term contracts and a better balance through spot purchases.

To decrease internal demand for oil, the government views pricing systems as potentially useful. By reorienting power systems towards true cost, more efficient consumption will result.

Part Three

THE PHILIPPINE GEOTHERMAL SECTOR

Reserves

An assessment of geothermal reserves is given in Table 3.1. Reserves are scattered across the archipelago, with the major concentrations discovered to date in Luzon and Visayas. Mindanao also has several geothermal sites, but their magnitude is not as great as those in the other islands. In all, the total of installed capacity, capacity proven, and probable, and potential geothermal reserves is about 894 MW, 1,641 MW, 4,413 MW, and 6,168 MW, respectively. If an estimate of undiscovered reserves is taken into account, the total geothermal potential stands at approximately 8,000 MW.

Only a few of the 25 to 30 known geothermal occurrences have been fully explored. Usually, original estimates of geothermal potential tend to be less than that later proven. In the Philippines, the Tongonan and Palimpinon fields in Visayas are proving larger than originally believed.

In Luzon, several fields are believed to have great promise, including the Bacon-Manito, Sorsogon; Mt. Labo, Camarines Norte; Mt. Pinatubo Prospect; and Batong-Buhay Prospect.

Geothermal Exploration

While the Philippines is the world's second largest geothermal producer, little is actually known about its true potential. Of the 25 to 30 known geothermal occurrences, few have been explored. Overall, about 350 wells have been drilled in the Philippines. Of this, more than 85 percent are appraisal or production wells.

The costs of developing geothermal sites in the Philippines, while higher than international costs, are still not excessive. The locations are usually remote, a factor which tends to drive up costs but labor is is cheaper than in other countries. Piping costs are internationally comparable. The critical element affecting cost, however, is

Table 3.1
GEOTHERMAL RESERVES

Field Name or Prospect	Installed (MW)	Proven (MW)	Probable (MW)	Potential (MW)
Luzon				
Mak-Ban, Laguna	330	387	440	800
Tiwi, Albay	330	330	250	250
Bacon-Manito, Sorsogon		140	80	220
Batong-Buhay, Kalinga		150	350	350
Mt. Pinatubo, Zambales			200	300
Irosin-Bulusan, Sorsogon				30
Mt. Labo, Camarines Norte			400	1,000
Daklan, Benguet				50
Buhi-Isarog, Camarines Sur			160	
Acupan-Itogon, Benguet				34
Mt. Natib, Bataan			160	160
Visayas				
Tongonan, Leyte	115.5	400	800	1,200
Palimpinon, Negros	118.5	224	283	372
Biliran Island, Leyte		7	283	372
Mambucal, Negros Occidental		1	1	
Baslay-Dauin, Negros Oriental		1	20	30
Anahawan, Leyte			160	160
Burauen, Leyte			330	330
Bato-Lunas, Leyte			160	160
Mindanao				
Mt. Apo, Cotabato			160	160
Malindong, Misamis Oriental			160	160
Amcan, No. Davao		1	16	30
Total	894	1,641	4,413	6,168
Undiscovered reserves			1,000-2,000	
Total potential			Approximately 8,000	

NOTE: Installed capacity refers to the number of megawatts in currently installed power plants. Proven reserves are the additional number of potential megawatts in the field that are either under wellhead and not yet being produced or are proven by reservoir testing. Probable reserves are based on geologic and geophysical information that gives reasonable assurance that the field will be extended beyond the presently tested wells. Potential reserves are tested, identified reserves plus identified reserves likely to be discovered by the year 2000.

Source: World Bank, Report No. 7269, Sept. 1988.

the drilling of wells. The lower the total number of wells necessary to supply a facility, the lower the costs will be for the gathering system, access roads, and land rights. Development time will also be shorter.

The average cost per well in the Philippines ranges from US$1.2 million to US$1.8 million. The industry norm under similar conditions ranges from US$800,000 to US$1,000,000. Thus, there is scope for cost reduction, which could be accomplished by the incorporation of procedures such as concentrating in areas with good market potential, utilizing cost reduction technologies, and reducing drilling time and costs by employing more experienced crews.

The most logical area for future exploration and development will be at the sites on Luzon, the center of demand. Particular fields of interest are the Bacon-Manito field, Mt. Labo, Mt. Pinatubo, and Batong-Buhay.

On Visayas, the Tongonan field on the island of Leyte is the most promising, with probable reserves of 800 MW. It is the only field on the island to be extensively drilled and developed, as the others are still in the exploration phase.

To utilize the full potential of Tongonan, much of its power should be transmitted to the Luzon grid at Naga. The total length of transmission would be approximately 430 km, of which 23 km would be submarine cables. If it is decided that the Tongonan field is to be connected to the Luzon grid, some 52 wells will have to be drilled to support an additional 440 MW of capacity. Further, it will have to be decided whether to employ high voltage direct current (HVDC) or high voltage alternating current (HVAC). There are substantial cost differences, as HVAC transmission at 500 kv is cheaper. System stability and reliability factors will thus need to be assessed.

Institutional Structure of Geothermal Energy in the Philippines

There are three major organizations involved in the Philippine geothermal sector. Philippine Geothermal, Inc. (PGI), a privately owned company, is the major producer of geothermal steam. Its production accounts for over 80 percent of the geothermal

energy used. The remaining 20 percent is produced by the PNOC Energy Development Corporation (PNOC-EDC), a wholly owned subsidiary of PNOC. PNOC-EDC sells its steam to NPC.

Aside from PGI, PNOC-EDC and NPC, a number of other key organizations have been instrumental in the overall development of the industry. In the early 1960s, the Philippine National Science and Technology Authority funded studies by the Philipinas Institute of Technology on the use of geothermal energy. The OEA is also involved with geothermal energy as it undertakes resource inventories in several known but unexplored areas.

Philipinas Shell Petroleum Corporation (PSPC) began its work in geothermal activity in 1982 but did not extend its efforts past the planning stage. At that time, several foreign firms expressed interest in the search and development of local geothermal energy sources. These included Total Exploration and Caltex Petroleum Corporation. Neither now operates in the Philippines. Total Exploration withdrew in 1983, and Caltex, after exploring in Batong-Buhay, Pasil and Kalinga-Apayao, halted activity the following year due to economic difficulties.

Geothermal Production

Geothermal energy has come to play a significant role in the Philippine energy balance. By 1987 domestic geothermal energy production generated more than 22 percent of the nation's electricity supply. Geothermal power plant capacity constituted 18 percent of the NPC's installed capacity.

The industry was underway by 1979 when Union Oil's subsidiary, PGI, commissioned the country's first geothermal turbine, a 55 MW unit at Tiwi, 200 miles southeast of Manila. Since then, the Philippines has steadily added capacity and now has a total of 894 MW. Four commercially developed fields, Tiwi, Makiling-Banahaw (Mak-Ban), Tongonan and Palimpinon, constitute this capacity (Table 3.2). A fifth geothermal field is planned for Bacon-Manito (Bac-Man) and is intended to support the new 110 MW Bacon-Manito plant in Luzon scheduled for commissioning in 1991.

Table 3.2
CAPACITY OF GEOTHERMAL POWER PLANTS
(MW)

Luzon	Supporting Field
330	Tiwi
330	Makiling-Banahaw (Mak-Ban)
Visayas	
115	Tongonan
118.5	Palimpinon
Total capacity 894	

Source: World Bank, Report No. 7269, Sept. 1988.

Part Four

THE PHILIPPINE COAL SECTOR

Coal Resources

While coal deposits are scattered throughout the Philippine archipelago, they are concentrated mostly in four areas--Semirara, the Cagayan Valley on Luzon, the Surigao coal region on Mindanao, and on the island of Cebu. Table 4.1 illustrates both locations and reserve quantities, while Figure 4.1 details the locations of the various coal regions.

Total resources of coal may be as large as 1.5 to 1.55 billion metric tons; however, proven reserves are believed to be within the range of 200 to 275 million metric tons. Coal qualities of these deposits range from semi-anthracitic and coking coal, found at Zamboanga del Sur, to bituminous and sub-bituminous on the island of Cebu.

The most extensive deposits are found on Semirara, which at current estimates holds approximately 37 percent of the Philippine coal reserve base. Resources there are estimated at 550 million metric tons, and reserves are estimated at approximately 79 million metric tons. Within Semirara, there are three major deposits--Himalian, the Panian area, and the Unong area, which is currently being mined.

The Cagayan Valley in northeastern Luzon is the location of the second largest deposit, containing approximately 65 million metric tons of proven reserves. Although over 25 percent of the Philippine's coal reserves are located here, no mines are in operation.

