R. Ashton

AGENCY FOR INTERNATIONAL DEVELOPMENT

WASHINGTON, D.C. 20523

PROJECT PAPER

PHILIPPINES: Technology Transfer for Energy Management Project (492-0381) and Annexes

May 1985

TECHNOLOGY TRANSFER FOR ENERGY MANAGEMENT PROJECT

(492-0381)

TABLE OF CONTENTS

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT DATA SHEET

1. TRANSACTION CODE: A (A = Add, C = Change, D = Delete) — Amendment Number: _____ — DOCUMENT CODE: 3

2. COUNTRY/ENTITY: Philippines

3. PROJECT NUMBER: 492-0381

4. BUREAU/OFFICE: Asia [04]

5. PROJECT TITLE (maximum 40 characters): Technology Transfer for Energy Mgt

6. PROJECT ASSISTANCE COMPLETION DATE (PACD): MM 06 DD 30 YY 90

7. ESTIMATED DATE OF OBLIGATION (Under "B." below, enter 1, 2, 3, or 4): A. Initial FY 85 B. Quarter 3 C. Final FY 87

8. COSTS ($000 OR EQUIVALENT $1 =)

A. FUNDING SOURCE	FIRST FY 85 B. FX	C. L/C	D. Total	LIFE OF PROJECT E. FX	F. L/C	G. Total
AID Appropriated Total	354	124	478	4,554	446	5,000
(Grant)	(354)	(34)	(388)	(1,844)	(156)	(2,000)
(Loan)	( )	(90)	(90)	(2,710)	(290)	(3,000)
Other U.S. 1.						
Other U.S. 2.						
Host Country		90	90	-	732	732
Other Donor(s)		38	38	-	1,542	1,542
TOTALS	354	252	606	4,554	2,720	7,274

9. SCHEDULE OF AID FUNDING ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH. CODE 1. Grant	2. Loan	D. OBLIGATIONS TO DATE 1. Grant	2. Loan	E. AMOUNT APPROVED THIS ACTION 1. Grant	2. Loan	F. LIFE OF PROJECT 1. Grant	2. Loan
(1) 106	742	878	878			800	2,567	2,000	3,000
(2)									
(3)									
(4)									
TOTALS						800	2,567	2,000	3,000

10. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each): 874 | 875 | 890

11. SECONDARY PURPOSE CODE: 743

12. SPECIAL CONCERNS CODES (maximum 7 codes of 4 positions each)

A. Code	Tech						
B. Amount	1,500						

13. PROJECT PURPOSE (maximum 480 characters)

To promote and accelerate the adoption of energy efficient technologies and operational practices, and to establish a strong institutional capacity, predominantly in the private sector, to undertake and manage conservation-related investments and programs.

14. SCHEDULED EVALUATIONS: Interim MM YY | MM YY 87 | Final MM YY 90

15. SOURCE/ORIGIN OF GOODS AND SERVICES: [X] 000 [X] 941 [X] Local [ ] Other (Specify) _____

16. AMENDMENTS/NATURE OF CHANGE PROPOSED (This is page 1 of a _____ page PP Amendment)

17. APPROVED BY — Signature: Frederick W. Schieck — Frederick W. Schieck — Title: Director, USAID/Philippines — Date Signed MM DD YY

18. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION MM DD YY

AID 1350-4 (8-79)

LIST OF ABBREVIATIONS

AID	Agency for International Development
BAP	Bankers' Association of the Philippines
BBL	Barrels of Oil
BEU	Bureau of Energy Utilization
CB	Central Bank of the Philippines
CDSS	Country Development Strategy Statement
ENMAP	Energy Management Association of the Philippines
GOP	Government of the Philippines
IGLF	Industrial Guarantee and Loan Fund
LOP	Life of Project
MBOE	Million Barrels of Oil Equivalent
MOE	Ministry of Energy
MOF	Ministry of Finance
MOI	Ministry of Industry
NEA	National Electrification Administration
NEDA	National Economic and Development Authority
PCCI	Philippine Chamber of Commerce and Industry
PID	Project Identification Document
PNB	Philippine National Bank
PP	Project Paper
TA	Technical Assistance
USAID	U.S. Agency for International Development

LIST OF TABLES AND FIGURES

PROJECT AUTHORIZATION

NAME OF COUNTRY/ENTITY: Philippines

NAME OF PROJECT: Technology Transfer for Energy Management

NO. OF PROJECT: 492-0381

1. Pursuant to Section 106 of the Foreign Assistance Act of 1961, as amended (the "Act"), and in accordance with my authority as delegated by Redelegation of Authority 133.1, as amended, I hereby authorize the Technology Transfer for Energy Management Project (the "Project") for the Republic of the Philippines ("Cooperating Country") involving planned obligations of not to exceed $3,000,000 in loan funds and $2,000,000 in grant funds over a two year period from date of authorization subject to the availability of funds in accordance with the A.I.D. OYB/allotment process, to help in financing foreign exchange and local currency costs for the Project. The planned life of the Project is 61 months from the date of initial obligation.

2. The Project consists of technical assistance, training, commodities and credit to assist the Cooperating Country: promote and accelerate the adoption of energy-efficient technologies and operational practices; and establish a strong institutional capacity, predominantly in the private sector, to undertake and manage conservation-related investments and programs.

3. The Project Agreement, which may be negotiated and executed by the officer(s) to whom such authority is delegated in accordance with A.I.D. regulations and Delegations of Authority, shall be subject to the following essential terms and conditions, together with such other terms and conditions as A.I.D. may deem appropriate:

   a. Interest Rate and Terms of Repayment

      The Cooperating Country shall repay the Loan to A.I.D. in U.S. Dollars within forty (40) years from the date of first disbursement of the Loan, including a grace period of not to exceed ten (10) years. The Cooperating Country shall pay to A.I.D. in U.S. Dollars interest from the date of first disbursement of the Loan at the rate of two percent (2%) per annum during the first ten (10) years; and three percent (3%) per annum thereafter, on the outstanding disbursed balance of the Loan and on any due and unpaid interest accrued thereon.

b. Source, Origin, Nationality

Except as A.I.D. may otherwise agree in writing:

1) With respect to the Project's Loan-funded component, goods financed by A.I.D. shall have their source and origin in the Cooperating Country or in countries included in A.I.D. Geographic Code 941; services financed by A.I.D. shall be of Cooperating Country or Code 941 nationality; and ocean transportation financed by A.I.D. shall be on vessels under flag registry of the Cooperating Country or countries included in Code 941 of the AID geographic code book as in effect at the time contracts are entered into for such services.

2) With respect to the Project's Grant-funded component, goods financed by A.I.D. shall have their source and origin in the Cooperating Country or the United States; services financed by A.I.D. shall be of Cooperating Country or United States nationality; and ocean transportation financed by A.I.D. shall be on vessels of United States registry only.

CLEARANCES:

A.	William Oliver	OD	5/24/85
B.	Douglas Clark	ORAD	5/22/85
C.	Peter Davis	OD/PE	5/15/85
D.	Alexander Spathopoulos	CO	5/9/85
E.	Richard Rhoda	PO	5/14/85
F.	Brian Miller	RLA	5/16/85

RRhoda - provided project life changed to 60 months. Date

Signature: _____
Frederick W. Schieck
Mission Director
USAID/Philippines

Date: May 27, 1985

PHILIPPINES - TECHNOLOGY TRANSFER FOR ENERGY MANAGEMENT

III. PROJECT SUMMARY AND RECOMMENDATION

A. Goal and Purpose

The primary purpose of this project is to promote and accelerate the adoption of energy-efficient technologies and operational practices by energy consumers who are heavily dependent on fossil fuels and electricity, especially in industry and commercial buildings. Secondarily, the project seeks to establish a strong institutional capacity to undertake and manage conservation-related investments and programs, especially in the private sector. This capacity will be developed among energy consumers, suppliers of equipment and services, lenders, and government policy-makers. The project's ultimate goal is to increase the efficiency of energy use among conventional energy users in the Philippines, thereby reducing dependence on imported oil, conserving foreign exchange, and improving the overall economic and financial position of the Philippines. Achievement of this goal will alleviate some of the major underlying causes of the country's current economic crisis.

B. Summary Project Description

The project's elements are designed to overcome existing constraints to the widespread adoption of energy-efficient technologies and operational practices. The key components are:

1) a program of technical assistance, training and information dissemination, studies, and policy analyses;

2) a financing program to demonstrate the technical, financial and economic feasibility of specific energy conservation measures and to facilitate their widespread adoption.

The project will be aimed principally at, and implemented largely by, the private sector, most notably private industrial and commercial energy users, financial institutions, and suppliers of conservation-related equipment and services. The GOP's role will be to devise and put into effect policies, develop performance standards, enforce regulations, provide fiscal and tax incentives, and carry out information dissemination programs in support of the project's goals. The project will complement existing efforts of the GOP to promote energy conservation, by enhancing the private sector's ability to respond to market forces and government policy.

Primary responsibility for GOP conservation programs rests with the Ministry of Energy's Bureau of Energy Utilization (BEU), which will serve as the principal counterpart government agency for the project. Several non-governmental entities will assist the BEU in carrying out key activities of the project.

The technical assistance program will include the services of a U.S. consulting team, with one senior consultant in residence in Manila and short-term specialists brought in to assist on specific problems and opportunities, and some full-time Philippine project staff. The technical assistance contractor will be charged with assisting the TTEM staff in preparing annual budgets and action plans, developing criteria and procedures for evaluating and implementing demonstration subprojects, providing technical assistance on design and analysis of specific subprojects, and leading the training, data collection, information dissemination and policy research components of the project. This portion of the project will be largely grant-funded and will have a total budget (including the GOP contribution) of approximately $3.4 million over five years.

The demonstration financing program, loan-funded by AID at $2.6 million and supplemented by an estimated $1.3 million in contributions from firms undertaking demonstrations, will serve to introduce into the Philippines a wide variety of energy-efficient technologies that are proven and commercially available elsewhere but not widely used in this country at present. They are technologies and operating practices that offer the economic and technical potential for significant national energy and foreign exchange savings, as well as attractive financial paybacks to individual users.

