

THE PHILIPPINE ENERGY SITUATION AND OUTLOOK  
AND THE USAID ASSISTANCE STRATEGY

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This paper presents an overview of the Philippines current energy situation and highlights the key features of the strategy being implemented by the government to lower its oil import dependency. It then relates the AID energy assistance strategy to the problems the country is facing in the development of its rural and modern sectors, and summarizes each of the specific AID energy assistance initiatives.

This paper is organized into three sections:

- the Philippine energy situation
- the Philippine energy program
- the AID strategy in the Philippines

I. THE PHILIPPINE ENERGY SITUATION

The Philippine energy situation is characterized by two factors. First, the Philippines is composed of some 7,000 islands, eleven of which constituting 95% of the total land mass. The Philippines archipelago will thus always depend on dispersed and small scale power generating systems other than for the largest islands. Second, the Philippines has experienced very high economic growth--its gross domestic product (GDP) grew at over 5% per year in the 1960's and at 6.3% during the 1970's. Yet the Philippines is still mainly in an agricultural phase, nearly one third of its labor force being engaged in crop growing. Despite a rapid growth in household real income at 2.6% since 1960, per capita energy consumption is still substantially below per capita energy consumption for countries with similar income levels. Concomitantly, the potential "demand" growth is very high. This section first reviews the current and prospective

energy supply situation of the Philippines. Then it looks at the sectoral energy demand. Thirdly, it briefly reviews the current institutional and organizational framework for the energy sector. Finally, it places the Philippines energy situation in perspective.

### 1.1 ENERGY SUPPLY

In 1982, the Philippines imported 68% of its primary energy requirements mostly in the form of crude oil from Saudi Arabia, Kuwait, Dubai and Qatar (which together supplied 75% of total crude oil importations of 57 million barrels). In addition, the country imported approximately 8.5 million barrels of petroleum products such as fuel oil, diesel and LPG. The Philippines is thus a prime example of a country highly dependent on foreign oil imports. Indigenous energy sources accounted for only 32% of primary energy requirements in 1982. This is summarized in Exhibit 1, and described below.

Oil and Gas: In 1982, domestic oil production was 3 million barrels corresponding to 3% of total energy consumption. An annual production target of about 7 million barrels (equal to 1979 production) based on already proven reserves has been set.

Coal: 1982 coal production was 560,000 metric tons, a 55% increase over 1981. This corresponded to 70% of the estimated production capacity of existing mines (800,000 metric tons). Total proven coal reserves are quite large--363 million metric tons of which 177 million are estimated to be mineable.

Geothermal: The Philippines is presently generating 556 megawatts of electricity from two major geothermal fields located in Luzon island. Two new fields are expected to produce shortly an additional 225 MW of electricity. Geothermal power is one of Philippine's most promising sources of energy with a theoretical potential estimated at 2 billion barrels of oil equivalent per year and proven reserves on the order of 18 million barrels.

Uranium: The Philippines uranium exploration program has slowed down considerably because of the continuing depressed international price for uranium.

Hydroelectricity: Hydropower is currently the second largest producer of electricity in the Philippines (after oil) with 3,771 gigawatt hours or 6.7 million barrels of oil equivalent. The Philippines has also a most favorable environment for the development of small hydroelectric facilities. Approximately 50 MW of minihydro is being brought on line each year; so far some 4,500 potential sites have been identified as suitable for development. The total hydropower potential of the Philippines is estimated at 45 million barrels of oil equivalent.

Biomass Energy: Biomass will play an increasingly important role although no reliable estimates of total potential exist. In 1982, it is estimated that bagasse and agri-industrial wastes, such as wood-wastes and coconut shells accounted for 14% of total primary energy consumption. It is very likely that this estimate of biomass energy use is substantially underestimated. Indeed, a nationwide residential survey in 1978 reveals that households consumed the

equivalent of about 20.5 million barrels of oil equivalent in the form of firewood (60%), charcoal (26%) coconut wastes (12%) and rice hulls (2%).

Other Nonconventional: The Philippines has initiated several projects in the area of solar and wind power and the use of coconut and alcohol fuels. At this time, the contribution of these sources is small although theoretically the potential is quite large. The consumption of alcohol and coconut oil dropped sharply from 340,000 in 1981 to 78,000 barrels in 1982, due primarily to rising international prices for sugar and coconut oil which made their use in motor fuel blends uneconomical.

## 1.2 ENERGY DEMAND

In 1982, the industrial sector accounted for nearly 58% of total energy consumption including noncommercial energy and 51% of all commercial energy use as shown on Exhibits 2 and 3. It is the second largest consumer of oil after the transport sector with 44% of the total and by far the largest consumer of electricity with 59% of the total (on a primary energy basis). The two largest energy consuming industries are mining and cement respectively.