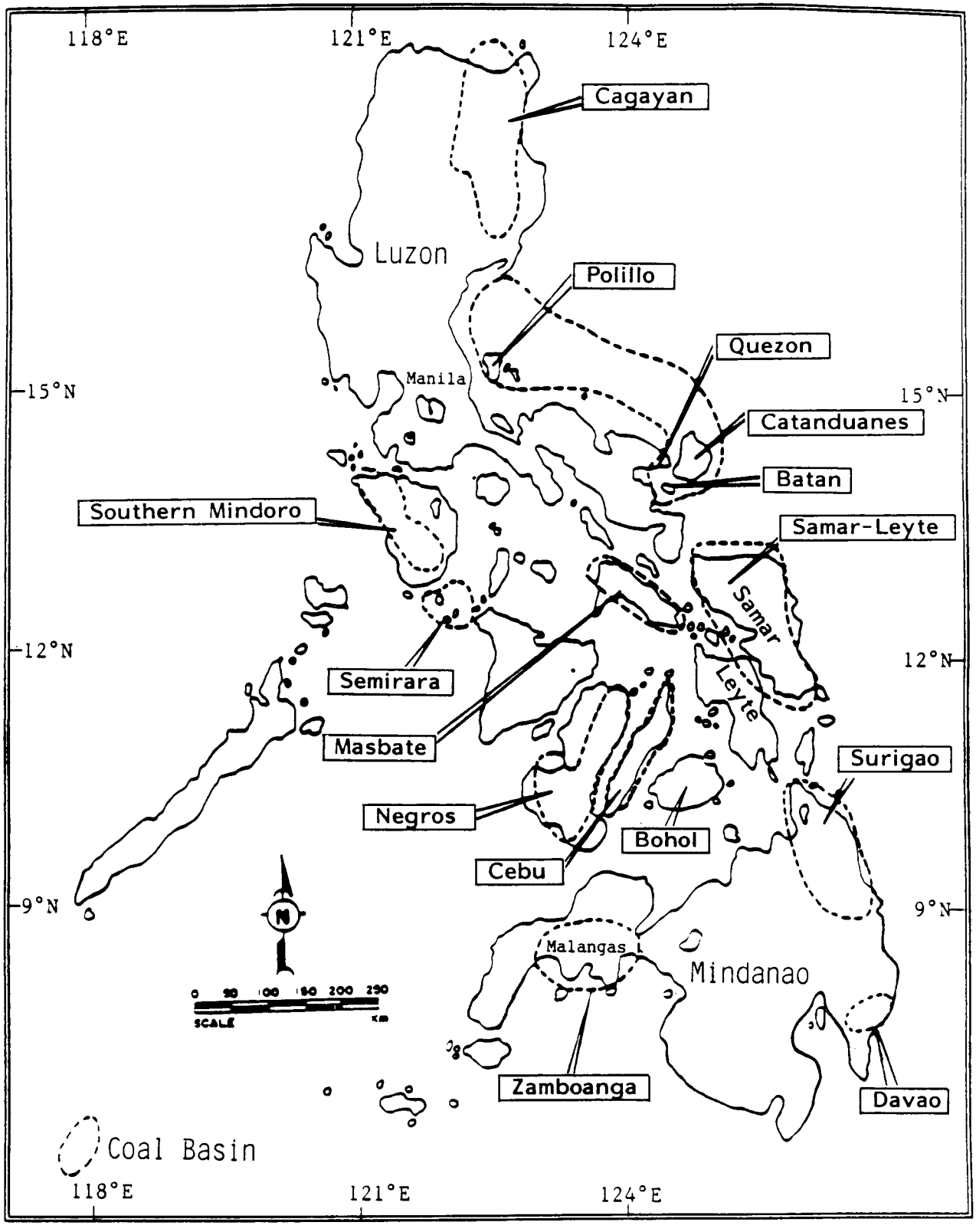
The Surigao coal region in Mindanao, holding 20 million metric tons of proven reserves, ranks third in size, and both surface and underground mining is in operation there.

Table 4.1
COAL RESOURCES AND RESERVES
(million metric tons)

Coal Region	Resources	Proven Reserves
Semirara	550	132
Cagayan Valley	336	65
Surigao	189	20
Cebu	190	8
Southern Mindoro	100	4
Zamboanga Del Sur	50	13
Polillo-Batan-Centanduanes	50	7
Negros	50	2
Samar-Leyete	27	5
Cotobato	100	--
Agusan-Davao	100	--

Source: ESCAP, *Coal Logistics Scenarios for the Asia-Pacific Region*, ESCAP Series on Coal, Vol. 3, May 1985, Bangkok, Thailand.

Figure 4.1
Coal Areas/Basins in the Philippines



Coal Qualities

As coal in the Philippines is scattered geologically, its quality is similarly divergent in moisture, ash, volatile matter, fixed carbon, sulphur, and heat value. Table 4.2 delineates these qualities for all of the major coal regions.

Coal Consumption

Prior to 1976, coal was not a dominant fuel source in the Philippines. Demand for coal was fairly low--100,000 metric tons per year satisfied one coal-fired generator as well as the industrial sector's demand.

In response to the oil crisis of the 1970s, "The Coal Development Act of 1976," was promulgated by Presidential Decree 972. This was highly effective, as the statistics in Tables 4.3 and 4.4 indicate. Tables 4.3 and 4.4 illustrate the dramatic increase in consumption levels between 1977 and 1987. This was caused by a number of events, including the shifting of the entire cement industry from oil to coal; the commissioning by the NPC of the 50 and 55 MW coal-fired units at Naga in Cebu in 1982 and 1986; the commissioning by the NPC of the 300 MW Calaca I coal-fired power plant near Batangas, south of Manila; the installation of a fluidized-bed, coal-fired power plant by Atlas Mining in Cebu; and the conversion from oil to coal at the power plant and for the ore driers of the Nonoc Mining and Industrial Corporation (NMIC) in 1983.

The NPC consumes over 1 million metric tons of coal, almost half the country's total demand. The next largest user is the cement industry, which accounts for approximately 35 percent of total consumption.

Coal Production

Approximately half of the Philippine's coal requirements are met through indigenous production. Current levels of production stand at about 1.2 million metric tons per year. As Table 4.5 shows, the dominant producer is the state-owned Semirara Coal Corporation (SCC) mine on Semirara Island, from which 595,000 metric tons were produced in 1987 for the Calaca power plant. The remainder for 1987 was from

Table 4.2
COAL QUALITY IN THE PHILIPPINES
(air-dried basis)

Coal Area Basin	Moisture (%)	Ash (%)	Volatile Matter (%)	Fixed Carbon (%)
Semirara Island	17-18	2-9	37-38	37-41
Cagayan Basin				
Cauayan, Isabela	14-16	15-18	36-38	25-29
Maddela, Quirino Prov.	8-12	8-16	41-55	28-32
Surigao				
Bislig	12-14	11-13	31-34	34-38
Guigaquit	8-9	17-22	37-40	28-34
Samar-Leyte	NA	NA	NA	NA
Zamboanga	2-4	5-7	24-28	58-67
Southern Mindoro	6	2-3	50-53	36-39
Northern Cebu				
Danao-Compostela	6-9	5-8	40-41	38-44
Toledo-Balamban	3-4	10-13	36-39	41-46
Central Cebu	11-12	5-6	38-40	39-42
Southern Cebu	5-6	3-6	40	46-48
Batan Island				
East	16-19	5-6	36-37	34-36
West	6-10	2-7	35-37	42-47
Quezon	5	4	48	42
Polillo Island	11-14	1-6	30-35	36-42
Catanduanes	3-7	9-15	22-25	50-55
Negros (East)	17-19	12-13	32-34	35-37
Davao	18	9	33-34	36
Masbate	4-15	5-35	20-36	36-45

Table 4.2. Continued

Coal Area Basin	Sulphur (%)	Heat Value (kcal/kg)	Coal Rank (ASTM Classification)
Semirara Island	0.5-0.7	4,440-5,550	Lignite to sub-bituminous
Cagayan Basin			
Cauayan, Isabela	0.7-1.1	3,780-4,110	Lignite
Maddela, Quirino Prov.	NA	5,170-5,400	Lignite to sub-bituminous
Surigao			
Bislig	0.5-1.0	4,900-5,400	Sub-bituminous
Guigaquit	2.4-3.8	4,780-5,170	Sub-bituminous
Samar-Leyte	NA	4,170-5,280	Sub-bituminous
Zamboanga	0.4-0.9	7,060-7,280	Bituminous to semi-anthracitic
Southern Mindoro	3.0-4.1	6,170-6,280	Sub-bituminous
Northern Cebu			
Danao-Compostela	0.3-1.0	5,830-6,400	Sub-bituminous
Toledo-Balamban	3.0-5.0	5,170-6,780	Sub-bituminous to bituminous
Central Cebu	0.3-0.5	5,400-5,780	Sub-bituminous
Southern Cebu	0.4-0.6	6,670-6,900	Bituminous
Batan Island			
East	1.7-2.0	4,560-4,940	Sub-bituminous
West	1.5-3.0	5,830-6,280	Sub-bituminous
Quezon	0.4	7,170	Bituminous
Polillo Island	0.3-1.3	5,060-6,110	Sub-bituminous
Catanduanes	1.2-1.6	5,720-6,720	Bituminous
Negros (East)	1.5-4.4	4,670-5,060	Sub-bituminous
Davao	0.6-1.7	4,560-6,110	Lignite to sub-bituminous
Masbate	0.7-3.2	4,440-5,110	Lignite to sub-bituminous

NA Not available.
Source: World Bank.