Demonstrations are needed to overcome a number of critical constraints to energy efficiency in the industrial and commercial sectors of the Philippines. These constraints exist despite the fact that the GOP has already made a strong commitment to improve energy demand management and has taken concrete steps to promote this goal. These steps include gradual adjustment of energy prices, particularly since 1980, to pass on real energy costs to final consumers, and creation of a Bureau of Energy Utilization (BEU) in the Ministry of Energy to monitor energy consumption patterns and encourage conservation through a program of training, energy audits, and information dissemination. These demand management efforts have complemented programs on the supply side, implemented by the Bureau of Energy Development (BED) and the National Electrification Administration (NEA). As a result of these demand-side efforts, total energy consumption in the Philippines grew at an annual rate of only 1.2% between 1978 and 1984, while GNP grew at 2.18%. Furthermore, the BEU estimates that its conservation programs resulted in savings ranging from 1 to 15% of energy consumption in participating industries, largely through low-cost "housekeeping" measures.

That greater savings have not been achieved is due to a number of factors, including:

- energy-consumers' lack of awareness of technologies for energy conservation;
- skepticism about the economic and technical performance of conservation technologies;
- lenders' reluctance to undertake what they often perceive as high-risk loans;
- competition for scarce investment capital with more typical corporate investments such as capacity expansion;
- loan "packaging" problems resulting from the small size of many conservation investments; and
- a shortage of domestic suppliers of both equipment and services needed to implement conservation measures.1/

The TTEM demonstration subprojects will be aimed directly at overcoming each of these constraints. The ultimate success of the project will be measured by the extent to which it stimulates both successful demonstration projects, and, more important, extensive replication outside the scope of the project itself with financing by other donors (notably the development banks) and commercial investors, including the internal financial resources of the energy users themselves. For that reason, evaluation of the project should continue for several years beyond the project termination date.

As observed later in this paper and in Annex J, demonstration programs similar to the TTEM effort have successfully stimulated conservation investments in other countries, notably the United States, Western Europe and Japan. Experience in the developing countries is lacking; the TTEM project is thus a pioneering effort. However, the use of demonstrations is believed to be appropriate and effective as a conservation catalyst because the TTEM demonstrations will go well beyond showing technical feasibility. They will seek to provide start-to-finish evidence that energy conservation investments are viable and highly attractive from financial, economic and institutional points of view.

1/ In addition to the above factors, the current economic situation has placed a tight constraint on foreign exchange needed to import equipment.

To accomplish this, the demonstrations will include:

- publication and dissemination of clear, comprehensive feasibility studies leading up to financing of these demonstration subprojects so that other potential users can learn from the analysis and apply its methodologies to their own situations;

- opportunities for direct observation of the technologies and operational practices at work through on-site visits;

- access to actual performance data based on post-installation monitoring and comparison with pre-installation data;

- use of demonstration sites for on-the-job practical training (supplemented by related classroom training);

- circulation of case studies and journal articles documenting the results of the demonstrations;

- personal contact between energy consumers participating in the program and others who can profit from their experience, through seminars, workshops, trade association membership, and other mechanisms;

- experience for lenders in financing energy conservation measures, resulting in greater receptivity toward such loans;

- opportunities for Philippine architecture/engineering firms, manufacturers and equipment vendors to increase their capabilities through the project's demonstration and technical assistance components, leading to expanded markets;

- improvement of GOP inter-agency coordination necessary to stimulate conservation; and

- identification of remaining policy-related constraints on conservation projects, leading to a better, more market-oriented business investment environment conducive to such projects.

The likelihood of widespread adoption of the demonstrated technologies will be enhanced by choosing technologies that are proven and commercially available and thus relatively low in risk, and that have relatively low initial cost and ongoing management, maintenance and operational requirements. Financial evaluation of the candidate subprojects will be based on conservative assumptions and real market conditions (including market interest rates) rather than the slightly more favorable incentive terms available under the TTEM project. Subproject success will be enhanced by providing all required technical

assistance and training associated with each technology. And finally, the project as a whole will be implemented in progressive phases designed so as not to outpace the gradual development of the capabilities of all the key actors in the project, including the core TTEM team.

Candidate technologies to be demonstrated during the first phase include combustion monitoring and control systems, flue gas heat recovery systems, insulation, power factor control systems, steam distribution system maintenance procedures, and energy management systems for buildings.

Potential targets for the demonstrations include all subsectors of the industrial and commercial sectors. In the manufacturing sector alone, there are an estimated 3,000 establishments with more than 20 employees and nearly 7,000 commercial, institutional and industrial buildings estimated at over 800 square meters or more. Since the project's objective is to save as much energy, capital and foreign exchange as possible, participation by enterprises in the industrial sector has not been limited in any way, such as by size or ownership pattern. These factors may be taken into account, however, in evaluating and making decisions on individual subprojects.

C. Implementation

The major participants in project implementation will be the Government of the Philippines (GOP), Philippine private-sector organizations, and a U.S. consulting team. The implementing agency will be the Bureau of Energy Utilization (BEU). In addition to the BEU, other GOP organizations involved will include the Ministry of Trade and Industry's Board of Investments (BOI), the Central Bank of the Philippines (CB), Ministry of Finance (MOF), the National Economic and Development Authority (NEDA), and Office of Budget and Management (OBM). The major Philippine private-sector organizations participating directly in the project will be three trade associations (the Philippine Chamber of Commerce and Industry, the Energy Management Association of the Philippines, and the Bankers' Association of the Philippines) and, initially, four private banks. In addition, private energy users, vendors, academics, and professional and trade associations will participate in specific subprojects and through project advisory panels.

A project team, with assistance from a general contractor, will be responsible for day-to-day project implementation including administrative support and monitoring. The team will receive guidance from a Steering Committee made up of representatives from the major organizations cited above. The project team will work with local end-users, A&E firms, vendors and financial institutions in developing, implementing, monitoring and reporting on subprojects. Loans for the subprojects will be administered through local private banks to end-users.

D. Budget Estimates ($000)

	AID			Private	
	Grant	Loan	GOP	Sector	Total
1. Technical assistance	1,289	218	160	-	1,667
2. Studies/workshops/ information dissemination	586	72	77	190	925
3. Demonstration	-	2,660	-	1,352 1/	4,012
4. Commodities/monitoring instruments	50	50	3	-	103
5. Project operations/ management	-	-	492	-	492
6. Project evaluation	75	-	-	-	75
Subtotal 2/	2,000	3,000	732	1,542	7,274
Total	$5,000		732	1,542	$7,274

1/ Assuming a minimum 25% financial contribution by users to each subproject.
2/ A 10% contingency factor has been built into each line item.

E. Recommendation

It is recommended that a loan of $3.0 million and a grant of $2.0 million be authorized for the Technology Transfer for Energy Management (TTEM) Project. All statutory requirements have been met and the Project Identification Document (PID) issues have been answered.

IV. PROJECT BACKGROUND

A. General

The Philippines is highly dependent on energy imports, primarily crude oil. In 1984, these oil imports represented about 56% of its primary energy requirements. Indigenous energy sources accounted for about 42% of primary energy requirements in 1984, although this share has grown significantly in recent years (see Table 1).

More specifically, the Philippines consumed the equivalent of 93.6 million barrels of oil in 1984 of which 52.7 million barrels were imported oil costing $1.5 billion. Increased oil prices are a major reason for the 40% drop in the external terms of trade since 1972. As a result of this drop, the Philippines had to export 19% more in 1984, on a volume basis, than it did in 1972 to purchase the same quantity of imports.

Until 1972, the cost of oil imports never accounted for more than 12% of the total cost of imports. By 1984, they accounted for 23%. Consequently, since imports exceeded exports, the country had to allocate nearly 27% of its 1984 export earnings to pay the fuel bill (see Table 2). Until 1983, the Philippines had little trouble financing its trade deficits. However, the picture changed dramatically when a commercial debt moratorium was declared on October 17, 1983. Now, the foreign exchange required to pay for imports is not only costly but difficult to obtain.

Given the present shortage of foreign exchange, the country can ill afford increased oil imports. Thus, any increases in energy use, which a resurgence in the country's economic growth implies, must be provided from domestic resources or must be offset by greater efficiency in the overall use of energy.

[A complete description of the Philippines' energy situation including supply and demand data, institutional setting, the energy development program and the USAID energy assistance strategy in the Philippines is contained in Annex F.]

Table 1
Primary Energy Consumption, 1981-1984
(In million barrels of oil equivalent MBOE)

					PERCENT OF TOTAL			
	1981	1982	1983	1984	1981	1982	1983	1984
Oil	68.53	68.48	68.19	56.21	73.5	71.5	69.2	60.0
Imported	67.16	65.53	63.54	52.67	72.0	68.4	64.5	56.3
Local	1.37	2.95	4.65	3.54	1.5	3.1	4.7	3.8
Non-oil	24.72	27.26	30.28	37.37	26.5	28.5	30.8	39.9
Commercial								
Coal	0.91	1.11	3.54	5.67	1.0	1.2	3.6	6.1
Geothermal	4.75	6.25	7.03	7.81	5.1	6.5	7.1	8.3
Renewable								
Nonconventional	0.34	0.08	0.07	0.08	0.4	0.1	0.1	0.1
Hydro	6.38	6.65	5.12	9.01	6.8	6.9	5.2	9.6
Agro-Industrial								
Waste	6.12	5.82	9.05	8.23	6.5	6.1	9.2	8.8
Bagasse	6.22	7.35	5.47	6.57	6.7	7.7	5.6	7.0
Total	93.25	95.74	98.47	93.58	100.0	100.0	100.0	100.0

Source: Bureau of Energy Utilization.

Table 2
Balance of Trade and Oil Importation
(CIF in million US $)

	1973	1975	1977	1979	1981	1982	1983	1984
Total exports	2,097	2,608	3,739	5,291	6,567	5,830	5,830	5,391
Total imports	1,790	3,776	4,270	6,613	8,475	8,263	7,979	6,428
Balance of trade	307	(1,168)	(531)	(1,322)	(1,908)	(2,433)	(2,149)	(1,037)
Oil imports	231	833	1,040	1,597	2,534	2,151	(2,081)	1,473
Oil imports as Percent of imports	12.9	22.1	24.4	24.1	29.9	26.0	26.1	22.9
Oil imports as Percent of exports	11.0	31.9	27.8	30.2	38.6	36.9	35.7	27.3

Sources: Economic Research - International Central Bank

B. Problem Statement

The modern sector of the Philippines is the principal consumer of imported fuels and electricity. The modern sector is composed of those firms or groups in the economy that 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. In 1984, this sector was responsible for approximately 90% of the nation's total commercial energy consumption, which was approximately 93 MBOE.[1/] More than 60% of the primary energy consumed was lost in conversion, transmission, heat transfer and stack losses, as compared with approximately 49% in the United States.