In the transportation sector, there has been a dramatic shift since 1972 from gasoline to diesel engines due to the higher fuel mileage and government policies which heavily tax gasoline but not diesel fuel. Between 1972 and 1980, the population of cars/jeeps, jeepneys, buses and trucks nearly doubled and the share of diesel powered vehicles increased from 11.2% to 17.5%. This shift explains

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the low energy growth rate in the transportation sector (1.3% per annum in the 1973-1978 period despite an annual growth in value added of 10%).

The commercial sector relies overwhelmingly (almost 90%) on electricity. About 40% of this is for airconditioning with another 27% for air handling and the remainder for lighting, elevators, and so forth. There is little potential for reducing electricity's share, although there is significant potential for reducing the demand through proper design and maintenance.

The majority of Filipino households still rely largely on noncommercial fuels - firewood, charcoal, coconut wastes. The nature of residential energy consumption is changing, however due to an aggressive plan by the government to achieve 100% electrification by 1987. Under this plan, the fraction of households with electricity has grown from 1% in 1973 to about 25% in 1982.

### 1.3 INSTITUTIONAL SETTING

One of the government's major response to the energy problems of the 1970's has been to consolidate and strengthen the institutional and organizational framework for the energy sector. The Ministry of Energy was created in 1977 to formulate and complement the government policies, plans and programs on energy resource development. Two line bureaus under the Ministry were given specific tasks. The Bureau of Energy Development is responsible for the development of the country's energy resources. The Bureau of Energy Utilization (BEU) formulates and implements the country's energy conservation programs, collects

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and interprets energy statistics and regulates certain energy related activities.

For purposes of policy coordination and integration with sectoral programs, a number of agencies and organizations have been attached to the Ministry including the Philippine National Oil Company (PNOC); the National Power Corporation (NPC); the National Coal Authority; the Philippine National Alcohol Commission; and the Emergency Petroleum Operations Board.

The Philippine government relies on the private sector for sources of high technology in areas such as offshore petroleum exploration and development. At present the private sector is involved in the exploration and production of oil, coal, uranium, geothermal as well as the development of nonconventional energy resources.

#### 1.4 MAGNITUDE OF THE PROBLEM

The Philippines is expected to consume the equivalent of 101 million barrels of oil this year of which 62 million barrels will be imported oil. The Philippine oil imported bill amounted to \$2.1 billion last year; despite a 5% drop in imports over last year the 1983 oil bill will still be on the order of \$2 billion.

Until 1972, oil importation never accounted for more than 13% of the total import bill. Successive escalations in the prices of crude oil coupled with rising imports has more than doubled the fraction to 30% in 1981. As a result, the country had to allocate nearly 39% of its 1981 export earnings to pay the fuel bill as shown on Exhibit 4. At this time, the problem for the Philippines is largely financial or economic.

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Despite the rapid growth in commercial energy consumption over the last two decades per capita energy consumption in the Philippines is still 40% below consumption for countries with similar income levels. In 1983, each Filipino will consume slightly less than 2 barrels of oil equivalent as compared with 50 barrels per capita in the United States, 25 barrels in Europe and Japan and 3 barrels in Malaysia. These figures underline the high potential for growth in energy demand in the Philippines particularly as the real income of households increases; needless to say the country can ill afford increased oil import; thus the increases in energy use must come from domestic resources or from improvements of the overall utilization efficiency.

## II. THE PHILIPPINE ENERGY PROGRAM

Given the importance of the energy sector to the Philippines development prospects, the government has since the early 1970's made energy planning a key element of its development planning. These efforts are incorporated into a National Energy Plan which formulates a comprehensive energy resource development and use policy.<sup>1/</sup>

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<sup>1/</sup> "The Philippine Energy Development Program 1982-1987". This plan is currently being updated. The Philippine Structural Adjustment Program of the World Bank, which was initiated in 1980, has involved major policy changes mainly in trade, industry and finance. Under this program the government is currently initiating a review of its policies in the energy sector. An action program will be formulated to adjust the structure of power tariffs and to make appropriate changes in retail and ex-refinery petroleum product prices. The overall level of investment will also be reviewed.

In the next five years 1983-1987, the Gross Domestic Product (GDP) is targeted to grow by 6.3% annually. Energy consumption is expected to grow by 6.1% as shown on Exhibit 5. In comparison energy consumption grew by a mere 1.8% annually from 1978 to 1982 despite an annual growth rate in GDP of 5.1%. The expected high energy growth rate is due to the pressure of urbanization and industrialization, an aggressive electrification program, and the expectation that the "cheap" efficiency improvements have largely been made. As can be seen from Exhibit 5, the Philippine Energy Development program seeks to reduce oil imports by more than 5% annually in order to decrease the country's oil import dependence from nearly 71% at the start of the six year plan to only 38% in 1987.