Table 4.3
COAL CONSUMPTION BY END-USE, 1977-1982
('000 metric tons)

	1977	1978	1979	1980	1981	1982
Power Plants						
National Power Corp.						
Naga (Cebu)	--	--	--	--	--	18.4
Calaca	--	--	--	--	--	--
Atlas Mining (Cebu)	56.3	47.4	39.9	26.8	13.0	8.3
Visayan Elect. Co. (Cebu)	22.4	25.3	33.0	53.4	50.0	34.0
Universal Cement (Cebu)	21.2	17.7	16.4	14.9	21.9	41.9
LuDo and LuYu (Cebu)	--	3.0	5.9	9.7	7.3	60.2
Nonoc Mining and Industrial Corporation (NMIC)	--	--	--	--	--	--
Semirara Coal Corp.	--	--	--	--	--	--
Subtotal	**99.9**	**93.4**	**95.2**	**104.8**	**92.2**	**162.8**
Cement Plants						
Universal (Cebu)	85.0	70.6	64.5	84.8	61.8	54.5
Pacific (Surigao del Norte)	31.6	44.2	32.4	32.5	35.7	49.2
Bacnotan (La Union)	18.3	31.8	11.6	15.3	29.7	24.9
Apo (Cebu)	10.9	17.9	17.2	23.3	16.2	16.7
Floro (Iligan City)	--	--	--	--	--	16.7
Iligan (Iligan City)	--	--	--	--	--	10.5
Northern (Rizal)	--	--	--	--	--	--
Island (Rizal)	--	--	--	--	--	--
Continental (Bulacan)	--	--	--	--	--	--
Bacnotan (Davao)	--	--	--	--	--	--
Republic (Bulacan)	--	--	--	--	--	--
Midland (Rizal)	--	--	--	--	--	--
Hi (Rizal)	--	--	--	--	--	--
Central (Rizal)	--	--	--	--	--	--
Filipines	--	--	--	--	--	--
Fortune	--	--	--	--	--	--
Rizal	--	--	--	--	--	--
Subtotal	**145.8**	**164.5**	**125.7**	**155.9**	**143.4**	**172.5**
Other Industrial	--	1.3	12.2	31.0	39.1	19.4
Nonenergy						
Maria Christna Chemical Ind.	13.8	6.0	4.5	4.4	0.4	--
Electro-Alloys	--	--	--	3.2	3.0	0.8
Subtotal	**13.8**	**6.0**	**4.5**	**7.6**	**3.3**	**0.8**
Total steam coal	**259.5**	**265.2**	**237.6**	**299.3**	**278.1**	**355.5**
Metallurgical coal[a]	**150.0**	**162.0**	**180.0**	**191.7**	**220.7**	**240.0**

Note: [a]Philippines Sinter Corp. (imported).
Source: World Bank.

Table 4.4
COAL CONSUMPTION BY END-USE, 1983-1987
('000 metric tons)

	1983	1984	1985	1986	1987
Power Plants					
National Power Corp.					
Naga (Cebu)	54.7	121.0	66.2	105.3	44.8
Calaca	--	75.0	651.0	737.5	996.8
Atlas Mining (Cebu)	186.4	354.6	324.9	141.1	207.4
Visayan Elect. Co. (Cebu)	26.3	33.0	7.7	6.0	1.5
Universal Cement (Cebu)	52.7	--	--	--	--
LuDo and LuYu (Cebu)	66.5	47.3	48.5	73.3	43.5
Nonoc Mining and Industry Corporation (NMIC)	--	219.0	361.6	62.0	--
Semirara Coal Corp.	--	--	--	43.4	44.5
Subtotal	**386.6**	**849.9**	**1,459.9**	**1,168.6**	**1,338.5**
Cement Plants					
Universal (Cebu)	61.7	22.6	15.7	--	--
Pacific (Surigao del Norte)	48.8	56.4	38.3	36.0	29.4
Bacnotan (La Union)	19.4	58.1	34.2	53.6	72.9
Apo (Cebu)	29.0	25.3	34.4	27.4	39.0
Floro (Iligan City)	25.5	47.2	48.9	17.4	16.5
Iligan (Iligan City)	43.5	50.9	49.0	48.5	58.6
Northern (Rizal)	42.2	80.8	49.9	59.2	71.9
Island (Rizal)	94.2	70.0	91.8	35.9	11.0
Continental (Bulacan)	14.6	31.2	25.0	29.3	12.1
Bacnotan (Davao)	18.0	56.5	68.7	77.9	89.3
Republic (Bulacan)	6.6	41.1	45.9	59.2	71.9
Midland (Rizal)	13.9	57.8	--	--	--
Hi (Rizal)	11.6	14.0	40.4	47.2	65.6
Central (Rizal)	1.9	60.0	42.4	24.6	35.9
Filipines	--	74.8	31.2	--	9.2
Fortune	--	--	--	50.0	56.9
Rizal	--	--	--	58.7	82.0
Subtotal	**430.9**	**802.9**	**615.8**	**624.9**	**722.2**
Other Industrial	**235.5**	**10.9**	**276.6**	**75.0**	**62.0**
Nonenergy					
Maria Christna Chemical Ind.	--	--	--	--	--
Electro-Alloys	1.2	--	--	--	--
Subtotal	**1.2**	**--**	**--**	**--**	**--**
Total steam coal	**1,054.2**	**1,607.5**	**2,352.3**	**1,868.5**	**2,122.7**
Metallurgical coal[a]	**200.0**	**NA**	**NA**	**NA**	**NA**

Note: [a] Philippines Sinter Corp. (imported).
Source: World Bank.

Table 4.5
COAL PRODUCTION IN THE PHILIPPINES, 1983-1987
('000 metric tons per year)

	1983	1984	1985	1986	1987
Semirara (SCC)	326	552	568	592	595
Cebu					
Private	323	238	313	364	226
PNOC-CC (Uling)	4	13	17	16	12
Subtotal	327	251	330	380	238
Mindanao					
Private	15	23	17	23	45
PNOC/MCC (Malangas)	232	209	163	97	165
PNOC (Bislig)	39	61	55	65	26
Subtotal	286	293	236	185	237
Other islands (private)	81	120	128	78	99
Total	**1,020**	**1,216**	**1,262**	**1,235**	**1,169**

Source: World Bank.

PNOC's Malangas, Bislig,and Uling mines on Mindanao and Cebu, which produced 203,000 metric tons, and private producers on Cebu and other islands whose output comprised the remaining 370,000 metric tons.

Coal production in the Philippines has remained somewhat steady over the years, while demand for coal has continued to increase. Thus, imports account for almost half of Philippine coal requirements. While there is certainly the capacity to produce more, greater expansion has not occurred because declining international coal prices, have made it more economical to import coal, despite import duties.

Apart from the price disparity, there are coal quality issues that preclude further domestic usage. In particular, the mismatch between the design of the Calaca I coal handling equipment and boiler and the quality of the Semirara coal has created the need to import 40 to 50 percent of Calaca's coal requirements to blend with the Semirara coal. In addition, technical problems at both the Semirara mine and PNOC's largest underground mine at Malangas have prevented the attainment of planned production. Lastly, many of the cement plants are designed to burn higher quality Mindanao and Cebu coals, which are currently in limited supply.

Coal Pricing

The difference between domestic and international coal prices has become a crucial factor in coal import levels. Public policy set forth by the Coal Council of Advisors, which is enforced by the Energy Regulatory Board, dictates that a certain percentage of domestic coal must nevertheless be used. In 1987 this figure was 50 percent, and in 1988 it was raised to 55 percent. This percentage is based on the proportion of total consumption that can be met by the Philippine mines. Prices are naturally affected by the quotas and required use of domestic coal. In addition, both imported and domestic coal are subject to taxes, duties, and royalties. Table 4.6 indicates the prices for domestic and imported coal without duties.

Table 4.6
PRICES FOR DOMESTIC AND IMPORTED COAL, SELECTED YEARS, 1981-1988

	Philippine Coal on Cebu		Duty-Free Imported Coal	
	P/ton	US$/$10^6$ BTU	US$/ton	US$/$10^6$ BTU
1981	340	1.95	60-70	2.27-2.65
1986	740-930	1.64-2.08	31-40	1.17-1.51
1987	740	1.64	26-34	0.98-1.21
1988	941	2.05	30-34	1.13-1.29

Source: World Bank.

Imported coal is subject to a 20 percent duty, a 0.1 percent Board of Energy fee and, as of 1988, a value added tax. Although these extra charges raise the price of imported coal approximately 20 to 25 percent, it is still less expensive than domestic coal.

Domestically produced coal is also subject to a number of fees: royalties, income tax, and revenue sharing. However, under current market conditions, most domestic coal companies pay a minimum 3 percent in revenue sharing and in most cases, little or no income taxes. In a thriving market, the combined amount of revenue sharing and income taxes could reach 10 to 15 percent. Table 4.7 demonstrates the effect of taxes on pricing by indicating the domestic coal prices with and without revenue sharing, and duties and taxes on imported coal. Even with taxation, imported coal is much less expensive.

The policy implications of this price disparity are significant. For the small mining companies that base their decisions to expand on the prevailing domestic price, decisions leading to economic inefficiencies may be made, particularly if international prices remain soft. With low international prices, the mandated use of domestic coal economically burdens consumers who have to pay more for it.