The reasons for this energy loss are:

- o old and inefficient equipment resulting from past industrial and construction investment decisions made when fuel and power costs were a less important factor; in fact, such decisions were generally made on a least-cost capital basis.
- o inefficient management and operational practices.

These losses not only decrease productivity per se, but also severely drain financial resources. In 1984, imported oil accounted for 56% of total commercial energy consumption, cost a staggering $1.5 billion, claimed 27% of total export revenues and exceeded the trade imbalance of $1.0 billion by 42%. It is clear that the heavy dependence on imported oil is a major factor in the country's current economic crisis.

The 1983 shares of total commercial energy consumption in the Philippines break down as follows: industry 63%, transportation 22%, commercial and residental sectors 15%. (A more detailed description of inefficient consumption, with specific examples in the industrial, building and commercial sectors, electricity generation and transportation, is contained in the Project Identification Document.)

Energy inefficiency places an enormous strain on the balance of payments. These costs, however, are not limited to actual foreign exchange losses. Long-term costs occur when energy costs constrain investment in productive activities. The long-term opportunity cost of investing to reduce demand is lower in most cases than the opportunity cost of external borrowing to pay for current oil consumption. Relieving the growing burden of energy costs by achieving greater energy efficiency could expand investment and growth in the modern sector of the Philippines and improve living standards throughout the country.

1/ Million barrels of oil equivalent.

C. Potential Benefits of Energy Conservation

The present pace of economic growth and industrialization in the Philippines makes it imperative to give high priority to improved productivity. The benefits of such efforts could be substantial. For example, the GOP has projected an annual growth rate of 4% for commercial energy consumption through 1992, and with only a 15% reduction in energy consumption per unit of industrial output, annual savings in the industrial sector alone would reach $285 million in 1985, $295 million in 1987, $415 million in 1990 and well in excess of $400 million in 1992 (assuming a constant average oil price of $30 per barrel).

Ignoring the timing issue, overall conservation potential has been estimated by ADB consultants at about $500 million per year with relatively quick payoff investments.

An order-of-magnitude estimate of the financial and economic benefits of these potential conservation investments can be seen from Table 3. Annual gross financial savings of $492 million are estimated against an investment cost of $1,208 million. Assuming an average fifteen year equipment lifetime, these aggregate numbers suggest a financial rate of return of about 40%. But the savings are essentially all foreign exchange and hence the benefit side (annual savings), with a 20% shadow price of foreign exchange, would be measured at $590 million. Of course, the investments are also largely foreign exchange (assume two-thirds), hence, the economic measure of the investment cost is now $1,365 million but the economic internal rate of return is 140%.

D. The GOP Energy Conservation Effort

Intent on reducing its oil dependency as soon as possible, the government has given high priority to indigenous energy resource development and demand management. The National Energy Development Program calls for a close public and private partnership to reduce oil imports to an equivalent of 42% of total commercial energy consumption by 1986. Approximately 80% of the reduction will come from the use of indigenous resources such as coal, geothermal and bioenergy sources, and 20% will be obtained through effective energy demand management in the modern sector.

The GOP has instituted a number of demand management measures including improved pricing policies, programs of fuel substitution and energy conservation.[1/] The measures are aimed at passing increases in

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1/ Energy conservation, or efficiency, in the context of this paper does not mean curtailment of energy use through reductions in output of goods and services. Rather, it means the generation of more goods or services with the same or reduced input of energy by optimizing all production factors.

Table 3
Energy Conservation Savings Potential and Investments in the Philippines

	Annual National Cost Savings ($ Millions)	National Investments ($ Millions)
A. Industrial Boilers		
1. Combustion control	51.3	20.8
2. Flash steam, condensate recovery, economizers	9.7	27.0
3. Insulation, steam traps, repair leaks	16.0	9.0
4. Fuel switching (oil to coal)	42.0	142.0
5. Fuel switching (oil to waste)	53.0	156.0
Subtotal	172.0	354.8
B. Utility Sector		
1. Boiler/turbo generators upgrade	36.0	55.0
2. Turbo generators: achieve design heat rates	35.0	0.2
3. Combustion control	3.6	0.6
Subtotal	74.6	55.8
C. Heaters including furnaces, kilns, dryers		
1. Combustion control	27.8	0.3
2. High temperature heat recovery-recuperators, heat exchanges	21.0	60.0
3. Low temperature heat recovery-waste heat boilers, low temperature heat exchanges	0.4	0.4
Subtotal	49.2	60.7
D. Electric Energy		
1. Cogeneration	127.0	730.0
2. Self generation-diesel, steam, electric energy use	70.0	3.0
Subtotal	197.0	733.0
Grand Total	492.8	1,204.3

Source: BEU/ADB

energy costs on to consumers through price increases and taxes on higher consumption; promoting conversion to coal through price guarantees, some financing, linking repayments to energy cost savings, and increased hydroelectric and bioenergy resource development.

To promote energy conservation, the Bureau of Energy Utilization (BEU) was created in 1978, in the Ministry of Energy (MOE), to develop and implement a national program for energy conservation geared towards judicious and efficient energy use. The BEU's main thrusts to date have been:

1. Information dissemination on conserving energy in industry, buildings, households and transport. This effort is assisted by two private sector organizations, the "ENERCON Movement", an affiliation of business executives and technical experts, and the Energy Management Association of the Philippines (ENMAP), an association of energy managers of large energy consuming establishments.

2. Education and training, including free short courses on general energy management and more technical courses on topics such as electrical energy conservation, boiler and furnace operations and energy audits.

3. Energy audit services to industrial plants and commercial buildings.

In 1980, the government passed the Omnibus Energy Conservation Law (BP No. 73). Among the provisions of the law are: (a) reporting requirements for facilities consuming more than one million liters of oil equivalent per year; (b) employment of an energy manager and preparation of a management plan for facilities consuming more than two million liters per year; and (c) development of energy use standards for industry, appliances, vehicles and buildings.

In 1982, energy conservation investments were included in the Priorities Plan of the Board of Investments, providing for such concessions as duty-free import of energy-saving capital goods and tax credits for locally manufactured equipment for energy conservation. Under the World Bank-supported Structural Adjustment Program, the GOP has also taken steps to reinforce the present energy program through appropriate changes in energy pricing policies and a continuing review of its overall energy investment plan.

As a result of these efforts and world oil price movements, noticeable gains in fuel substitution and energy efficiency have been made. A shift from gasoline to diesel since 1973 has been dramatic in both public transport and private vehicles. Savings in 205 surveyed industrial and commercial firms have ranged from 1-15% because of improved operating practices and better "housekeeping", which generally involve little investment. A large portion of this savings may result

from recent lower industrial activity related to economic slowdown. Much more energy conservation remains to be accomplished. Savings on the order of 10-40%, depending on the sector involved, can still be achieved through better management practices, increased training and information dissemination, and capital expenditures on energy-efficient technologies and management systems.

E. Constraints

As noted above, energy conservation successes realized so far have been obtained through "housekeeping" improvements which are relatively easy to implement and require little or no capital. These near-term improvements have consisted of simple changes in procedures and practices such as pre-heating of boiler water, plugging steam leaks and modifying thermostat settings. These changes, however, were only implemented by a limited number of businesses. In contrast, subsequent stages of conservation will require measures to modify (retrofit) or replace energy using equipment and processes, design new buildings with improved lighting and cooling systems, improve plant layout, install new management systems and recovery and recycling devices for waste streams, and reduce costs through fuel substitution, process cascading and co-generation.

The adoption of most of these options will require from the private sector: (1) increased awareness of potential savings; (2) introduction of improved technology processes and equipment; and (3) capability to analyze the potential financial returns from energy-saving investments and savings. They also require access to better information and more technical and financial support than the current programs and agencies provide.

Energy use in the modern sector is often as much influenced by the attitudes of management and employees as it is by the efficiency of machinery and production processes. Since the advent of the energy crisis, industrialized countries have developed and implemented numerous technologies, practices, and innovative management systems for the efficient use of energy. The adoption of these technologies and systems in the Philippines has been slow; consequently, much of the potential savings to be realized through energy conservation and substitution have not yet been achieved.

While energy conservation remains an important goal of government leaders because of its rapid positive impact on the nation's balance of payments and security of energy supply, it is not necessarily the highest priority of industrial, commercial, building and transport owners/managers, or of financiers. This is because owners and managers may realize the costs of energy inefficiency, but are reluctant to invest their scarce discretionary internal capital, credit lines and foreign exchange for little-known technologies or systems. Major energy

conservation investments are difficult to finance when financial institutions are unable to evaluate properly their economic returns, foreign exchange to finance imported energy conservation technologies is difficult to secure, and alternative financing mechanisms such as shared-savings ventures are little known. This situation is made worse by a paucity of experience with projects which demonstrate the technical, economic and financial feasibility of such investments in the Philippines. Once demonstrated and accepted, private sector leaders should be more willing to implement and promote conservation investments on their own.

Analysis of conservation alternatives indicates that many of them have very attractive financial returns (see Annexes G and H), with economic returns that are even higher. Why then are these conservation technologies not being adopted solely on the basis of market forces? As suggested previously, the problem is one of imperfections in the market structure and other issues that static financial analysis does not reflect. One of the market imperfections is a lack of information. Potential end users do not know about the technologies available; there is no Energy User News for a plant manager to pick up and read weekly. There are few relevant publications available from federal and state energy offices, and there is no set of well documented examples in the trade press. Even if end users know about the technologies from a vendor, they are reluctant to trust the technology cost and performance data supplied by the limited set of suppliers, particularly in light of the lack of other information. They want to be able to hear and see this information from satisified customers, preferably ones in the Philippines with similar equipment. Moreover, in most industries in which energy costs are not the dominant input cost, firms lack the incentive to invest their own managerial resources to get this information and/or try a small test--the transaction costs are too high.

Financial institutions can be reluctant to provide loans for new technologies of which they are ignorant. This too is a constraint. Finally, the size of the market is limited because of a lack of adequate information, thus limiting development of a vendor community. This and other limitations such as the vendors' own capital shortages have prevented vendors from undertaking demonstrations or providing attractive financing to users. Hence vendors have not been the strong change/technology diffusion agents they could be in a better developed market.