This section briefly summarizes the government's current resource development and supply policies and the energy demand management policies. Then it evaluates the plan in terms of its accomplishments to date and some of the remaining challenges.

## 2.1 RESOURCE DEVELOPMENT AND SUPPLY POLICY

In order to accomplish its oil-import reduction objectives, the government has articulated an aggressive domestic energy resource development program. As shown on Exhibit 5 between 1983 and 1987, coal is targeted to grow by 27% annually, hydro by about 18%, geothermal by 12% and nonconventional energy supply by 27%.

The major components strategies supporting the Philippine resource development and supply policy are:

- the diversification of the origins of petroleum supply including the intensification of domestic oil and gas exploration programs. The six year plan calls for the drilling of 94 offshore and 45 onshore exploratory wells together with an extensive geological and geophysical mapping program. To meet targeted domestic oil production, the program must maintain a 5% discovery ratio--i.e., one commercial discovery per year for the period.
- the accelerated diversification to alternative sources of energy with emphasis on indigenously abundant and regenerative forms. The Philippine Energy Development Program pins a lot of hope on coal which is envisioned to become by 1987 the country's second largest energy source, next only to oil. It is estimated that coal production will develop rapidly from 560,000 metric tons in 1982 to 4.3 million metric tons by 1987. The program hopes to achieve a targeted level of proven resources of 600 million metric tons by 1987.
- the establishment of support logistical infrastructure to enable efficient handling, storage, distribution and marketing of traditional and new energy resources. For example, the coal logistics program envisions the completion of seven coal terminals, four coal unloading ports and three relay stations. The widespread application of appropriate decentralized energy technologies for rural application and for inaccessible consumption areas.

- the establishment of adequate stockpiles of energy as a protective measure against possible supply disruptions. The country's crude oil inventories were, however, lowered from the end-1981 level of 130 day's consumption to only 80 days supply in 1982.
- the promotion of research and development on indigenous energy resources especially those that are rural-based, renewable and compatible with countryside needs.

## 2.2 DEMAND MANAGEMENT POLICY

The Philippine government strategy on energy consumption is contained in the following policies:

- the use of fiscal measures for reflecting the real economic and social costs of energy without losing touch of political timing sensitivities. The Philippine government has generally moved quickly to cover changing world oil prices. It has even gone further and imposed selective taxes to further discourage oil consumption, e.g., the land transport tax, the air transport tax and the water transport tax. Since 1973, the weighted average of petroleum product prices has registered a sevenfold increase.
- government rationalization of supply in times of emergency - the power industry has resorted to load suppression and rotation in the past, and the petroleum industry has applied fuel allocation and rationing in emergencies.

- direct government intervention to accelerate development of certain markets for non-oil fuels
- institutionalization of energy conservation, in the industry, transport and commercial sectors. This includes the following activities:
  - o information dissemination and training--since 1979, the BEU has been implementing energy management training courses, energy management seminars and briefing, a quarterly review of energy conservation activities and various energy conservation booklets on specific conservation measures. The BEU also provides free energy audit assistance to companies.
  - o Industry energy efficiency program--Establishments consuming more than one million fuel oil equivalent liters of energy per year are required to submit quarterly energy consumption reports. Moreover, those consuming more than 2 million liters are required to submit efficiency targets and appoint full time energy managers.

### 3.3 ACCOMPLISHMENTS TO DATE

The best way to assess the success of the country's resource development and energy demand management policies is to look at some of the following indicators:

- As shown on Exhibit 6, the ratio of the total energy consumption to gross national product has declined by 26% since 1973.

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The share of non-oil energy to total energy consumption increased from 13% in 1973 to 20% in 1981. The share of domestic energy to total energy consumption increased from 13% to 22% in the same period. The coal conversion program is expected to increase coal consumption from over one million barrels of oil equivalent in 1982 to 9 million in 1983 representing nearly 9% of energy consumption. Geothermal energy which began only large-scale commercial production in 1979 now ranks as the fourth largest source of energy.

Energy savings ranging from 1 to 15% have been reported by 205 industrial and commercial establishments being monitored by BEU.

These indicators show that the Philippines is following the right direction in its energy management and conservation programs. Nevertheless, the potential for improved energy management and energy conservation remains large particularly on the industrial and commercial sectors. In order for the Philippines to capture this potential several technical, economic and institutional barriers will however need to be overcome.

The country's energy resource development program requires substantial investments. Unfortunately, the current economic and political problems are likely to slow down many of these programs as the country's ability to borrow is diminished.