While it is the consumer who bears the economic hardship, it is not unreasonable for the Philippines to maintain a domestic coal industry, especially in light of the fluctuating price of imported coal and the lead times required for mine development. Thus, the government has a difficult task: to ensure on the one hand, the survival of the domestic industry, while, on the other, to reduce the burden on coal consumers and prevent the misallocation of resources by limiting the expansion of the domestic industry until it is economically warranted.

Discussions are taking place on the expansion of the Semirara and Isabela mines, which would service the power sector. In both cases, expansion costs are estimated to be higher than the projected costs of importing coal to fuel new power plants, such as the proposed Calaca II.

Table 4.7
EFFECT OF TAXES AND DUTIES ON COAL PRICES

	Philippine Coal		Imported Coal
	Calaca	Naga/Cebu	
Heating value (BTU/lb)	8,700	8,500-10,000	12,000
Prices to coal consumers			
--per ton	P 787	P 800 P 941	US$38 to US$44
--per million BTUs	US$2.00	US$2.08	US$1.44 to US$1.66
Prices excluding revenue sharing on Philippine coal, and duties and taxes on imported coal			
--per ton	P 763	P 777 P 914	US$30 to US$34
--per million BTUs	US$1.94	US$2.02	US$1.13 to US$1.29

Source: World Bank.

In view of the economic forces at work, the government may want to keep its options open by perhaps designing Calaca II to use either Semirara or imported coal and, at the same time, be prepared to import coal until international prices rise. Given current market conditions, the expansion of Semirara might best be postponed, although, studies to indicate the optimal mining layouts of future sites at Semirara should be continued. If such an approach is followed, it is possible that the Philippine government could maintain internal flexibility without undue expense to consumers.

Part Five

THE OIL INDUSTRY

Major Players

The major players in the Philippine oil industry are the national oil company PNOC, Shell Philippinas, and Caltex, all of which own refineries.

PNOC is involved in all facets of Philippine energy; its interests include geothermal, coal, marine transport, and petroleum. PNOC was created in 1973 as part of the government of the Philippines' program to achieve greater energy self-sufficiency. In addition, it was charged with providing and maintaining an adequate petroleum supply, as well as promoting exploration and utilization of domestic reserves.

By 1976 PNOC expanded into a total energy company, as Presidential Decree 927 authorized PNOC to search for and develop nonoil energy sources. PNOC has since established government-to-government crude supply arrangements. It is also the largest refiner, marketer, and transporter of petroleum in the Philippines.

To carry out its energy mission most efficiently, PNOC is composed of a number of subsidiaries, which are outlined below.

PNOC Energy Development Corporation
This subsidiary explores and develops geothermal energy as well as other nonoil resources. The major sites for geothermal activity include Leyte, Southern Negros, and Manito, Albay. It provides drilling service for oil, gas, geothermal, and other volatile substances.

PNOC Exploration Corporation
This focuses primarily on potential onshore oil exploration. The major areas of activity include Central Luzon, Cebu, and Mindoro.

Malangas Coal Corporation
The exploration, mining, and processing of coal are its primary businesses.

Bislig Coal Corporation
Bislig is also engaged in the exploration, mining, and processing of coal.

PNOC Coal Corporation
While involved in the exploration, mining, and trading of coal, this company participates in the national coal logistics program.

Transport & Logistics Group
Within this large group are PNOC Shipping & Transport Corporation; Petron Tankers Corporation; PNOC Tankers Corporation; Petrophil Tankers Corporation; PNOC Oil Carriers, Inc.; PNOC Crude Oil Tankers, Inc.; PNOC Petroleum Carriers Corporation; and PNOC Marine Corporation. All are involved in the transport of crude and/or the maintenance of the vessels that transport it. PNOC, with its fleet of tankers, is the country's largest shipowner. In addition, it accommodates the shipping requirements of both Caltex and Shell. In all, PNOC's international fleet is capable of lifting 65 percent of national oil importations with its total tonnage of 777,032 DWT, or a capacity of 5.5 million barrels.

Petroleum Refining/Marketing Group
This group is composed of many corporations involved with the refining and marketing of petroleum. The Bataan Refining Corporation is the largest oil refinery in the country and is wholly owned by PNOC. The country's leading marketer is Petron Corporation. The Filoil Refinery Corporation is a part of this group. While the Filoil Refinery is located in Rosario, Cavite, its main processing facilities have been transferred to the Bataan Refinery.

PNOC, through its wide range of activities, is a major force in the Philippine energy sector. One of its more noteworthy refining and marketing achievements is Petron's development of Petrol clean diesel, a diesel blend with only half the sulfur content of the competing local brands. The lower sulfur content results in smoother engine operation and longer engine life. Its introduction into the market has met with great success. Petron has also successfully introduced into the gasoline market a premium gasoline blend, Vitalized Rev Mix 95 octane, which meets international standards for premium gasoline and is priced competitively with other lower octane premium gasolines. With this level of achievement, Petron has been a vital component of PNOC.

The other two major players, Caltex and Shell Philippinas, are active primarily in the refining industry. Caltex has indicated financial difficulties as it recently asked the

Energy Regulatory Board for relief to help it recover some of the 300 million pesos (US$14.26 million) in increased costs incurred in the five years ending in 1987. Caltex reports that increased operating costs have created an unviable local oil industry, and without financial relief the company cannot justify investments that would serve the energy needs of the community.

Both Shell and Caltex are in favor of deregulation. In fact, the industry is currently supporting legislation seeking a study of deregulation that would encourage the lifting of some, or possibly all, of the government rules of energy development and operation.

Oil Production

The Philippines is a very small producer of crude oil. Only three major fields are under production, namely South Nido, Matinloc, and Cadlao. Matinloc and Cadlao both produce light crude; in both cases the API is over 40°. South Nido's API gravity is 27.1°. Table 5.1 provides data on each field. It is hoped that petroleum production will increase because of the expanded efforts expected to occur in oil exploration. In 1986, on average production levels were about 6,900 barrels per day from ten wells.

Oil Exploration and Development

The prospects for oil exploration improved considerably from the mid- to late 1980s. Economic crisis engendered a stagnant environment for exploration, and the revolution in 1986 did little to further exploration efforts. Major disruptions in the industry occurred as the former energy minister and head of PNOC, Geronimo Velasco, fled the country under accusations of siphoning millions of dollars from PNOC.

By 1987, PNOC had been reorganized and the Ministry of Energy replaced by the Office of Energy Affairs. It also appeared that exploration efforts had taken on a new look, as two new offshore licenses were granted and one offshore relinquishment was accepted in that year. In addition, exploration and development expenditures tallied US$16 million and were expected to increase.

Table 5.1
PHILIPPINE OIL PRODUCTION, 1986

Field	Depth (ft)	No. of Wells		Production (b/d)
		Producing	Total	
South Nido	6,576-6,885	3	6	1,054
Matinloc	6,656-6,750	5	5	3,217
Cadlao	5,734-5,881	2	2	2,640
Total		**10**	**13**	**6,911**

Source: Oil and Gas Journal, 28 Dec. 1987.

Table 5.2 indicates exploration and development activities in the past few years. In 1987 four wells were drilled--three offshore exploration wells, two of which were dry holes, and one offshore production well, indicating some progress. No wells were drilled in 1986.

The Office of Energy Affairs envisions 1988 as even more favorable for drilling activity, claiming it will sign 11 new exploration licenses and that development expenditures will rise to US$30 million. Of the 11 new wells, 5 are to be offshore and 6 onshore. Exploration efforts in the past have proven viable, as in 1987 the Philippines produced 2.039 million barrels of crude oil from three small fields in the South China Sea. These fields--Matinloc, Cadlao and Nido--are now consolidated and operated by Alcorn International Inc., a private firm in Houston. While production levels were higher (2.469 million barrels) in 1986, production in 1988 is expected to approximate that of 1987.

Refineries

The Philippines has three major refineries, as Table 5.3 indicates. The largest is owned by the government and has a crude running capacity of 155,000 barrels per stream day (bpsd). It has three distillation units, a vacuum distillation unit, an 11,000 bpsd catalytic cracker, 45,000 bpsd of naptha hydrotreating capacity, 19,200 bpsd of reforming capacity, and a 14,000 bpsd distillate hydrotreater. It is by far the most complex of the three refineries, yet its crude capacity utilization of 48 percent is the lowest of all.

The next largest refinery is owned by Shell. Located in Tabangao, this refinery has some 70,000 bpsd of crude running capacity. It lacks a vacuum distillation unit and a catalytic cracker; however, it has 16,000 bpsd of hydrotreating capacity, 9,500 bpsd of reforming capacity, and a 6,000 bpsd distillate hydrotreater. It operates at 52 percent crude capacity utilization.

The Caltex refinery located in Batangas has 68,000 bpsd of crude running capacity and an 18,500 bpsd vacuum distillation unit. It is almost as complex as the Bataan

Table 5.2
OIL EXPLORATION AND DEVELOPMENT, 1986-1988

	1986	1987	1988[a]
Exploration wells			
Onshore	0	1	6
Offshore	0	3	5
Total	0	4	11
Production wells			
Onshore	--	--	--
Offshore	0	1	NA
Total	0	1	NA
Seismic data (line-km)			
Onshore	NA	94	1,400
Offshore	NA	2,700	7,000
Total	2,807	2,794	8,400
Maximum active rigs			
Onshore	0	2	3
Offshore	0	1	3
Total	0	3	6
Expenditure	NA	US$16 million	US$30 million
Exploration licenses granted	1	2	11

Notes: NA Not available.
[a]Projected goals.
Source: *Petroleum News*, Jan./Feb. 1988.