Information based on demonstrations (complemented with other activities such as information dissemination) will overcome many of these barriers. Given the economic benefits, there is strong rationale to overcome these market imperfections through demonstrations with AID/GOP support. To the extent the economic returns are larger than financial

returns, there may also be an argument for other incentives such as loans at favorable rates. These may be pertinent particularly in situations where industrialists have other opportunities for their capital (perhaps at higher financial returns than the conservation investment), but where these other investments are not as attractive economically, i.e., are not as much in the public interest. Favorable loan rates and other incentives could overcome this distortion.

V. PROJECT DESCRIPTION

A. Introduction

Conservation enjoys the advantage of a much shorter lead-time than most options for increasing energy supply. Market forces promote energy conservation by lowering production costs through adoption of technologies that are financially and economically feasible at both the enterprise and the national level.

This project is based on the premise that introducing a more systematic and comprehensive approach to adopting new and improved technologies will contribute directly to overcoming the imperfect market situation and to greatly widen adoption of these technologies. The project emphasizes institutional development, information dissemination and technology transfer to energy users, their intermediaries (equipment suppliers, architectural and engineering firms, professional and trade associations) and their financiers.

B. Goal and Purpose

The goal of the Technology Transfer for Energy Management (TTEM) project is to increase the efficiency of energy use among users of energy (especially fossil fuels and electricity) in the Philippines, thereby reducing dependence on imported oil, conserving foreign exchange and improving the overall economic and financial position of the Philippines.

The project emphasis on institutional development and technology transfer supports a process that takes time to achieve. The project is designed to achieve both immediate demonstration results and to support the process of leveraging these demonstrations and other activities to provide a multiplier effect over time. This multiplier effect is expected to take hold during the latter years of the project when the worst effects of the current economic crisis are over and more foreign exchange and other resources are available for investment in energy-saving technologies.

The primary project purpose is to promote and accelerate the adoption of energy efficient technologies and operational practices by energy consumers who are heavily dependent on fossil fuels and electricity, especially in industry and commercial buildings. Adoption of these technologies will reduce commercial energy consumption, reduce oil imports (thus improving the balance of payments), increase productivity and improve economic growth prospects.

The second purpose is to establish a strong institutional capability to undertake and manage conservation-related investments and programs, especially in the private sector. The project will also seek to stimulate additional energy conservation investment by private energy users and financial institutions and other international donors such as the Asian Development Bank (ADB) or the World Bank.1/

The largest share of project activities, including project staff efforts, will emphasize the expansion and improvement of capabilities of private energy users, manufacturers and vendors of equipment, technical service firms, and financial institutions to accelerate technology transfer. The skills of the project staff will be upgraded through training, consulting services and limited procurement of commodities such as a micro computer with software designed for energy conservation technical and economic analysis, and energy efficiency measuring and monitoring instruments to improve their ability to quickly and effectively design and implement energy conservation activities.

As a result of this project, energy users will be more aware of the conservation options available to them and will be better able to analyze and make the technology investment choices that best meet their needs. Moreover, private-sector equipment suppliers and service firms will be better prepared to help consumers improve energy efficiency.

C. Project Activities

The TTEM Project consists of financing for technology demonstrations, and a technical assistance program that includes studies, training, and information dissemination.

1/ For example, the ADB Energy Office has already expressed an interest in providing up to $120 million in loan funds for energy conservation in the Philippines upon achieving the purposes of the TTEM Project.

In the following sections, each type of activity is described and examples of typical subprojects are given. The actual subprojects will be selected by the TTEM project staff, based on proposals from energy users, suggestions by vendors and service organizations, and the project staff's own experience and analysis. These activities will be carried out in different industrial and commercial centers in the country. The examples presented result from analyses of the current Philippine energy situation and of specific energy conservation technologies carried out during the project design phase. These examples are actual candidates for an initial set of activities to enable the project to start up quickly in the first year. Later project activities will be identified and scheduled through an annual planning and budgeting process by the project staff. Annexes G and H describe these proposed activities in substantially more detail, giving reasons for the focus and purpose of each, and their projected costs and benefits, and the market constraints that require their inclusion in the demonstration program. Section VI, Project Organization and Management, describes the organization and management plan, the duties and responsibilities of participating entities, and procedural guidelines for project activities.

1. Technology Demonstration

a. Technologies

Technology demonstrations form a major portion of the TTEM effort, with total funding estimated at $3.9 million, of which $2.6 million is from a USAID loan and an estimated $1.3 million from private contributions of participating energy consumers. In addition, approximately $1.9 million will be generated by the project itself through loan repayments, or "reflow funds".1/ The demonstrations will address two major constraints to energy technology transfer: a lack of reliable information on technologies and their costs and performance, and a resulting hesitancy on the part of management and financiers to provide financing. Experience in other countries indicates that demonstrations can be effective ways of promoting new technologies for improved energy efficiency. As observed in Annex J, demonstration programs similar to the TTEM effort have successfully stimulated conservation investments in the U.S., Western Europe and Japan. Since experience is lacking in developing countries, the TTEM project is a pioneering effort. Technology demonstrations should serve as catalysts to conservation investments by demonstrating not only technical feasibility, but also

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1/ Section VIII and Annex N present the sources and uses of funds in detail, and Annex M analyzes the reflow of funds. Only first generation fund reflows are considered here.

financial, economic and institutional viability. The demonstrations should provide the impetus to accelerated technology transfer, including the promotion of local manufacture of equipment with the support of the GOP, the private sector, and other donors.

The project will support applications of energy conservation technologies that are currently not widely used in the Philippines. Demonstration projects of commercial scale will be initiated in cooperation with industrial and commercial firms, and building or hotel groups which are prepared to share cost and performance information.

Table 4 summarizes the costs and savings for typical applications of these technologies, and estimates the payback to the user and the foreign exchange benefit. Annex H describes these factors in depth and provides supporting data. The initial technologies are:

- o Combustion monitoring and control systems. These systems improve boiler and furnace efficiency by allowing more precise control of combustion air. This will primarily consist of mounting electrochemical oxygen analyzers in a flue to achieve virtually instantaneous measurement information, enabling operators to know when to make air-to-fuel adjustments. Increased use of such systems was the recommendation of a major BEU/ADB energy audit study.

- o Flue gas heat recovery systems. These systems reduce fuel use by recovering energy that would otherwise be wasted from flue gases. The heat contained in the gases is recovered by installing metal or ceramic heat exchangers (depending on temperature and gas composition) and used to preheat fuel boiler water or combustion air.

- o Increased use of insulation in industrial processes. Insulation materials reduce energy losses from boilers, steam pipes, tanks, and similar equipment by providing a barrier to the flow of heat between a heat source (a hot object) and a heat sink (a cooler object).

- o Power factor control systems. These systems improved plant power factors through improvement of plant equipment operation and the use of capacitors to balance the inductance in the electrical system. Such control systems reduce wasted electrical power and thus utility oil consumption.

Table 4
Costs and Savings for Typical Application of TTEM Technologies
During First Two Project Years[1/]

Technology	Capital Investment (Single Installation) Equipment	Installation	Annual Operation & Maintenance Manpower (₱)	Supplies (₱)	Annual Savings: Annual energy Savings	Value (₱)	Net (₱) Savings	Payback
Combustion monitoring and control system								
Small	$ 340	-	₱22,500	₱ 1,400	2,500[2/]	₱ 235,000	₱233,600	6 days
Large	5,100	₱14,440	22,500	14,400	12,500[2/]	1,150,000	1,136,000	10 days
Flue gas heat recovery systems	51,000	60,000	3,000	3,000	2,484[2/]	231,000	228,000	3.1 years
Increased use of insulation in industrial processes	4,000	1,000	-	-	460[2/]	40,800	40,800	1.5 mos.
Power factor control equipment	72,300	10,000	2,400	-	-	2,037,800	2,035,400	6 mos.
Steam distribution system maintenance procedures	23,800	600	10,000	-	11,030[2/]	1,021,000	1,021,000	2 weeks
Outside air temperature compensation for chiller systems	12,000	60,000	30,000	-	33,000[3/]	39,600	36,600	6.2 years
Building energy management systems	17,000	36,000	4,800	-	189,300[3/]	227,160	222,360	1.2 years
Increasing roof insulation in existing bldgs	47,500	22,600	-	-	149[2/]	17,400	17,400	6.9 years

1/ Additional technologies which TTEM will consider after the initial phase: commercial building cogeneration with absorption chilling; small industrial cogeneration (less than 1 MW); vapor recompression in the processed milk industry; cold extrusion in the tire industry; electric and chemical heat pumps in the vegetable and processing industry; task lighting and daylighting; high-efficiency electric motors; advanced heat exchangers (e.g., heat wheels, heat pipes); and automatic electricity demand limiters.

2/ Million British Thermal Unit.

3/ Kilowatt Hour.

Note: $1.00 = ₱18.00

- o Steam distribution system maintenance procedures. Proper maintenance of steam traps and repair of steam leaks reduces energy losses.

- o Outside air temperature compensation for chillers. The system involves installation of basic automatic controls in chiller systems to reset chilled water temperature. These compensation devices raise the chiller water temperature, thus reducing the commercial building electricity demand.

- o Building energy management systems. These involve the installation of an energy management system (EMS) composed of microprocessor-based devices to control and optimize energy use in a building or facility. These systems use a variety of technologies from simple time clocks to elaborate computers to reduce energy demand, and have become very common in the industrialized countries.

- o Increased roof insulation. The system installs of roof insulation under common concrete deck roofs. Such insulation reduces the heat loss through roofs, a major source of loss in commercial buildings.

These initial technology demonstrations were selected on the basis of the minimum criteria discussed below. Future demonstrations will use the same general criteria, with appropriate modifications based on lessons learned.

- o Potential for extensive use in the Philippines. Discussions with users and vendors indicated that fewer than 25% of the potential applications have actually been undertaken to date. The technologies are usable in many Philippine industrial plants and are not limited to a narrow subsector. This will maximize the savings to be realized through replication.

- o Attractive paybacks. The technologies selected offer a simple payback ranging from 11 days to 8 years for both the user and the foreign exchange cost. Most paybacks are one year or less.