In the power sector, the level and structure of both wholesale and retail tariffs need urgent revision. The current tariffs are inconsistent with the government stated objective of reflecting the real economic and social costs of energy. Without changes it is

unlikely that the National Power Corporation will be in a position to meet over one half the country's energy investments in this decade.

The energy conservation potential has not yet been tapped on a large-scale basis. More coordinated involvement and cooperation between the government and the private sector is necessary. While the BEU has made efforts in the dissemination of technical information regarding energy conservation, much more training, technical and financial assistance is required. There appears to be limited understanding of the value of even such basic conservation measures as combustion control and insulation. Energy conservation presents one of the quickest and cheapest opportunities for the government to relieve some of the current foreign exchange problems.

### III. THE AID ENERGY ASSISTANCE STRATEGY IN THE PHILIPPINES

The availability and cost of energy will play a decisive role in determining the direction and pace of planned economic and social development in the Philippines. This is true in the rural sector where energy availability and cost is a key factor in alleviating rural poverty; it is also true in the modern sector where improved energy efficiency and utilization will stimulate additional productive and economic activity and with it improve the country's overall financial and economic condition.<sup>3/</sup> The Philippines with its National Energy Plan is moving in

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<sup>3/</sup> By modern sector we mean those firms or groups in the economy who provide goods and services using equipment and processes comparable to those in the major developed countries. The modern sector covers such activities as manufacturing, commercial establishments (e.g., hotels, department stores, office buildings), transportation, and electricity generation and transmission. The modern sector includes firms of all sizes--from small-scale enterprises through large-scale plants.

the right direction to meet its stated supply and efficiency objectives. The AID strategy is to strengthen wherever possible the Philippine's ability to meet these objectives. Two major areas have been identified for AID assistance in light of AID constraints, the needs of the Philippine government and other donor activities:

- nonconventional energy development particularly as it applies to decentralized technologies for rural application.
- institutionalization of energy conservation and oil substitution particularly in the industrial and commercial sectors.

The AID energy strategy is currently being implemented through seven projects--four of these projects are on-going and three others are in preparation. In this section, we will first describe AID's energy strategy in the rural sector and then summarize its strategy in the modern sector. A more detailed description of the AID energy projects in the Philippines is available in attachment one to this paper.

### 3.1 THE RURAL ENERGY STRATEGY

The Problem: It is becoming increasingly clear that alternative energy technologies and systems, based on renewable resources, will be a key requirement in the development of the rural sector in order to improve income levels, health standards and living conditions. In the rural sector the demand for wood and charcoal is outstripping natural regrowth and reforestation efforts resulting in deforestation, soil erosion reduced upland storage capacity and siltation of reservoirs and coastal waters. Rural areas suffer from inefficient and inadequate means of food production, severe shortages of potable

waters, and extremely high levels of underemployment. Energy shortages are continuing to have an immediate adverse impact on food production costs and on the lives of the poor thus diminishing further the prospects for increasing food production and alleviating rural poverty.

The Strategy: Among the rural energy development problems confronting the Philippines, two crucial challenges are the regeneration and management of the rural biomass resource base and the development and dissemination of technologies to convert these resources efficiently into usable energy forms. The degree to which the Philippines will be able to meet these challenges will depend on its ability to: (1) plan and implement large-scale programs to develop renewable energy resources, particularly biomass; (2) develop a pool of skilled personnel through technical training; (3) introduce technologies that are economically and culturally acceptable; (4) promote and disseminate information regarding renewable energy information and (5) strengthen institutional for improving planning programming and interagency coordination. AID's strategy is to provide financial and technical assistance to support these activities.

Other Donor Activities: (to be completed)

The AID Initiatives: Four projects have been initiated under the rural energy strategy. The purpose of the Nonconventional Energy Development Project which started in 1978 is to identify, field test and evaluate nonconventional energy technologies that could be adapted

and applied in the Philippine rural sector. Eleven technology subprojects have been completed or are being implemented. Two others have been approved for start by October 1983 and two more are expected to start by December 1983. The Nonconventional Energy Development Project is funded at \$7.1 millions.

The second project under the rural energy strategy is the Rural Energy Development Project which is comprised of three components. The Wood-Fired Power Plants project calls for the construction of three 5 MW wood-fired power plants, along with the tree farms and related facilities necessary to fuel them. The plants will be operational in early 1986. The second component, Gasifiers for Irrigation, provides assistance to convert diesel engine pump sets at 495 irrigation installations to producer gas/diesel fuel operations. Gasifiers have been installed at 95 sites already; approximately 200 units will be installed in the next 12 months. The Charcoal Production Program's objective is to produce readily available charcoal for industrial, commercial and household use. The program includes the development of 19,500 hectares of tree farms, construction of road networks and the construction of 975 charcoal kilns. Twenty-one tree farms (2,000 hectares) have been started. The Rural Energy Development Project is funded with \$25 million in Economic Support Fund.