Table 5.3
PHILIPPINE REFINERY CAPACITY
(bpsd)

	Caltex/Batangas	Petron/Bataan	Shell/Tabangao
Crude Unit 1	35,000	45,000	30,000
2	33,000	85,000	40,000
3	--	25,000	--
Total running capacity	68,000	155,000	70,000
Distillate handling capacity	47,000		
VDU	18,500	18,000	
Catalytic cracker	12,500	11,000	
conversion (%)	65	55	
Naphtha hydrotreater 1	12,000	12,000	16,000*
2	--	33,000	--
Reformer 1	9,000	5,200	3,900
2	--	14,000	5,600
Distillate hydrotreater	16,000	14,000	6,000
Jet/kero merox	10,500	--	--
Crude capacity utilization (%)	59	48	52

*Kero Minus
Source: Caltex.

refinery in that it contains a catalytic cracker, a reformer, and a distillate hydrotreater. In addition, it has a 10,500 bpsd jet/kero merox treater.

Given current and projected product demand, new upgrading investment may not be needed until the mid- to late 1990s. The current rise in fuel oil demand has accommodated the excess fuel oil supplies so that, at present, the Philippine refinery industry is in balance. However, as geothermal capacity increases, this balance may be lost by the early 1990s. At the same time, Shell and Caltex may reach their capacity limits and find it necessary to debottleneck by adding 40-50 thousand barrels per day (b/d) capacity to existing capacity. This would result in greater middle distillate production by the mid-1990s.

Refinery Production

Refineries in the Philippines produce a wide slate host of products, including avturbo, premium gasoline, regular gasoline, kerosene, diesel, fuel oil, LPG, asphalts, naphtha, avgas, and solvents. As the pricing structure of petroleum products has favored the heavier products, those are produced in the larger amounts, such as diesel and fuel oil. Table 5.4 indicates the relative magnitude of product production for the first halves of 1986 and 1987.

Diesel production is emphasized. In the first half of 1987, it accounted for almost 30 percent of all refined products. Fuel oil production was even greater, as over one-third of all production was devoted to it. The next largest in production is premium gasoline, which in the first half of 1987 accounted for almost 14 percent of all production. This represents more than a 23 percent increase from the same period in 1986. All other products increased in production relative to 1986, except naphtha, which decreased by nearly 19 percent.

Petroleum Product Prices

The government of the Philippines sets overall prices of domestic petroleum products based on the consideration of international oil prices, peso-dollar exchange

Table 5.4
REFINERY PRODUCTION
(million barrels)

	First Half of Year		
	1986	1987	% Change
Avturbo	1.44	1.58	9.2
Premium gasoline	3.13	3.86	23.4
Regular gasoline	1.27	1.74	37.2
Kerosene	1.06	1.29	21.5
Diesel	7.51	8.13	8.2
Fuel oil	7.51	9.34	24.3
LPG	0.89	1.10	25.0
Asphalts	0.15	0.16	7.5
Naphtha	0.75	0.61	(18.7)
Avgas	0.00	0.00	0.00
Solvents	0.11	0.14	22.0
Total	**23.71**	**27.95**	**17.3**

Source: Office of Energy Affairs, Bureau of Energy Utilization, Manila.

rate fluctuations, inventory levels, as well as revenue generation and industrial viability. Much controversy has arisen over its pricing policy and most of the discussions concern the Oil Price Stabilization Fund (OPSF).

The OPSF was established to facilitate the stabilization of domestic prices that would otherwise be affected by fluctuating international oil prices and peso-dollar exchange rates. The fund is generated through oil product taxes and is used to reimburse oil companies the excess of the actual peso cost computed on the basis of a reference crude price and peso-dollar exchange rate set by the government energy regulatory agency. Conversely, if actual peso costs are lower, the oil companies are required to pay the resulting peso differential to the OPSF.

Originally called the Consumer Price Equalization Fund (CPEF), OPSF was introduced through Public Decree 1956 during the Marcos regime. The justification for the fund centered around the post-Iranian revolution petroleum pricing structure. At that time, OPEC members were not in agreement on crude oil prices; thus, purchase prices by Philippine refineries varied considerably. For instance, Caltex paid US$32 per barrel for crude from Saudi Arabia, while Shell purchased crude from Kuwait and Brunei at much higher prices. The Ministry of Energy argued that to ensure uniform product prices, those oil companies paying more for their petroleum should be reimbursed. Since that time, OPEC prices have become uniform, and the peso-dollar exchange rate has emerged as an important factor in the justification of the OPSF.

In the past, the retail market in the Philippines reflected international price decreases. As the price of imported crude dropped from US$25-27 per barrel in 1985 to an average of US$14 per barrel in 1986, there was a resultant decrease in the price of domestic petroleum prices. (Retail prices for 1986 are given in Table 5.5.)

As Table 5.5 indicates, prices of products were reduced four times during 1986, resulting in a cumulative reduction in the average petroleum price of P1.85 per liter.

By the time the really significant international price decreases occurred, the OPSF had been depleted. In fact, it had been suspended at various times, including from January to April 1985 and from January 1986 to March 1987.

Table 5.5
RETAIL PRICES OF PETROLEUM PRODUCTS
ON SELECTED DAYS IN 1986
(Pesos/liter)

Product	25 January 1986	20 March 1986	22 May 1986	31 July 1986
Premium gasoline	7.40	7.15	6.90	6.90
Regular gasoline	7.03	6.78	6.53	6.53
Diesel	5.72	5.26	4.76	4.76
Fuel oil	4.12	3.47	2.81	2.50
Kerosene	5.76	5.31	4.81	4.81
LPG	5.26	4.66	4.16	4.16

Source: Board of Energy (BOE), Manila.

In 1987, international crude prices were at an all-time low, and the exchange rate was relatively stable. As these were the former parameters for the justification of the OPSF, a new proposal was set forth so that oil companies could continue to draw from the OPSF. The oil companies claimed that inventory losses were incurred during the reduction of local oil prices. To accommodate this situation, President Aquino signed Executive Order 135, allowing inventory losses to be reimbursable from the OPSF retroactive to January 1986.

Along with the new proposal, the oil companies proposed a substantial price increase. The increases that actually occurred, as compared to 1986, are indicated in Table 5.6. While the oil companies had lobbied for a 90-centavo-per-liter increase, an average of 44 centavo-per-liter increase actually occurred.

Aside from covering costs and ensuring a profit margin for the oil companies, petroleum product prices also have a large tax component that consists primarily of import duties on crude oil and ad valorem taxes on the products. The levels of taxation on petroleum products is dictated mostly by social equity considerations. For example, taxes on gasoline and jet fuel are higher than those on other products such as LPG, because they are perceived to be demanded by more affluent consumers. As the consumption of diesel, kerosene, and LPG are perceived to be related more to basic necessities, their taxes are lower. Likewise, the tax on fuel oil is kept reasonably low in order to minimize industrial production costs. To illustrate the tax structure, Table 5.7 illustrates the various components involved in the total price of regular gasoline.

A tax structure as given above lends itself to substantial government revenues. Table 5.8 illustrates the oil tax revenues and oil consumption data for 1980 through 1986. In 1986 alone, almost 12 billion pesos were collected from the sale of petroleum products. Table 5.8 also reveals that despite lower oil consumption through the years, the government has managed to maintain its share of revenues. Though the government was forced to lower oil prices in 1984, 1985, and 1986 due to the severe slump in the price of crude oil, the specific tax rate has increased considerably since 1985. The Aquino government announced that the specific tax would be scrapped as of 14 July

Table 5.6
OLD AND NEW PRICES OF OIL PRODUCTS
(in pesos)

	Old Prices			New Prices[b]	
	Actual Price[a]	Retail	OPSF	Retail	OPSF
Premium gasoline	7.61	6.90	(.71)	7.50	--
Regular gasoline	7.24	6.53	(.71)	7.15	.37
Diesel	5.16	4.76	(.40)	5.25	.42
Fuel oil	3.59	2.50	(1.09)	2.83	--
Kerosene	5.28	4.81	(.47)	5.30	.30
LPG	3.58	3.57	(.01)	3.69	.45

Notes: [a]Actual price is the sum of the retail price paid by the consumer plus the contribution made to the OPSF.
[b]New prices as of 26 August 1987.
Source: *Kasarinlan*, Vol. 3, No. 2, 1987.

Table 5.7
PRICE OF REGULAR GASOLINE
(Peso/liter as of July 1987)

Component	Price	Percentage of Total
Company's direct recovery	3.49	48
OPSF	(0.71)	10
Government take	3.47	48
Specific tax	2.60	36
Ad valorem tax	0.87	12
Hauling charge	0.05	0.007
Dealers' markup	0.23	0.03
Retail price	**6.53**	
Actual price	**7.24**	

Source: *Kasarinlan*, Vol. 3, No. 2, 1987.