- o Low technical risk. All technologies have been demonstrated in other countries, leaving little or no technical risk in their demonstration in the Philippines. The primary remaining risk is whether they can be properly designed, installed, and operated and whether they will prove economic in the Philippine application.

b. Financing

Loan funds will be used to support feasibility studies, equipment purchase, and installation costs associated with the technology demonstrations. Funding will not be provided for standard commercial purchases of technologies. Several financing methods may be used, depending on borrower preference, the relative importance of the demonstration to project goals, and the level of risk involved. In the first phase of the project straight loans (i.e. loans made on conventional terms), loans with repayments tied to savings, grants (in limited exceptional circumstances) and various combinations of these alternatives will be used. (See Section VI (C), Subproject Management, for description of the financing methods.)

The loans for demonstrations will be made at rates at the favorable end of the range of prevailing commercial rates in order to make it possible for the company involved in the demonstration to cover the cost of monitoring and evaluating the new technology's performance and payback, and to cover the cost of possible site disruption resulting from installation and visits by observers.

The participating companies will be required to provide a significant portion of the cost from sources outside the project fund. This requirement will ensure that they have a significant financial stake (at least 25%) in the successful operation of the project, and will allow more demonstrations to be undertaken.

Table 5 shows estimated costs of loans, grants, and administration related to the demonstrations. The total costs of the individual demonstration projects recommended for initial funding range from $57,900 to $251,000. Section VII (B), Economic Analysis, and Annex M discuss the economic performance and demonstration project payback in more detail.

After a successful demonstration, other companies will have the information they need to make investment decisions.

The demonstrations will result in:

- publication and dissemination of clear, comprehensive feasibility studies leading up to financing for these demonstration subprojects so that other potential users can learn from the analysis and apply its methodologies to their own situations;

- opportunities for direct observation of the technologies and operational practices at work through on-site visits;

Table 5
Projected TTEM Demonstration Projects
1986-1990

	Project No. of Installation	Investment Cost Per Unit ($) Foreign Purchases	Investment Cost Per Unit ($) Domestic Purchases & Installation	Total Investment Required Foreign Purchases	Total Investment Required Domestic Purchases & Installation	Payback (Days)	Net Annual Energy Savings (Less O&M Cost Equivalent)	Total Energy Savings Equivalent
A. Industrial Equipment								
Combustion monitoring								
SMALL	250	340	-	85,000	-	11.2	2,280 mmBTU	570,000
LARGE	250	5,100	52	1,275,000	13,000	31.4	12,129 mmBTU	3,032,250
Flue gas heat recovery	5	51,000	3,243	255,000	16,215	1584	2,457 mmBTU	12,285
Increased use of insulation in industrial processes	200	65	294	13,000	58,800	45	460 mmBTU	92,000
Power factor control equipment	20	72,250	540	1,445,000	10,800	240	190,000 KWH	3,800,100
Steam distribution maintenance procedures	350	1,700	573	595,000	200,573	15	11,030 mmBTU	3,860,500
B. Building System Maintenance Procedures								
Outside air temperature compensation for chiller system	1	12,000	3,243	12,000	3,243	2916	29,757 KWH	29,757
Building energy management systems	50	17,000	1,946	850,000	97,300	576	184,111 KWH	9,205,550
Increased roof insulation in existing buildings	1	540	5,946	540	5,946	2592	14,500 KWH	14,500

Savings: Total Energy Savings: 7,567,040 mmBTU — Average Annual Savings: 1,513,408 mmBTU = $9,035,046
(5 years) 13,049,810 KWH — 2,609,962 KWH = 112,228

- access to actual performance data based on post-installation monitoring and comparison sites for on-the-job practical training (supplemented by related classroom training);

- circulation of case studies and journal articles documenting the results of the demonstrations;

- personal contact between energy consumers participating in the program and others who can profit from their experience, through seminars, workshops, trade association membership, and other mechanisms;

- experience for lenders in financing energy conservation measures, resulting in greater receptivity toward such loans;

- opportunities for Philippine architecture/engineering firms, manufacturers and equipment vendors to increase their capabilities through the project's demonstration and technical assistance components, leading to expanded markets;

- improvement of GOP inter-agency coordination necessary to stimulate conservation; and

- identification of remaining policy-related constraints on conservation projects, leading to a better, more market-oriented business investment environment conducive to such projects.

One of the project objectives is to develop and demonstrate innovative financing mechanisms that will help to overcome the reluctance of energy users and commercial lenders to finance these investments themselves. Thus, the demonstrations will not only demonstrate energy conservation technologies, but also introduce financing vehicles for energy conservation investments that are being used extensively in the industrialized world but not in the Philippines. These vehicles include:

o Loans with repayments tied to savings. The loan repayments are a specified fraction of the actual monitored savings until the principal plus accrued interest is paid off. In this way, the user risk is zero on the loan portion of the investment and assured immediate cash flow benefits from any energy savings achieved. Generally, these loans are made at a premium interest rate to cover the additional risks to the lenders.

- o Shared savings plans. These plans are becoming increasingly popular in the industrialized countries for both industrial and commercial applications. Savings resulting from an energy conservation investment are split between the user and an investor who supplies most or all of the capital required. The investor also receives the tax benefits that result from the investment, and generally manages the operation of the investment to ensure the greatest possible savings.

- o Energy service agreements. In this option, an energy service firm agrees to supply energy services--such as process steam or air conditioning and lighting--to a user for agreed terms on price, availability, and quality. The service firm selects, finances, installs, and operates the equipment. If one firm serves several clients within a region, economies can be realized through efficient use of skilled manpower.

- o Joint ventures. A joint venture generalizes the shared-savings scheme above but differs in that under a joint venture, the user shoulders more of the financial risk, while the external investor provides most of the equity capital. Under this arrangement, a separate entity is set up to manage the construction and operation of the energy conservation project. Usually, the energy user retains control over these activities while the investor receives many of the tax benefits. Revenues to the project, which are determined by the reduced energy costs to the user, are first used to pay off debts and operating expenses, with the residual split between the investor and the user.

Discussions with Philippine banks and venture capital organizations indicate their strong interest in participating in the project and in exploring these financing mechanisms. The first innovative mechanism applied will be loans with repayments tied to savings. As the simplest mechanism, this one will prepare participants for the financial evaluation, contract negotiation, and monitoring required for the more complex financing mechanisms. As financial institutions, borrowing companies and the project staff gain experience, more complex financing mechanisms will be tried. The project will help financial intermediaries interested in these mechanisms to evaluate the technologies and structure financing, while providing funds for demonstration subprojects.

c. Summary

The technologies to be demonstrated have already been tested, proven, and made available in the United States and other countries. Nonetheless, their application to the Philippines will, in most cases, be innovative. Successful demonstrations are expected to be replicated in

other plants, buildings, and commercial units and centers as plant equipment and building stock is changed or replaced. Successful demonstrations should thus provide the impetus to accelerated technology transfer, including the promotion of local manufacture of equipment with the support of the GOP, the private sector, and other donors.

2. Studies, Seminars, and Workshops

Studies, seminars, and workshops will develop data on energy use and approaches to energy conservation, provide information on new technologies to be used by energy consumers, upgrade capabilities of equipment and service suppliers, aid in policy formulation and investment decision-making, and promote greater receptivity to conservation among commercial energy consumers by increasing their knowledge of the benefits of energy conservation. To achieve this, the project will support the activities of BEU, PCCI, ENMAP, and other business or manufacturing groups. These activities will benefit owners, managers, supervisors, and technicians in the industrial, energy production, commercial, and building sectors as well as financial groups and government managers. Total funding for studies, seminars, and workshops will be $1.0 million.

These activities could include:

- o Studies to measure energy intensities of representative enterprises and determine the potential for energy conservation and substitution in industrial processes and building design. These baseline data can also help in developing performance standards and least-cost energy strategies, including analysis of the long-term industrial, building and urban development outlook. They can also provide benchmarks for comparison of the Philippine experience with that of other countries.

- o Special technical studies on heat processing equipment, practices and processes, and electricity use and management.

- o Seminars and workshops on specific topics such as: energy consumption monitoring in industry, buildings and commercial establishments; new monitoring and control techniques; electric and thermal load characteristics; payback and life-cycle costing; thermal energy systems optimization; waste heat recovery and cogeneration; new equipment and management systems; improved instrumentation; and, improved operating and maintenance practices. The project will also promote technology booths at workshops to enable suppliers to display equipment relevant to the workshop subject area.

- o Surveys of, and seminars for, private entrepreneurs seeking to establish or expand conservation-related businesses, such as conducting energy audits; manufacturing, importing or distributing conservation equipment; and providing design, engineering, maintenance and other services to energy-consuming clients.

- o Analyses of policy issues related to energy conservation, including energy pricing, tax incentives, investment code provisions and other topics.

- o Dissemination of technical and promotional publications such as industry-specific technical manuals, conservation case-study materials, and policy analysis documents selected from a large body of U.S. industrial and government literature.

- o Dissemination of the technical and economic results of the technology demonstrations.

These activities are also designed to support institutional development through extension services, short-term training courses to upgrade skill levels and apprenticeships, and visits to plants and commercial enterprises where energy-efficient equipment and processes can be demonstrated. Existing BEU and ENMAP training courses will be improved and expanded. The training courses will be industry-, process-, and system-specific and will address problems of individual industries and businesses that are not covered in present courses. For example, an energy management workshop that focuses on retrofit or energy conservation technologies could be a valuable follow-up to the more general energy management workshop currently offered for engineers and technicians in the sugar, cement, and pulp and paper industries. A special course could teach plant owners, managers and engineers to prepare feasibility studies and loan applications, to evaluate and develop innovative financing agreements, and to monitor the results of energy-saving investments.

Training programs suggested for the initial phase of the project by Philippine energy users, vendors, service firms, and government experts include:

- o Industrial boiler operations

- o Industrial energy auditing

- o Commercial building "housekeeping" practices

- o Commercial building controls

- o Commercial building energy auditing.

These courses will be widely applicable and will provide hands-on operating experience and minimize the theoretical emphasis of many existing courses.

3. Technical Assistance

Technical assistance supports the demonstrations, studies, seminars, and training activities. Two types of technical assistance activities will be provided by the project: first, assistance to Philippine energy users, equipment vendors, and service firms interested in applying a particular energy conservation technology. This service will provide consulting services in response to requests to identify attractive technologies or to assist in their evaluation or implementation. Generally, from one to four hours of engineering time will be provided free to the requesting firm; additional time will be available at a cost to be determined by the project's Project Director.