The Rural Energy Technical Assistance Project provides technical consultants and field research in support of the Rural Energy Development Project. The project is funded at \$2 million.

The purpose of the Energy Technology for Fisheries Project, which is scheduled to start in late FY 1984, is to increase the income and socioeconomic security of municipal fishermen. The project will introduce improved production methods and processing practices by reducing costly fossil fuel consumption and reliance on outside fuel sources. The project will be funded at \$8.1 million.

### 3.2 THE MODERN SECTOR ENERGY STRATEGY

The Problem: The modern sector of the Philippines is the principal consumer of imported fuels and electricity. It accounts for approximately 90% of the nation's total commercial energy consumption. The country has to allocate nearly 39% of its export earnings to pay for oil-imports. In turn the foreign exchange losses constrain expenditures on new development related projects both in the modern as well as rural sectors. We have seen that the Philippine National Energy Plan calls for a vigorous program to develop indigenous resources (e.g., coal, geothermal and biomass energy) coupled with a series of demand management and fuel substitution measures.

Two factors are most critical to the Plan's success--first, the ability to develop the country's coal resources and to substitute coal for oil use in the industrial and power sectors and, second, the ability to control energy demand in order to limit per capita oil consumption to less than one barrel by 1987. In 1980, per capita oil consumption was 1.5 barrels; in 1983 it is estimated to be 1.25 barrels. But the successes realized so far have been obtained mostly through low-cost "housekeeping" measures which are generally easy to

implement. In order for the Philippines to realize its energy conservation potential much more will have to be achieved.

The Strategy: The major challenges confronting the Philippines energy demand management and substitution programs are institutional in nature. Indeed, the adoption of energy efficiency measures requires that the private sector investors acquire (1) an increased awareness of potential savings; (2) an understanding of the availability, performance and costs of improved technologies, processes and equipment; and (3) the ability to analyze the trade-off between additional investments and savings. The current capabilities of the government are insufficient to meet the needs of the private sector investors--more information, technical assistance and financial support is needed. AID's modern sector strategy is to strengthen the private sector's institutional ability to implement energy demand management and substitution measures. AID assistance will be used to: (1) provide on-the-job conservation training and technical assistance; (2) disseminate technical and economic information on proven energy conserving technologies applicable to the Philippine modern sector; (3) develop the capabilities in the private sector, with end users and technology suppliers as well as with financial institutions, to implement and finance fuel conservation and substitution measures; and (4) stimulate additional funding arrangements for conservation-related investments and technology transfer with other donor groups such as the Asian Development Bank.

Other Donor Activities: (to be completed)

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The AID Initiatives: Three projects have been initiated. The Managing Energy and Resource Efficient Cities (MEREC) pilot project is an attempt to reduce energy and resource consumption in rapidly growing cities through better planning. During the first phase of the project which started in 1981 an energy and resource conserving strategy was developed for Tacloban City, Leyte. The purpose of the second phase is to demonstrate the effectiveness of the MEREC strategy in other Philippine cities. This project is centrally funded (S&T Bureau). The primary purpose of the Technology Transfer for Energy Management project which is in the project paper preparation stage is to promote and accelerate the adoption of energy efficient technologies, equipment, processes and improved management systems by the modern sector. The secondary purpose is to improve the institutional capabilities of the BEU and private sector groups to implement energy conservation initiatives. The project funding will be \$7.5 million and is expected to start October 1984. Finally, the Technical Assistance in Coal Development project which is also in the preparation stage is designed to accelerate coal development from extraction and preparation to logistics and conversion. The project's primary focus will be to provide technical assistance to insure proper timing between supply availability and coal demand. This project is centrally funded (S&T Bureau).

Exhibit 1

Primary Energy Consumption, 1981-1983  
(In Million Barrels of Oil Equivalent (MMBOE))

	% of Share					
	<u>1983<sup>t</sup></u>	<u>1982</u>	<u>1981</u>	<u>1983</u>	<u>1982</u>	<u>1981</u>
Oil	<u>65.36</u>	<u>68.49</u>	<u>68.54</u>	<u>64.4</u>	<u>71.4</u>	<u>75.0</u>
Imported	62.10	65.54	67.17	61.2	68.3	73.5
Local	3.26	2.95	1.37	3.2	3.1	1.5
Non-Oil	<u>36.11</u>	<u>27.53</u>	<u>22.86</u>	<u>35.6</u>	<u>28.6</u>	<u>25.0</u>
Coal	9.00	1.11	0.90	8.9	1.2	1.0
Geothermal	7.64	6.25	4.75	7.5	6.5	5.2
Nonconventional	1.05	0.08	0.34	1.0	0.1	0.4
Hydro	7.91	6.65	5.41	7.8	6.9	7.0
Agro-Industrial Waste	5.05	6.09	5.30	5.0	6.3	5.8
Bagasse	<u>5.46</u>	<u>7.35</u>	<u>6.16</u>	<u>5.4</u>	<u>7.6</u>	<u>5.6</u>
Total	<u>101.47</u>	<u>96.02</u>	<u>91.40</u>	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>