Table 5.8
OIL TAX REVENUES AND OIL CONSUMPTION, 1980-1986

Year	Tax Collection (Pesos billion)	Oil Consumption (million barrels)
1980	7.4	79.96
1981	7.8	75.22
1982	7.8	74.85
1983	7.5	74.82
1984	14.5	61.64
1985	14.6	55.01
1986	11.7	52.63

Source: PNOC.

1987, but that the ad valorem tax would be increased. Thus, the controversy regarding the real equity of the domestic pricing policy rages on, especially in light of the oil companies' increasing profitability despite lower oil prices (Table 5.9).

The issue of petroleum product prices is multifaceted, and it is understandable that not all parties can be satisfied at any point in time. Pricing should, to the extent possible, exert pressure on demand, ensure reasonable profitability to the oil companies, and contribute substantial revenue to the government.

Petroleum Product Demand

Given the decline in petroleum product prices, it is not surprising that an increase in product demand would ensue. From a demand level of 55.0 million barrels in 1985, overall product demand increased by 5.2 percent to 58.0 million barrels in 1986. In specific terms, all products, except naphtha, greases and aviation gas, were in greater demand. More pronounced growth was experienced in the demand for LPG, gasoline, kerosene, fuel oil, and solvents. Table 5.10 outlines individual product demand for 1985 and 1986.

There has been a marked increase in fuel oil demand, so much so that fuel oil has been imported by all refiners at one time or another. Private companies have been importing around 15,000-20,000 b/d of fuel oil. PNOC, however, has now been importing 12,000 b/d of Shengli--6,000 b/d directly to be burnt by NPC and 6,000 b/d for its own refinery. Thus, PNOC does not have to import fuel oil.

This increase in fuel oil demand is due in large part to its relative pricing. For the sake of comparison, the wholesale price of fuel oil in Singapore is priced at 69 percent of diesel whereas 80 percent in the Philippines.

Oil Demand Forecast

The Bureau of Energy Utilization forecasts oil demand to increase at modest levels into the next decade. Table 5.11 provides estimates of future demand. In keeping with a historical pattern, diesel will be in greater demand. By 1992, consumption of

Table 5.9
OIL COMPANY PROFITS, 1983-1986
(P 1,000)

	1983	1984	1985	1986
Refineries				
Bataan	26,211	31,163	30,273	46,166
Caltex	75,220	41,668	220,909	139,698
Philippinas Shell	(10,689)	92,226	206,897	204,828
Phil. Petroleum	(63,669)	143,024	35,591	273,572
Subtotal	**154,411**	**308,080**	**493,670**	**664,264**
Distributors				
Petrophil	51,823	61,067	80,159	403,632
Shell Dist.	15,265	44,469	39,750	49,557
Mobil Phils.	233	--	--	39,325
Sea Oil Mktg.	233	51.1	318	215
Petro Dist. Serv.	--	--	--	(38,166)
Making Ent.	--	73	77	68
Subtotal	**67,452**	**105,807**	**120,304**	**454,631**
Total	**221,863**	**413,887**	**613,974**	**1,118,895**
Oil consumption (million liters)	11,441.6	9,416	8,429.2	9,223.1
Company profits per liter (centavos)	**1.9**	**4.4**	**7.3**	**12.1**

Source: Kasarinlan, Vol. 3, No. 2, 1987.

Table 5.10
DOMESTIC NET CONSUMPTION OF PETROLEUM PRODUCTS
('000 barrels)

Product	1985	1986	Variance	% Change
Aviation turbo	2,712	2,716	4	0.14
Premium gasoline	5,885	6,334	449	7.63
Regular gasoline	2,562	2,806	244	9.54
Kerosene	2,074	2,273	199	9.59
Diesel oil	15,702	16,223	521	3.32
Fuel oil	20,039	21,511	1,472	7.35
LPG	2,234	2,464	230	10.29
Asphalt	284	295	11	4.02
Solvents	160	200	40	25.14
Naphtha	616	264	-352	-57.16
Aviation gas	36	35	-1	-3.76
Lubricating oils	693	731	38	5.46
Greases	17	16	-1	-5.64
Refinery fuel and loss	2,098	2,139	41	1.95
Total	55,112	58,007	2,895	5.25

Source: Office of Energy Affairs, Bureau of Energy Utilization, Manila, March 1987.

Table 5.11
OIL DEMAND FORECAST
('000 barrels)

Product	1989	1990	1991	1992
Premium gasoline	6,691	6,892	7,098	7,311
Regular gasoline	2,582	2,556	2,531	2,505
Diesel	18,017	18,737	19,487	20,266
LPG	2,494	2,544	2,595	2,647
Kerosene	2,103	2,082	2,061	2,041
Avturbo	2,884	2,971	3,060	3,152
Avgas	35	35	35	35
Fuel oil	21,138	22,816	24,283	22,884
Refinery fuel and loss	2,304	2,412	2,513	2,501
Total	**58,248**	**61,045**	**63,663**	**63,342**

Source: Office of Energy Affairs, Bureau of Energy Utilization, Manila, March 1987.

diesel is estimated to reach approximately 20 million barrels per year, which constitutes one-third of the overall product demand of 63 million barrels. Next in importance will be fuel oil, of which almost 23 million barrels will be demanded. Premium gasoline and avturbo remain relatively small in their demand profiles, with consumption by 1992 equalling 2 million barrels and 3.1 million barrels per year, respectively. Barring any major policy change in tax structure on products, consumption into the future will mirror the recent past.

Part Six
ELECTRICITY

The National Power Corporation (NPC) is responsible for the planning and operation of the seven separate grids in the Philippines. There are three major regions: the Luzon grid, which has an installed capacity of over 4,000 MW; the Visayas Islands grid, which is composed of five island grids with an aggregate capacity of 600 MW; and the Mindanao grid, with an installed capacity of over 1,000 MW.

Luzon has been the most significant region, as it accounted for 2,435 MW or 76 percent of total electricity demand in 1986. The Mindanao grid contributed 484 MW, or 15 percent of total demand, while the Visayas grid contributed the remaining 9 percent. Table 6.1 shows the overall demand structure.

Each grid is different in its overall characteristics. The Mindanao grid is heavily dependent on hydro, while in Visayas the grids on the islands of Leyte and Negros are largely dependent on geothermal, with a mix of oil and coal. The Luzon grid is the most varied, as it incorporates oil, coal, geothermal, and hydro. Owing to the varied nature of the grids, each is discussed separately.

The Luzon Grid

Luzon's existing power generation system, as shown in Table 6.2, consists of a mix of oil, coal-fired, hydro, and geothermal facilities. The geothermal facilities, Tiwi and Mak-Ban, located in Southern Luzon, have expanded rapidly in the past several years. The 660 MW they generate are used primarily to supply base load.

Hydro is a major source of power, constituting over one-half of NPC's generating capacity. Most of the large hydro stations are located in the northern part of Luzon.

Coal-fired generation is relatively new in the region. In 1984, the first 300 MW coal-fired thermal plant in Calaca, Batangas began operation, utilizing coal from Semirara Island. Coal is also imported and blended with the Semirara coal. Luzon's

Table 6.1
NATIONAL POWER CORPORATION
SYSTEM PEAK DEMAND
(MW)

Grid	1981	1982	1983	1984	1985	1986
Luzon	2,225	2,364	2,478	2,374	2,311	2,435
Visayas						
Cebu	66	88	105	98	92	105
Negros	26	30	46	48	50	48
Panay	25	21	25	38	38	48
Leyte	2	16	45	50	68	72
Bohol	5	7	8	8	8	11
Mindanao[a]						
Agus	298	371	394	433	470	484
General Santos	13	16	16	--	--	--

Note: [a]From 1984, Agus and General Santos grids have been interconnected.
Source: National Power Corporation.

Table 6.2
LUZON: INSTALLED CAPACITIES
OF NPC GENERATING PLANTS

NPC Plant	Unit No.	Capacity (MW)
A. Hydro		
1. Kalayaan	1	150
	2	150
2. Magat	1	90
	2	90
	3	90
	4	90
3. Angat Main	1	50
	2	50
	3	50
	4	50
4. Binga	1	25
	2	25
	3	25
	4	25
5. Pantabangan	1	50
	2	50
6. Ambuklao	1	25
	2	25
	3	25
7. Caliraya	1	8
	2	8
	3	8
	4	8
8. Masiway	1	12
9. Barit	1	1.8
10. Cawayan	1	0.4
Subtotal		**1,209.2**
B. Oil-Based		
1. Bataan	1	75
	2	150
Subtotal		**225**
C. Coal		
1. Calaca, Batangas	1	300

Table 6.2. Continued

NPC Plant	Unit No.	Capacity (MW)
D. Geothermal		
1. Tiwi	1	55
	2	55
	3	55
	4	55
	5	55
	6	55
2. Mak-Ban	1	55
	2	55
	3	55
	4	55
	5	55
	6	55
Subtotal		660
E. Meralco Plants		
1. Botocan	1	8
	2	8
	3	1
2. Rockwell 850	1	25
	2	25
	3	25
	4	25
	5	25
3. Manila		
Tegen 1	1	100
Tegen 2	2	100
4. Rockwell 1800	6	60
	7	60
	8	60
5. Sucat		
Gardner 1	1	150
Gardner 2	2	200
Snyder 1	3	200
Snyder 2	4	300
6. Malaya	1	300
	2	350
Subtotal		2,022
Total, Luzon		4,416.2

transmission system consists of 230, 115, and 69 kv lines. The network is extensive, as it spans from the distant hydro plants in the north to the geothermal plants in the south and to the main load centers, particularly in Metro Manila.