The second type of technical assistance will provide technical, financial, and administrative expertise through a long-term U.S. consultant stationed in the Philippines and supported by short-term U.S. and Filipino consultants. The long-term consultant will assist in project implementation on a day-to-day basis and will serve in an advisory and teaching capacity. He will be responsible for identifying short-term consultants and, with the project staff, for identifying staff training needs and appropriate placements in training programs such as short courses, seminars, workshops, apprenticeships in the Philippines and U.S., study missions to U.S. plants, buildings and research facilities, as well as government organizations such as the National Bureau of Standards (NBS), Tennessee Valley Authority (TVA) and Oak Ridge National Laboratory (ORNL). Funds available under this component will cover training costs. The consultant will have to be aware of the technologies, institutions and people who represent the state of the art in energy conservation.

The short-term consultants will undertake special studies, conduct training, assist in reviewing project activities and provide suggestions for long-term institutional development. Both short- and long-term consultants will also extend USAID's ability to maintain an on-going energy management policy dialogue with the GOP and will assist BEU in policy analysis and formulation.

D. Policy Dialogue

The GOP has already done much to create a policy environment in which an efficient, affordable energy system can be built. To promote energy efficiency, the GOP has made substantial changes in its energy pricing structure, especially in eliminating subsidies for oil products. The record is less progressive for electricity pricing, but progress in this area is evolving with strong encouragement from the World Bank and the International Monetary Fund.

Other policies necessary for building more productive private enterprises through energy efficiency remain to be firmly established. These may include investment tax credits, establishing foreign-exchange priority and exemptions from certain taxes or import duties for conservation equipment, development of equipment or building performance standards, and public support for research and development. The GOP has made an excellent start in some of these areas. GOP policies could also foster the development of local private firms to manufacture energy-efficient equipment, provide engineering and energy auditing services, and invest in conservation-related improvements through creative financing arrangements.

The grant portion of the project will promote an informed policy dialogue with the GOP on these points by supporting policy-oriented studies and seminars. In addition, the technology demonstrations funded by the project loan will provide actual case studies showing where current policies act as constraints or where policy changes have produced positive results.

VI. PROJECT ORGANIZATION AND MANAGEMENT

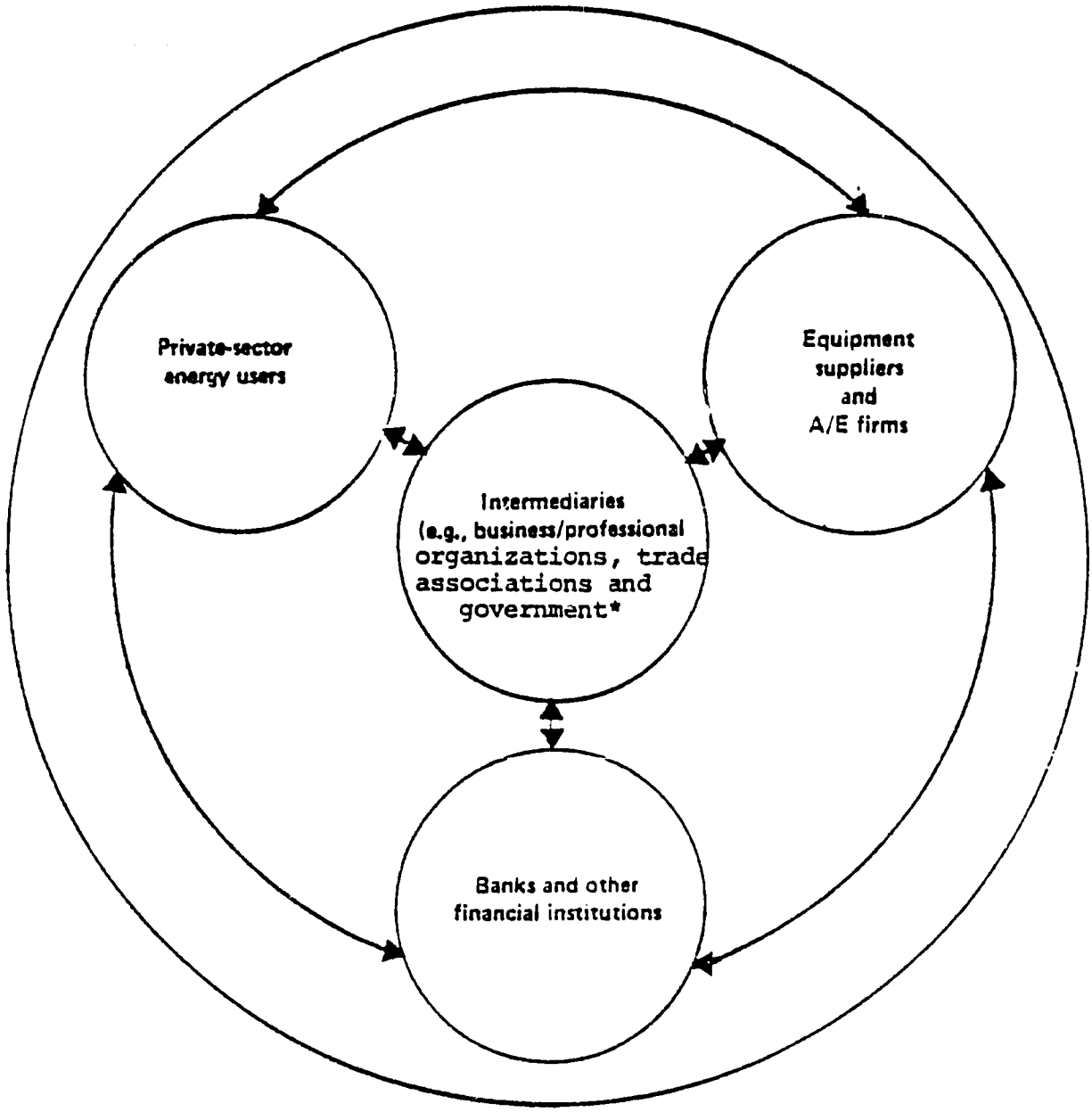
In discussions with the project design team, Philippine private- and public-sector energy experts identified a number of organizations whose participation is critical to the project's success. In addition, they made suggestions for the project's own organization.

Each of the identified organizations has reviewed the proposed project organization and agrees to its logic. The proposed organization has been kept as simple as possible, given the number of participants and multiple project objectives. While each group will actively participate in implementation, each will also directly benefit by developing capabilities to play an expanded role in energy conservation after project completion.

A. Organizational Guidelines

Four considerations have guided project organization. First, the project has to bring together all major participating groups whose decisions affect the use of energy conservation technologies (See Figure 1). These groups include private-sector energy users, architecture/engineering firms that recommend, design and install energy conservation technologies; energy conservation equipment vendors; financial intermediaries, such as commercial banks, who can provide capital for energy conservation investments; and government organizations whose regulations and policies affect the economic performance of energy conservation equipment and the users' ability to purchase it.

Figure 1
Interrelationships of the Participants



*Philippine Government (e.g. Ministry of Energy, Ministry of Trade and Industry, National Economic and Development Authority, Ministry of Finance, Office of Budget and Management, and Central Bank)

Second, the project has to improve the private sector's ability to deliver energy conservation technologies. This will be done by building on existing institutions such as the Philippine Chamber of Commerce and Industries (PCCI), the Energy Management Association of the Philippines (ENMAP), the Bankers' Association of the Philippines, and the commercial banks. No new institution will be created. The TTEM Project will spread its expertise through demonstrations and training programs developed with these participating organizations.

Third, the project is organized to respond flexibly to the Philippine energy market by involving users, vendors and other private-sector organizations in formulating policies and priorities. These will be reviewed on at least an annual basis and changed as necessary to respond to the fluid situations in both world energy markets and Philippine capital markets.

Finally, the project is designed to leverage USAID funds by stimulating additional investment by the private sector and international aid organizations. The $3 million available for lending is insufficient by itself to significantly reduce annual oil imports. Rather, the funds will be targeted at stimulating additional Philippine investments by reducing barriers to these investments through demonstrations, training programs and information dissemination efforts targeted at senior management, the financial community and energy professionals.

The following section describes the participating organizations and the project organization. Further detail on these topics, and on the organizations' current capabilities, can be found in Annex K.

B. Project-Level Organization

1. Key Participants

Nine private and public organizations will play critical roles in the project. They are described below.

a. Non-Government Organizations

The Philippine Chamber of Commerce and Industries (PCCI) is the major voice for Philippine industry. At present, PCCI has approximately 1,050 corporate and associate members, with a full-time staff of 29. It offers an excellent information network through its publications (such as the monthly magazine "Philippine Business"), has an ability to convene task forces to address specific problems, and is becoming increasingly active in educational work and management training. For this project, PCCI will serve as the primary communications channel to and from senior Philippine corporate executives, spreading the results of the demonstrations, assisting in structuring and conducting workshops and seminars, and providing feedback from the private sector on the project's effectiveness.

Members of the Energy Management Association of the Philippines (ENMAP) are primarily corporate and plant energy managers and engineers, most of whom have completed a formal course in energy management. Founded 5 years ago, ENMAP has 368 members and seven regional chapters. ENMAP is establishing committees to address the energy problems of specific industries in collaboration with the major trade associations. It is negotiating with the Philippine Licensing Board to develop professional requirements and a licensing examination for energy managers and engineers, and developing energy auditing courses and capabilities for regional ENMAP chapters. ENMAP will play a major role in the project by providing technical evaluation of subprojects. Its membership will also help identify demonstration, technical assistance, and training needs. Finally, ENMAP will use its information channels (such as its publication "Energy Manager" and its workshops) to disseminate information obtained from the demonstrations.

The Bankers Association of the Philippines (BAP) is the major trade association and spokesman for private banks and Philippine subsidiaries of foreign banks. Through its various committees and its nomination of members to represent the banking community to government and other groups, it is very influential in helping to develop government and commercial financial policies and in disseminating information to the entire banking community. The BAP will contribute effectively to project success by encouraging banks' participation and by continuing its ongoing dialogue with the GOP on laws and policies affecting banking.

The roles planned for these groups are the result of numerous meetings and design discussions. The role of each entity and its relationships with the others will be spelled out in a memorandum of understanding, which will be a Condition Precedent to initial loan disbursement.

b. Government Agencies

Six Philippine government institutions will play major roles in encouraging the use of energy-efficient technologies in the project. The Bureau of Energy Utilization is responsible for developing and implementing a national program for energy conservation, as described in Section IV and Annex L. The BEU has 142 employees and an annual budget on the order of ₱7 million.