<sup>t</sup>Targets

Source: Bureau of Energy Utilization

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Exhibit 2

Sectoral Distribution of Commercial Energy Consumption (%)

<u>Sector</u>	<u>1975</u>	<u>1979</u>	<u>1982</u>
Industry	47	49	51
Transport	33	30	29
Other	<u>20</u>	<u>21</u>	<u>20</u>
	100	100	100

Source: Based on data from Ministry of Energy  
Energy losses in electric power generation are  
allocated to end-use sectors on a pro rata basis.

Exhibit 3

1982 Sectoral Distribution of Primary Energy Use  
(Thousand Barrels of Fuel Oil Equivalent)

<u>Sector</u>	<u>Oil</u>	<u>Coal</u>	<u>Non- conven- tional</u>	<u>Bagasse</u>	<u>Agri- Waste</u>	<u>Elec- tricity</u> <sup>1/</sup>	<u>Total</u>
Industrial	21,359	560	-	6,806	6,037	20,216	54,978
Transport	24,039	-	-	-	-	-	24,039
Commercial	812	-	22	-	-	6,705	7,539
Residential	<u>2,602</u>	<u>-</u>	<u>57</u>	<u>-</u>	<u>-</u>	<u>7,101</u>	<u>9,760</u>
TOTAL	48,812	560	79	6,806	032	34,022	96,316

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<sup>1/</sup> Including hydro and geothermal

Source: Based on data from Ministry of Energy  
Energy losses in electric power generation are allocated  
to end-use sectors on a pro rata basis.

Exhibit 4

Balance of Trade and Oil Importation  
(CIF in Million US \$)

	<u>1981</u>	<u>1979</u>	<u>1977</u>	<u>1975</u>	<u>1973</u>
Total Exports	6,567	5,291	3,739	2,608	2,097
Total Imports	8,475	6,613	4,270	3,776	1,790
Balance of Trade	(1,908)	(1,322)	( 531)	(1,168)	307
Oil Imports	2,534	1,597	1,040	833	231
Oil Imports as % of Total Imports	29.9	24.1	24.4	22.1	12.9

Source: "Energy Management and Conservation in the Philippines"  
by Benjamin Lim

Exhibit 5

Primary Energy Consumption, 1983 and 1987  
(in Million Barrels of Oil Equivalent (MMBOE))

	Targets		Compounded Annual Growth Rate (%) <u>1983-87</u>
	<u>1983</u>	<u>1987</u>	
Oil	65.36	56.34	(3.65)
Imported	62.10	49.81	(5.36)
Domestic	3.26	6.53	18.97
Nuclear		6.52	
Coal	8.96	23.51	27.27
Imported	3.91	7.85	19.03
Domestic	5.05	15.66	32.70
Hydro	7.91	15.47	18.26
Geothermal	7.64	12.06	12.09
Bagasse	6.20	6.50	1.19
Agriwaste	5.30	6.10	3.58
Nonconventiona.	1.41	3.71	27.36
TOTAL	102.78	130.21	6.09

source: Updated Energy Program (still to be published)

Exhibit 6

Ratio of Total Energy Consumption to Gross National Product

<u>YEAR</u>	<u>GNP at 1972 Prices (In MP)</u>	<u>Total Energy Consumption (In MBOE)</u>	<u>Total Energy per GNP (In BBLs/P1000)</u>
1973	60,881	73,641	1.210
1974	64,739	70,380	1.087
1975	68,530	74,130	1.082
1976	72,718	78,107	1.074
1977	77,162	83,493	1.053
1978	81,995	86,372	1.053
1979	88,736	89,666	1.010
1980	92,597	88,227	0.952
1981	96,070	86,105	0.896

Source: "Energy Management and Conservation in the Philippines" by Benjamin Lim.

U.S. AID ENERGY PROJECTS

Nonconventional Energy Development Project

The purpose of this project is to identify, field test and evaluate non-conventional energy technologies that could be adapted and applied in the Philippine rural sector. This project is implemented through the Bureau of Energy Development (BED) and the Energy Research and Development Center (ERDC), through various line agencies and universities. The project was started in 1978 and is funded at \$7.1 million.