While not listed in Table 6.2, the 620 MW nuclear plant at Bataan is of interest. Despite having reached an advanced state of construction, work on the plant was stopped. It is unlikely that this plant will ever be completed and commissioned.

The Luzon grid will continue to expand. NPC plans two 55 MW units at a new geothermal site at Bacon-Manito in 1991, and a 300 MW coal-fired unit as an expansion to Calaca in 1992. NPC also plans to install approximately 200 MW of gas turbines in 1989 or 1990, and to rehabilitate Sucat units 1 and 4 to recover a total of 120 MW. Table 6.3 demonstrates the planned expansions for 1992, as well as for the year 2000.

These new additions are necessary to meet the expected growth in electricity demand. Electricity demand growth rates between 1973 and 1980 averaged almost 6.0 percent annually. In the early 1980s, the annual growth weakened and in 1984 and 1985 it was negative, as documented in Table 6.4. Since 1986, there has been a remarkable recovery, with electricity demand growing from an annual rate of 2.43 percent in 1986 to 10.52 percent in 1987.

NPC's load forecasts for the Luzon power grid reflect the recent increase in demand. The forecast is based on a GDP growth rate of 5.8 percent for 1988-1992, and 6.3 percent for 1993-2000. If a low GDP growth rate of 5.2 percent is used, and a high GDP growth rate of 7.5 percent is modelled, the future growth rates of electricity demand will be as indicated in Table 6.5.

In view of the anticipated rapid load growth, NPC is naturally concerned with expansion. There has been debate over the possibility of a capacity shortfall before the commissioning of the 300 MW coal unit in 1992. Given the NPC expansion plan, as set forth in Table 6.5, capacity should be sufficient. This would be contingent upon additional capacity being delivered from the hydro plants even during dry periods.

Table 6.3
NPC'S GENERATION EXPANSION PLAN

Year	Plant	MW
1987	Rehab Malaya 1	300.0
1988	Rockwell	180.0
1989	Gas turbine A	150.0
	Rehab Sucat 1	150.0
1990	Gas turbine B	200.0
	Rehab Sucat 4	300.0
1991	Bak-Man geo I	110.0
1992	Calaca coal II	300.0
	Retire Rockwell	-180.0
1993	Pantay hydro	23.0
	Bak-Man geo II	110.0
	Pinatubo geo	110.0
1994	Labo geo	110.0
	Irosin geo	110.0
1998	Geothermal	110.0
1999	Coal A	300.0
2000	Coal B	300.0

Source: World Bank, Report No. 7269, Sept. 1988.

Table 6.4
LUZON POWER GRID:
HISTORICAL ELECTRICITY DEMAND

Year	Sales (GWh)	Annual Percentage	Generation (GWh)	Peak (MW)	Load Factor (%)
1973	7,725	8.15	8,227	1,335	70.35
1974	7,805	10.04	8,262	1,379	68.39
1975	8,506	8.98	9,037	1,513	68.18
1976	9,200	8.16	9,652	1,659	66.42
1977	9,813	6.66	10,380	1,709	69.33
1978	10,749	9.54	11,222	1,780	71.97
1979	11,645	8.34	12,504	1,926	74.11
1980	12,163	4.45	13,115	2,074	72.19
1981	12,690	4.33	13,666	2,225	70.11
1982	13,125	3.43	14,398	2,364	69.53
1983	13,907	5.96	15,294	2,478	70.46
1984	13,243	-4.77	14,655	2,374	70.47
1985	13,221	-0.17	14,449	2,311	71.37
1986	13,542	2.43	14,756	2,435	69.18
1987	14,967	10.52	NA	2,592	NA

NA Not available.
Source: World Bank, Report No. 7269, Sept. 1988.

Table 6.5
SCENARIOS FOR ELECTRICITY DEMAND GROWTH
(% average growth rate per annum)

Period	Base	High	Low
1987-1990	6.15	7.16	6.09
1990-1995	5.47	6.92	4.64
1995-2000	4.97	5.76	4.19
1987-2000	5.44	6.53	4.80

Source: World Bank, Report No. 7269, Sept. 1988.

The Visayas Grid

Table 6.6 outlines the parameters of the Visayas generation system. The current grid connects the Palimpinon geothermal facility on the island of Leyte, the small hydro facilities on Negros and Bohol, the coal burning plants on Cebu, and the oil-fired plants on Negros and Panay. Transmission consists of 138 and 69 kv lines.

At present, each of the island grids operates independently; there is no interconnection. If there are generation shortfalls on any of the islands, there are four movable power barges that can be used. These barges are also available for Mindanao, providing the Visayas Islands are not using them.

Table 6.7 indicates NPC's expansion plans for the Visayas grid. Important to the future of Visayas power is the interconnection of island grids to extend geothermal power to areas without indigenous power supplies. NPC plans to interconnect Negros and Panay in 1989, with a link up to the island of Cebu in 1992. These interconnections will enable the future use of Negros geothermal potential (Palimpinon) to serve the Panay and Cebu grids, thus reducing the reliance on fossil fuels.

The Mindanao Grid

Mindanao power supply, as illustrated in Table 6.8, is dominated by hydro plants, which provide almost 900 MW of the island's total capacity of just over 1,000 MW. The remainder of the capacity is supplied by oil-powered facilities at General Santos and Aplaya. Almost all the plants are connected to one another via 138 kv lines.

Expansion plans for Mindanao are listed in Table 6.9. To comply with a policy of supply diversification, primary focus will be on gas and diesel generation until the late 1990s, when additional geothermal facilities are expected to come on line.

Expansion Plans: Future Costs

According to the various tables outlining NPC expansion plans for the various islands, several new hydro sites on Luzon had been identified for future system

Table 6.6
VISAYAS: INSTALLED CAPACITIES
OF NPC GENERATING PLANTS

NPC Plant	Unit No.	Capacity (MW)
Cebu		
A. Oil-based		
1. Cebu I	1	7.3
	2	7.3
	3	7.3
	4	7.3
	5	7.3
	6	7.3
2. Cebu II	1	19.28
	2	19.28
	3	19.28
3. Power Barge I	2	32
Subtotal		**133.64**
B. Coal		
1. Cebu Thermal I	1	50
2. Cebu Thermal II	1	55
Subtotal		**105**
Negros		
A. Hydro		
1. Amlan	1	0.4
	2	0.4
Subtotal		**0.8**
B. Oil-based		
1. Alman	1	5.5
	2	5.5
Subtotal		**11**

Table 6.6. Continued

NPC Plant	Unit No.	Capacity (MW)
Negros (cont'd)		
C. Geothermal		
1. Palimpinon	1	37.5
	2	37.5
	3	37.5
Pilot 1	1	1.5
	2	1.5
Pilot 2	3	1.5
	4	1.5
Subtotal		**118.5**
Panay		
A. Oil-based		
1. Panay	1	7.3
	2	7.3
	3	7.3
	4	7.3
	5	7.3
2. Power Barge II	3	32
Subtotal		**68.5**
Leyte-Samar		
A. Oil-based		
1. Power Barge I	1	32
B. Geothermal		
1. Tongonan I	1	37.5
	2	37.5
	3	37.5
Pilot	1	1.5
	2	1.5
Subtotal		**115.5**

Table 6.6. Continued

NPC Plant	Unit No.	Capacity (MW)
Bohol		
A. Hydro		
1. Loboc	1	0.4
	2	0.4
	3	0.4
Subtotal		**1.2**
B. Oil-based		
1. Bohol Main	1	5.5
	2	5.5
Extension	3	3.35
Subtotal		**14.35**
Total, Visayas		**600.49**

Source: National Power Corporation.

Table 6.7
NPC'S EXPANSION PLANS FOR VISAYAS

Year	Plant	MW
1988	Bohol diesel II-2	3.4
	Leyte-Samar I/C	--
1989	Janopol hydro	5.0
	Negros-Panay I/C	--
1992	Cebu-Negros-Panay I/C	--
1993	Palimpinon geo 4	37.5
1994	Palimpinon geo 5	37.5
	Bohol diesel	5.5
1997	Power barge #4	32.0
	Bohol diesel	5.5
1998	Palimpinon geo 6	37.5
1999	Jalaur hydro	24.0
	Bohol diesel	5.5
2000	--	--

Source: World Bank, Report No. 7269, Sept. 1988.

Table 6.8
MINDANAO: INSTALLED CAPACITIES
OF NPC GENERATING PLANTS

NPC Plant	Unit No.	Capacity (MW)
A. Hydro		
1. Agus II	1	60
	2	60
	3	60
2. Agus IV	1	50
	2	50
	3	50
3. Agus V	1	27.5
	2	27.5
4. Agus VI	1	25
	2	25
	3	50
	4	50
	5	50
5. Agus VII	1	27
	2	27
6. Agusan	1	0.8
	2	0.8
7. Pulangi IV	1	85
	2	85
	3	85
8. Taloma 2	1	0.2
	2	0.2
	3	0.2
Taloma 2A	1	0.45
	2	0.2
Taloma 2B	1	0.3
Taloma 3	1	0.95
	2	0.95
Subtotal		**899.05**

Table 6.8. Continued

B. Oil-based		
1. General Santos	1	7.44
	2	7.44
	3	7.44
2. Aplaya I	1	5.5
	2	5.5
3. Aplaya II	1	19.28
	2	19.28
	3	19.28
	4	19.28
	5	19.28
	6	19.28
4. Power Barge II	4	32
Subtotal		**181**
Total, Mindanao		**1,080.05**

Source: National Power Corporation.