The BEU will be the overall project coordinator for the GOP. The BEU will delegate day-to-day management of the project to the Project Director and his staff, and will assign some of its most experienced personnel to assist in project implementation. Thus, BEU's involvement in the operation of the project will be limited. The BEU will, however, as the agent for the GOP responsible for the overall implementation of the project, have the final authority for approval of demonstration subprojects, and will provide documentation necessary for disbursement of funds by the Central Bank.

BEU costs for administration of the project have been included in the counterpart budget for project operations and management, as shown in Section VIII and Annex N.

The National Economic and Development Authority (NEDA) formulates both short-term and long-term GOP development plans and identifies and coordinates all development policies and measures. It also coordinates the review of all GOP projects requiring foreign assistance as well as the implementation of all foreign assisted projects. In the TTEM project, NEDA will indicate GOP priorities and suggested criteria in selecting subprojects. NEDA will also play an important role in formulating and developing regulatory policy changes needed to promote energy conservation.

The Board of Investment (BOI) of the Ministry of Trade and Industry is responsible for the "technical evaluation" of any investment that makes use of government incentives, requires direct importation of foreign goods, or entails foreign investment. BOI will help to provide a perspective on foreign exchange priorities, and promote incentives for future use of energy saving technologies.

The Central Bank (CB) manages the monetary, credit, banking, and foreign exchange systems of the Republic of the Philippines. The CB does not make loans directly to individual borrowers, but rather provides a number of financial management services to programs that are funded jointly by the GOP and by foreign governments and international lending institutions (e.g., accrediting the banking institutions participating in the programs, disbursing moneys to the banks, and auditing the loans to ensure proper handling by the banks and proper use by the borrowers). One such program managed since 1952 by the CB is the highly successful Industrial Guarantee and Loan Fund (IGLF), initiated by DLF and continued by the World Bank.1/ The CB will administer the TTEM loan fund in a manner similar to its role in managing the IGLF program.

1/ The Industrial Guarantee and Loan Fund (IGLF) was established in 1952 by the GOP and the U.S. for the purpose of encouraging the establishment and expansion of viable cottage and small- and medium-scale industries nationwide. Under this program, the CB uses a network of financial intermediaries to serve as conduits in channeling IGLF assistance to new and existing industries under a loan guarantee program. The program has been quite successful and the fund has been replenished three times by the World Bank, currently at $130 million.

The Ministry of Finance (MOF) has public finance responsibilities including: administration and enforcement of customs laws; enforcement of the National Internal Revenue Code and other tax laws; treasury management; administration of special laws involving claims against the national government including management of public debts; and development and administration of securities market. The MOF will formulate financial policy measures and provide assistance to enhance the economic viability of various energy conservation projects.

The Office of Budget and Management (OBM) is charged with the primary responsibility of planning, executing and controlling the national budget. Thus, it assumes functional supervision over the various agencies in the entire government organization. In particular, this office regulates the distribution of government resources and sees to it that they are expended on programs and projects that support national goals. OBM's role in the project is essential to ensure that policies and procedures formulated in the budgeting and accounting of funds comply with national requirements.

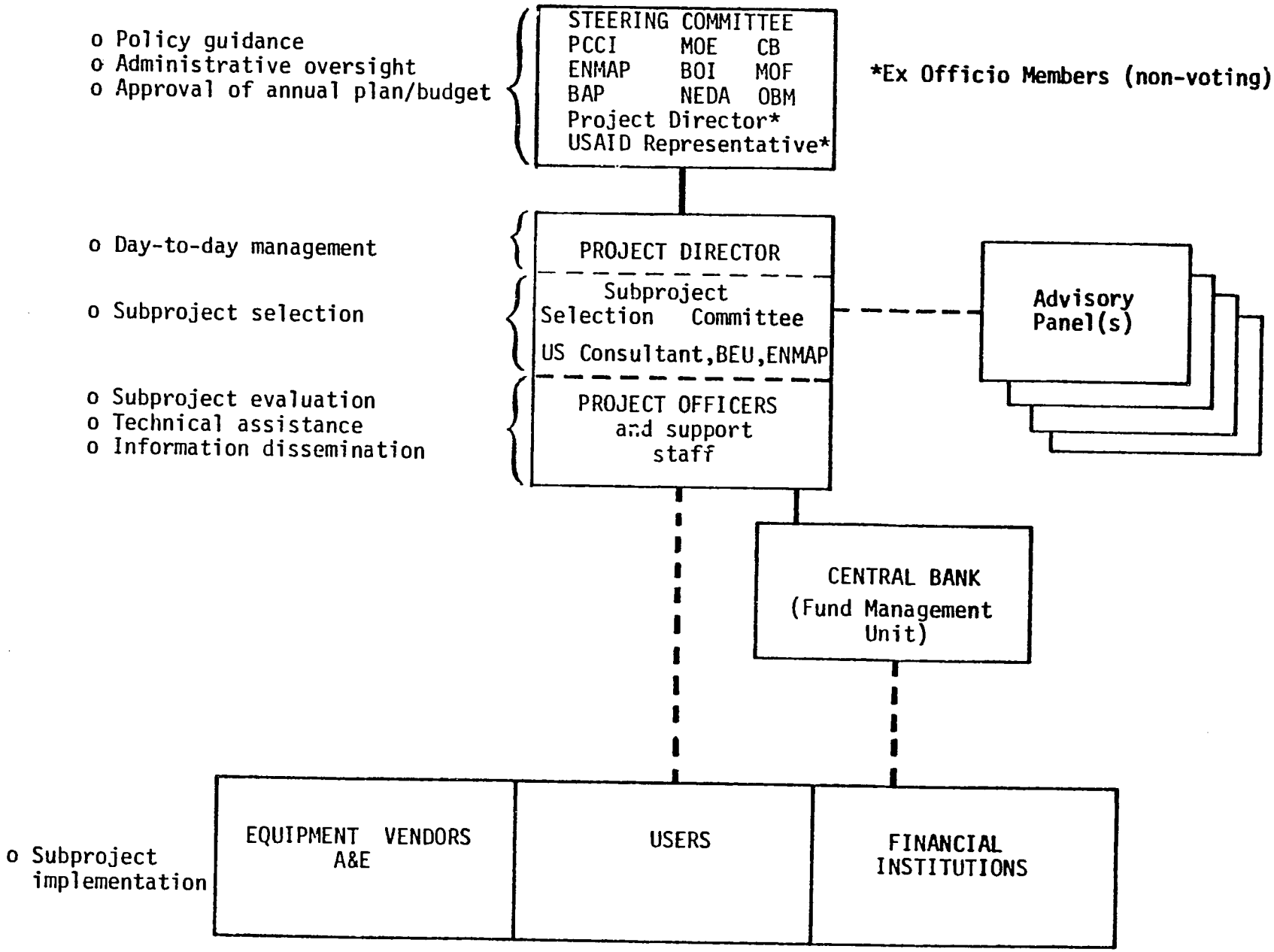
c. Project Management Structure

As noted earlier, the project is structured to bring together all major participating groups, improve private-sector capabilities in energy conservation,adapt quickly to changing needs, and promote leveraging of USAID funds. The structure includes a Steering Committee, a project staff, a Subproject Selection Committee, advisory panels, and a fund management unit. The project organization is shown in Figure 2.

The Steering Committee will provide overall policy guidance and oversight to the project. The private sector will be represented by PCCI, ENMAP, and BAP. The public sector will be represented by MOE, BOI, NEDA, MOF, OBM, and CB. The Project Director will be an ex-officio and non-voting member of the Steering Committee, and the USAID Energy Officer will serve as a technical consultant. The Steering Committee will be responsible for (a) approving the project annual plan and budget, (b) approving criteria used for subproject evaluation and selection, (c) approving financing terms offered under the project, and (d) reviewing project performance. The Steering Committee will not be involved in the selection of subprojects or in the day-to-day management of the project.

Each member of the Steering Committee will become a permanent link between the project and the organization or agency represented by coordinating TTEM activities with his respective organization and representing TTEM to his management. It is therefore important that the individuals on the Steering Committee be at the Director level of their organizations to ensure effective coordination and representation. For example, the MOE will be represented by an official designated by the Ministry of Energy. The ENMAP representative will be the organization's President. The PCCI representative will be the head of its energy

Figure 2
Proposed Organizational Structure



committee. Steering Committee members will not be compensated for their participation, except for honoraria that may be provided in accordance with Office of the Budget Ministry (OBM) guidelines.

The Steering Committee will initially be chaired by the Ministry of Energy representative. If the Committee wishes to rotate the chairperson, it may do so by election. The chairperson will convene the Steering Committee and will communicate with project staff on behalf of the Committee. After initial start-up and organization, which might require monthly or bimonthly meetings, the Steering Committee is expected to meet only two or three times a year.

The Project Staff is composed of a Philippine Project Director and several full-time and part-time professionals and support staff, including a U.S. technical assistance contractor providing a long-term resident consultant and short-term specialists. Day-to-day operations will be the responsibility of the full-time Project Director hired specifically for this project.

When it is fully operational, the project staff will have four full-time equivalent senior project officers and six junior officers. Each demonstration subproject, training course, or study will become the responsibility of a subproject officer, and some staff members may manage multiple subprojects as workloads and capabilities permit. The staff will draw on the U.S. contractor and outside Philippine consultants (from ENMAP, PCCI, A/E firms and others) for technical, administrative and financial advisory support as necessary. Each subproject officer will lead the initial subproject design and review, monitor performance, and ensure effective information transfer on the subproject's costs and benefits.

The project staff will be assisted by advisory panels composed of representatives of vendor, user, and professional groups, government agencies, and educational and research organizations. The advisory panels will be constituted on an ad-hoc basis by the Project Director or Steering Committee to provide advice on activities targeted at specific subsectors or industrial/commercial groups (e.g., commercial buildings, sugar refining, textile or food processing industries).

Working with the project staff will be a Subproject Selection Committee responsible for subproject selection, subject to final approval by BEU. The Project Director will convene the committee whenever a sufficient number of proposals reviewed and evaluated by the project staff are ready for approval. The committee to be headed by the BEU Director will consist of five members: Project Director, Chief of the Conservation Division of BEU and one representative each of ENMAP and the U.S. senior consultant. The ENMAP representative will be recommended by the ENMAP president.