The project recently underwent some significant changes to make it more relevant, and easier to implement. The project focus was changed to minimize laboratory research and to maximize field testing (especially in developing technologies to meet end-use needs of line agency programs) and provide for graduate training. The ERDC management staff was changed and given greater decision making authority, the Project Assistance Completion Date was extended and \$1.5 million was deobligated from the loan portion.

The subprojects supported under this project are:

1. Completed

Solar Lumber Dryer

2. Being Implemented

Rural Energy Demand/Resource Survey  
Wind/Solar Radiation Mapping Phase II  
Windmill Dispersal Program  
Rice Hull-Fired Thermal Power Plant  
Integrated Village Energy Systems (IVES) (Fishing Village)  
Integrated Village Energy Systems (Upland Village and Rice  
Producing Village)  
Photovoltaic Water Supply  
Adaptation of Engines for Fuel Interchangeability  
Medium-Scale Wind Systems  
Energy Education, Post Graduate Program

3. Approved and to Start by October 1983

Commercialization of Alternative Cooking Devices  
Evaluation and Use of Stirling Engines

4. Proposals being Prepared or Reviewed to Start by December 1983

Rural Refrigeration (Biomass)  
Rice Hull Gasification

Rural Energy Development Project

There are three components within the ESF assisted rural energy project, all of which support GOP energy production activities. Each depends on the production of fuelwood and the conversion of that wood to energy. In the wood-fired power plant component, the wood is converted to electrical energy; in the gasifier component, wood is converted to mechanical energy to run irrigation pumps; and in the charcoal component, wood is converted to charcoal and used as a substituted for petroleum-based fuels for a variety of uses.

1. Wood-Fired Power Plants - This project component calls for the construction of three 5 MW wood-fired power plants, along with the tree farms and related facilities necessary to fuel them. The plants will be situated in Negros Occidental, Iloilo and Bohol--all in the Visayas area. The project is being implemented by the National Electrification Administration (NEA). The ESF portion of this project, \$10 million, will finance the procurement of U.S. power plant equipment and the services of an American A&E firm to develop plant specifications, assist in procurement and co-supervise construction. NEA will finance the tree farms (a two thousand hectare tree farm each site), the transportation systems and the civil works. Approximately 285 jobs are created at each site.

Planting is underway at each site, and contract negotiations with the selected A&E firm (Stone and Webster of Boston) are starting. The plants will be operational in early 1986.

2. Gasifiers for Irrigation - This component will assist irrigation associations by converting current diesel engine pump sets at 495 irrigation installations to producer gas/diesel fuel operations. The conversion will markedly decrease production costs and reduce fossil fuel consumption. This nationwide program is being implemented by the Farm Systems Development Corporation (FSDC).

The ESF portion of the project, \$3.3 million, will finance the purchase of 1,150 units of gasifier equipment and development of 495 six hectare energy woodlots to serve as a fuel resource. FSDC covers the costs of program management, training and technical assistance. Gasifiers have been installed at 95 sites already, and funding for the next year's installations, approximately 200 units, has been transferred to the GOP treasury.

3. Charcoal Production Program - The objective of this component is to produce readily available charcoal for industrial, commercial and household use in rural areas and population centers. The program includes the development of 19,500 hectares of tree farms, construction of road networks and the construction of 975 charcoal kilns. Approximately 3,000 jobs are being created through tree farm and kiln development and operations.

The program is being implemented by the Farm Systems Development Corporation (FSDC), and FSDC covers program management, training and technical assistance costs. ESF funding, \$11.7 million, provides credit to develop tree farms to grow feedstock and construction of the necessary kilns for charcoal production. Twenty-one tree farms have been started, approximately two thousand hectares, and funding for the next year's operations will be released next week.

#### Rural Energy Technical Assistance Project

This \$2 million project provides technical consultants and field research to the National Electrification Administration and the Farm Systems Development Corporation in support of the Rural Energy Development Program. The objective is to develop and refine a body of knowledge and techniques in the production and use of biomass energy in order to modify and improve the power plant, gasifier and charcoal projects (as well as other fuelwood projects) as experience accumulates.

The project addresses several areas: (a) silviculture--including species selection and seed/seedling production, yield analysis and plantation development recommendations, and development of a pest and disease control capability; (b) review and recommendations on wood transport systems, power production costs and co-generation potential; (c) consultants for charcoal production, and review and recommendations on advanced charcoal production and gasifier technology, (d) training; (e) limited equipment; (f) library and information development; and (g) short-term consultants.

#### Managing Energy and Resource Efficient Cities (MEREC) - Phase II

The goal of this centrally funded pilot project (S&T Bureau) is to reduce energy and resource consumption in rapidly growing cities and their surrounding regions by introducing improved efficiencies. The core of the project is the design, development and implementation of resource efficient/conserving growth strategy.