Table 6.9
NPC'S EXPANSION PLANS FOR MINDANAO

Year	Plant	MW
1988	Agus I	80.0
	DLPCO diesels	46.0
1992	Gas turbine	50.0
1993	Gas turbine	50.0
1994	Diesel	19.3
1995	Agus III	225.0
1997	Diesel	19.3
	Power barge #4 out	-32.0
1998	Geothermal	55.0
1999	Geothermal	55.0
2000	Coal	200.0

Source: World Bank, Report No. 7269, Sept. 1988.

development along with additional increases in the production of geothermal and coal. Table 6.10 compares the generation costs of the various generation options.

The least-cost alternative appears to be the Tongonan geothermal with HVAC transmission, in addition to Luzon geothermal. Imported coal remains less expensive than domestic Semirara coal. Newly developed hydro power plants are themost costly of the power options.

Electricity Prices

Rural electrification cooperatives have their own rate structures, as do the NPC and Meralco. The NPC tariff structure is a two-part tariff that consists of a demand charge per kW and a block energy charge per kWh. Rates and blocks vary depending on the category of customer (i.e., utilities, industries, and nonutilities). Block energy charges are progressive for utilities and regressive for industries. Tariffs do not differentiate between voltage levels. Once a basic rate has been established, a charge for fuel cost and foreign exchange adjustment are added.

Table 6.11 indicates average rates charged by the NPC for electricity on all the islands. Recently, prices have been highest on Luzon. In 1986 electricity cost 1.0553 pesos per kWh. Visayas follows with a rate of .9063 pesos per kWh. Mindanao is the island on which purchasing electricity is least expensive. In 1986 it cost only .5086 pesos per kWh. This substantial difference in price between Mindanao and Luzon is due primarily to the fact that Mindanao relies heavily on low-cost hydro power.

Meralco, the largest distribution utility operating in Metro Manila and nearby areas, also bases its rates on the type of consumer, and does not take the supply voltage level into account. Meralco in the past had employed a subsidy program for residential and small users. The first 200 kWh of residential consumption and 90 kWh hours of commercial consumption were subsidized.

It was found that subsidies have led to wasteful consumption. In 1985 a five-year phased-in subsidy reduction program was implemented to reduce the distribution cost subsidy for both residential and small commercial customers to 50 kWh by 1990.

Table 6.10
LEVELIZED GENERATION COSTS--1986

Plant	Capacity (MW)	Levelized Generation Costs (US cents/kwh)
Thermal		
Imported coal	300	3.46
Semirara coal	300	4.50
Fuel oil	300	4.32
Geothermal		
Luzon geothermal	55	2.90
Tongonan geothermal		
--HVAC transmission	450	2.72
--HVDC transmission	450	3.10
Hydro		
Pantay	23	
San Roque	390	
Casecnan	268	5.54
Abra	174	7.96
Diduyon	352	5.83
BalogBalog	33	9.74
Agos (Kaliwa)	140	12.72
Matuno	180	9.11
Gened	600	9.69

Source: World Bank, Report No. 7269, Sept. 1988.

Table 6.11
NPC AVERAGE RATES
(Pesos/kWh)

Grid	1981	1982	1983	1984	1985	1986
Philippines	0.4166	0.4299	0.5790	0.8754	1.0985	0.9684
Luzon	0.4480	0.4670	0.6152	0.9740	1.2091	1.0553
Visayas	0.4982	0.5444	0.7244	0.9980	1.0401	0.9063
Panay	0.5250	0.5630	0.7190	1.1660	1.0833	0.7766
Bohol	0.4240	0.4580	0.6640	0.9540	1.0769	0.7621
Negros	0.5260	0.5400	0.6550	0.8580	1.1071	1.0385
Cebu	0.5640	0.6090	0.7320	1.1010	1.0785	0.9467
Leyte-Samar	0.2810	0.5300	0.6130	0.7930	0.9531	0.8557
Mindanao	0.1800	0.1859	0.2996	0.3740	0.5205	0.5086

Source: National Power Corporation.

Other concerns in the pricing of electricity revolve around the high industrial power rates for the Philippines in comparison to other Asian nations. In the capital region, the subsidy rate caused artificially high rates for industry and the commercial and middle class consumer.

Power rates in the future will most likely vary, as debate has begun over the restructuring of NPC rates towards a long-run marginal cost approach. As for Meralco rates, the grid distribution subsidy reduction will continue, as well as further reduction of subsidization on generation cost, both of which will have a bearing on future electricity pricing.

Part Seven

RENEWABLE ENERGY

Renewable energy has become a significant component of the Philippine energy mix. In 1973, renewables accounted for 3 percent of total energy supply. By 1979 its contribution increased to 13 percent. By 1986, over 18 percent of energy used was renewable. Much emphasis will be placed on the further development and expansion of renewable energy use, as it is projected that it will account for over 20 percent of total energy supply by 1992.

To effectively meet these goals, the government of the Philippines has in the past been closely involved through the Philippine Nonconventional Energy Development Program. Interest in this area actually started in 1977 with the establishment of the Ministry of Energy (MOE). Part of the MOE's mission was to develop renewable energy. It was through its Research, Development and Demonstration Program (RD&D) that R&D studies, as well as promotional activities for various emerging technologies, were implemented.

Resulting from this initiative was the hierarchical identification of appropriate technologies that utilize renewable energy resources. Geothermal energy was assessed as already commercially viable. Its prominence in the current energy supply testifies to this. Two other renewable energy systems, minihydro and dendro power systems, were also perceived as commercially viable and were incorporated in the rural electrification program of the now-defunct Ministry of Human Settlements. The program was carried out by the Ministry's National Electrification Administration (NEA), which was later moved with the NEA under the Department of Environment and Natural Resources.

By 1982, an assessment had been made regarding the commercial potential of the various projects examined. The Ministry's Nonconventional Resources Division (NCRD) initiated the Nonconventional Energy Commercialization Program, which

focused on the development of renewable energy systems that had the potential to penetrate the market and thus be commercialized in a short period of time.

Four renewable energy systems were thus identified: biomass-fired boiler systems, gasifier systems for power and process heat production, biogas systems for power and process heat production, and commercial-scale solar water heat production.

In 1987, the development strategy for renewable energy took a three-pronged approach. First, since several of the renewable energy systems still needed further technical development, the NCRD was to carry out a technology program, which would guide projects to a final phase of demonstration with pilot units and then with commercial-sized constructed units. Second, the Energy Technology Alternatives Program (ENTERTAP) was geared towards the utilization of technologies by attempts to institutionalize linkages required to stabilize the developing renewable energy systems. Third, the Affiliated Noncon Center Program (ANC) was established to address the energy needs of remote rural areas, as renewable energy is viewed having primary importance for these areas. As many rural areas in the Philippines are scattered and much of the terrain is rugged, they are seen as prime targets for the noncon energy system. In that regard, the ANC program was created to establish long-term links with strategically located universities and colleges to serve as links to the rural areas. Another component of the ANC program gave NCRD the role of exploring possible funding for renewable projects.

Decreasing petroleum dependency still remains a primary objective for the Philippines. While institutional support of renewables has declined in the recent past, it is still possible that the Philippines can meet the goals set forth for 1992, and that renewables will contribute significantly to the overall supply equation.

Part Eight

CONCLUSION

Energy policy and energy usage in the Philippines has changed dramatically in the past decade. Once a country almost totally dependent on imported oil, the Philippines has now distinguished itself by a much greater degree of self-reliance. This substantial alteration in the energy mix has occurred in an environment of political unrest and economic instability. The Philippines is a country with over 58 million people, with a GDP per capita of approximately US$550. It lacks sizable petroleum or uranium reserves, although its coal reserves are somewhat more substantial. The Philippines is, however, endowed with nonconventional energy resources, particularly hydro and geothermal power, and has made full use of them.

The political world of energy has changed radically, even as recently as 1987. The Ministry of Energy was abolished, and many of its functions were assigned to the Office of Energy Affairs. More changes are underway such as the adoption of an executive energy coordinating council. In addition, the spirit of deregulation is afoot as the oil companies are keen to shed government intervention.

Amidst all the political changes, some basic energy needs remain. Expansion is necessary to meet increased electricity demand. On Luzon, geothermal power will be expanded to accommodate this need. Interisland connection is on the agenda for the Visayas Islands, as is diversity of supply for Mindanao.

As for petroleum, import dependence has been declining, although distortions in the local product market still occur due to controversial pricing policies. Coal quality issues remain, as well as the need to continue importing coal.

The Philippines needs to continue initiatives in renewable energy, although, it is not clear at present if institutional support is forthcoming. Since energy imports still constitute the largest single element of the import bill, the Philippines would be wise to

continue in its progress towards greater utilization of geothermal and other nonconventional energy resources.