From August 1981 to January 1982, an energy and resource conserving strategy was developed in Tacloban City, Leyte with the help of S&T and outside consultants. The purpose of Phase II is to demonstrate the effectiveness and utility of the MEREC strategy and generate experience in Tacloban that will aid and stimulate replication of the strategy in other Philippine cities and elsewhere. The areas of focus are: (a) land use, (b) transportation, (c) building design and materials, (e) sewage, (f) solid waste, (g) water, and (h) energy and electric power. Each of these areas is being treated as a subproject and each has its own working group.

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Project implementation is assisted by the Tennessee Valley Authority (TVA), and started in October 1982. Phase II is funded at \$275,000 and will be completed in two years. The project will have a PSC project coordinator in Tacloban.

### Projects Being Prepared

#### Energy Technology for Fisheries Project

The purpose of this \$8.1 million project is to increase the income and socio-economic security of municipal fishermen. This will be accomplished through organized production, improved processing practices, a more equalized sales environment, and the use of alternative energy resources. The new practices will increase productivity, preservation and the fishermen's profit margin in selling fish. Through this project, the municipal fishermen will make a major contribution to increasing the supply of better quality fish and to reduce costly fossil fuel consumption and reliance on outside fuel sources.

The project emphasizes the organization of private fishermen's associations, and stresses the commitment and involvement of the end-users themselves, the fishermen, as an important prerequisite to success. The associations will be developed, owned, operated and managed by fishermen who, assisted by the Farm Systems Development Corporation (FSDC), will introduce improved production methods and processing practices as well as fishery resource management. FSDC will provide organizational assistance, management training, technical assistance and credit to purchase gas fed refrigeration equipment and gasifiers to run small fishing boats. The primary fuel source will be biomass-based producer gas to fuel diesel or gasoline engines.

This project is scheduled to start in late FY 1984.

#### Technology Transfer for Energy Management

The primary purpose of this \$7.5 million project is to promote and accelerate the adoption of energy efficient technologies, equipment, processes and improved management systems, by the modern sector. The adoption of these technologies will reduce commercial energy consumption, reduce oil imports (thus improving the balance of payments situation), increase productivity and improve economic growth prospects.

The secondary purpose is to improve the institutional capabilities of the Bureau of Energy Utilization (BEU) and private sector groups to implement energy conservation initiatives. This includes upgrading BEU's capabilities in providing improved analytical and advisory assistance to consumers in the modern sector, as well as assisting the consumers (either individuals or representative associations) in developing their own improved and expanded capabilities to provide these services themselves.

**Project activities will include:**

- institutional development through training, the use of consultants and limited commodities for analytical and programming purposes.
- studies, seminars and workshops to develop data and approaches to energy conservation; to provide information on new technologies to be used by energy consumers and producers in policy formulation and investment decision making; to promote attitudinal change and receptivity on the part of commercial energy consumers by increasing their awareness and knowledge of the benefits of energy conservation; and to upgrade sectoral service capabilities. These activities will also function in the nature of an extension service to promote institutional development.
- technology transfer through "on-site" demonstrations of technical, economic and financial feasibility of specific equipment, systems or processes. Demonstrations will be supported by means of workshops, trade exhibits, consultants and actual application. In the latter case, loan funds will be used to support feasibility studies, technology assessment and selection, and equipment purchases for demonstration purposes. These funds will also be available for general acquisition by companies which are prepared to adopt energy conserving equipment and/or management systems.

This project is scheduled to start in late FY 1984.

Technical Assistance in Coal Development

This centrally funded project is in the preparation stage, with start up scheduled for the end of 1983. It is designed to accelerate coal sector development from extraction and preparation to logistics and conversion. Subprojects under consideration are: testing coal water mix for application in various industries; defining the supply requirements for industries; updating information about coal resources; improving coal quality measurement and stockpiling; training in various aspects of production and management; data management; and environmental strategies to cope with expanded coal use. Technical work is underway to provide budget and activity levels.

These subprojects are integrated into the larger theme of a technical program to improve the timing of bringing supply and demand into balance. Early experience indicates that accomplishing this timing will require considerable effort, but failing to do so will lead to a further

deterioration of the balance of payments problems associated with imported oil. There is a sufficiency of local coal, but to bring it from the ground to the user will require an expansion of skills, technologies, and management -- the targets for this technical assistance program. Coordination with other donors within a comprehensive view of long term requirements is also a feature of the program.

Private sector contributions and services mark the essential nature of the program and will work to assure permanence of effect. Additionally, some aspects of the program are of value in the ASEAN region and steps to ensure information dissemination will be undertaken.