Finally, the CB will act as the fund management unit , administering the TTEM loan fund on behalf of the BEU in accordance with a master agreement between the BEU and the CB. The Department of Loans and Credit will use one of the IGLF desks and procedures modelled after the IGLF program to administer the fund. Portions of the loan fund (excluding the reflow of funds from the payment of principal and interest on TTEM loans) to be used for local costs will be kept in a non-interest bearing account, from which funds will be disbursed, upon BEU approval, to accredited banks for re-lending to preapproved borrowing companies. Loans extended for foreign exchange procurements will be disbursed directly by USAID through a purchasing services agent. Any funds released by the CB to accredited participating banks will also be maintained in a non-interest bearing account, and the CB will be responsible for ensuring the proper handling of funds by the participating banks. With the approval of the BEU, the CB is authorized to withdraw sums from the fund for administration, promotions, and research. These sums may not exceed 1 % per annum of the highest outstanding loans during the period immediately preceding. The rate of interest and other financing terms required of qualified financial institutions participating in the project will be determined from time to time by the Steering Committee within the guidelines established in the Demonstration Loan Fund Policy Manual, as developed by the CB and BEU and approved by AID. Initial financing terms are discussed below in subsection C(4).

In order to quickly and accurately describe the purpose and use of the TTEM loan fund, one of the early tasks of the CB and project consultants will be to finalize a Demonstration Loan Fund Policy Manual which defines the fund's purpose, policies, lending rates and terms, and lending and repayment procedures. The manual will also contain copies of all necessary processing forms. The manual will be distributed to potential subproject participants during the initial project phase. A preliminary draft of the manual appears in Annex I.

During the first two to three years of the project, only a limited number of private commercial banks will be accredited, based on the CB's experience with the IGLF and the suggestions of private-sector representatives interviewed by the design team. As experience is gained with the project, particularly with subproject financing, the number of accredited banks can be increased.

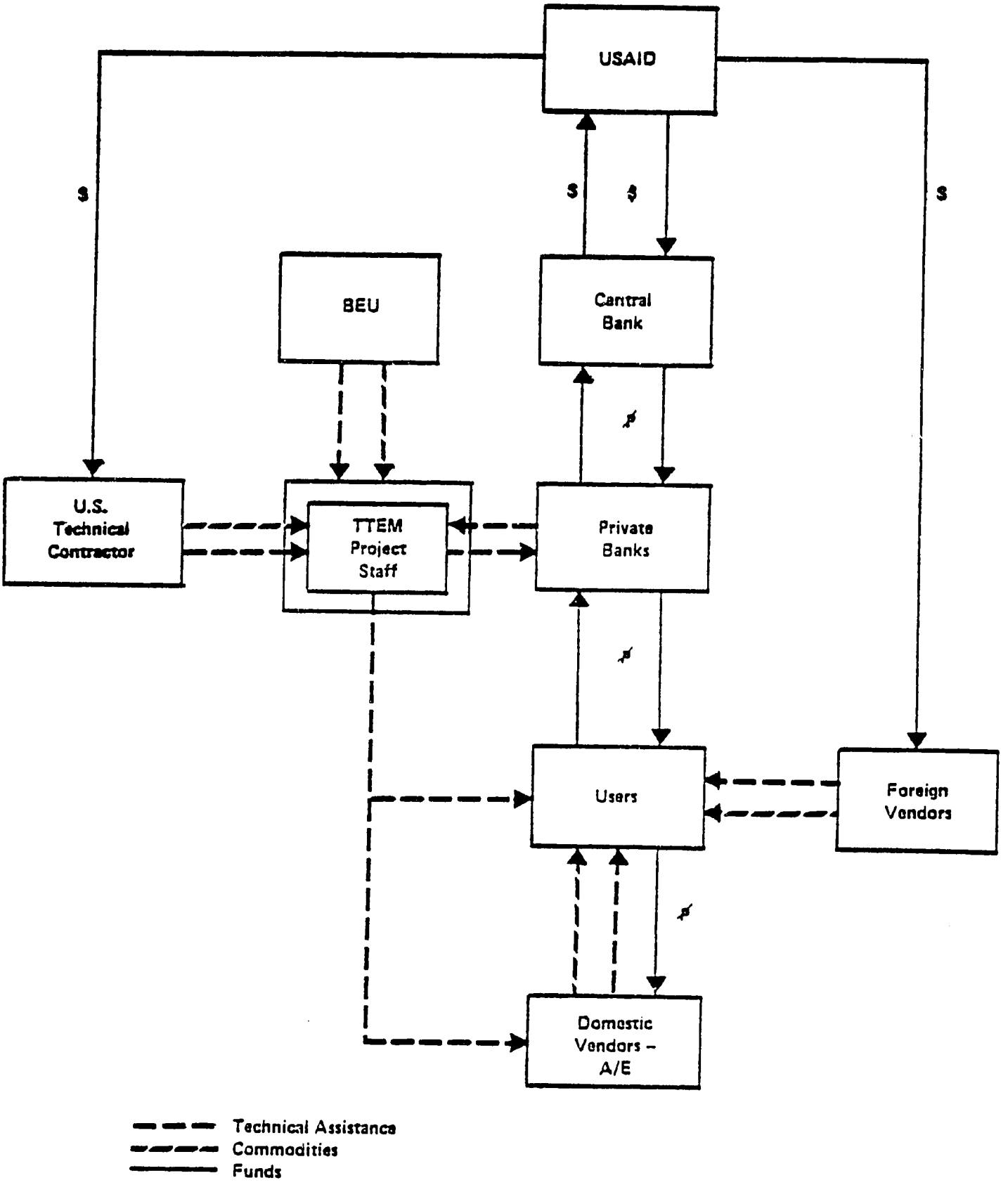
Major transactions occurring among the TTEM participants (i.e., flows of funds and technical assistance) are shown in Figure 3.

C. Subproject Management

1. Management Guidelines for Energy Conservation Demonstration Projects: Experience of Other Countries

A review of the programs in six industrialized countries (Federal Republic of Germany, France, Japan, Sweden, United Kingdom, and United

Figure 3
Simplified Flow of Funds, Commodities and Technical Assistance



States) designed to provide financial assistance to energy conservation research, development, and demonstration programs offered a number of guidelines that are pertinent to structuring the TTEM Project in the Philippines. Annex J discusses the guidelines in detail; the following discussion summarizes major procedures in the following areas:

- o Subproject application
- o Selection criteria
- o Financial assistance
- o Implementation assistance
- o Subproject management and monitoring
- o Information dissemination.

Subproject Application. Most of the programs studied assist applicants with proposal preparation to ensure that worthy projects, particularly in small- and medium-sized industries, are not refused support because of the inexperience of the proposer. This support usually takes the form of technical assistance in evaluating the costs and performances of the proposed systems and administrative assistance in preparing the application. Normally, this is done with "in-house" staff; however, academic and other technical experts can be used where special expertise is needed.

Selection Criteria. The selection process in several countries is biased toward small- and medium-sized firms, which are less likely than large firms to have the financial capability to undertake projects on their own. The subprojects also often aim at promoting near-term, low- to medium-risk technological development and demonstration opportunities, ensuring a high practical benefit from the assistance programs. Other criteria used for evaluating proposals include: a demonstrated need for public-sector support; the potential national energy savings or alternative energy production that may result from a technology; the expected financial return on the technology (determined by such measures as expected internal rate of return); the probability of project success; and the expected contribution to economic development, including increased employment, industrial production, and export opportunities. Industry representatives often participate in setting selection guidelines and establishing priorities for technological assistance.

Financial Assistance. The assistance programs studied use a combination of mechanisms, including grants, cost-sharing, preferential loans, and loan guarantees. Grants and cost-sharing tend to be provided for projects in higher risk categories, while loans and loan guarantees are used for lower risk projects. In most loan-related programs, there is a three- to five-year deferral of loan payments, and the size of the

loan payment may be contingent on the value of energy savings or alternative energy production realized in a project. In some programs, a loan may be entirely forgiven if a project is not commercially successful. The typical ceiling on grants and cost-sharing is between 25 and 50% of project costs. Loans or loan guarantees may be extended to a higher fraction (e.g., 70 to 80%) of project costs. Except for certain feasibility studies of high-risk projects, the award recipient is required to have a substantial economic interest at risk in undertaking a project. The recipient is expected to finance independently his contribution to the project. The project organization usually bears the complete cost of any monitoring, measurement, or reporting activities that are required for participation in the financial assistance program.

Implementation Assistance. Some form of technical implementation assistance is usually provided recipients of financial assistance. The extent of this assistance varies by program. In some programs, technical assistance may be provided at the government's expense from national laboratories or independent engineering firms during subproject construction or operation if an award recipient is encountering difficulties.

Subproject Management and Monitoring. The responsibility for technically directing and managing a subproject remains with the award recipient as the sponsoring program organization never retains any equity interest in projects it supports. However, as part of the agreement for receiving assistance (particularly for grant and cost-sharing assistance), the recipient agrees to perform specified activities according to schedule. Reports are periodically filed with program administrators indicating the award recipient's progress in carrying out the project. In several programs, the government pays for an independent review of project progress and measurement of project results in terms of energy savings. The administering agency may take a stronger role in project direction if technical difficulties are encountered or if an award recipient fails to meet project obligations.

Information Dissemination. All of the programs reviewed provide some method of disseminating project results to interested parties. The financial assistance agreement generally requires that an award recipient provide free, open access to the project site for agency representatives and others. Recipients must also provide project design and engineering information, and data on the results of a project. The government is permitted to disseminate this project information freely to interested parties. In most programs, there is a formal procedure for disseminating project information through government or private-sector publications, workshops and conferences, and inspection days, when interested people may visit the site of a supported project. The government bears the cost of disseminating project information and results.

2. TTEM Subproject Management Process

Based on the management guidelines presented and discussions with Philippine energy users, vendors, financiers, and government officials, an eleven-step subproject management process has been developed. The steps in this process and the key participants are presented in Table 6 and summarized below.

- Step 1: Preliminary Proposal Submission. A proposal will be submitted describing the candidate energy conservation system, indicating the type and level of loan or grant, developing preliminary estimates of the expected costs and savings, and providing a justification for support from TTEM funds. In the project's first six months, these proposals are expected to come principally from the TTEM staff, based on the suggestions made in this paper and those made in previous Philippine energy studies and audits. Later, more proposals will come from energy users, equipment vendors, and A/E firms. TTEM staff can assist in proposal preparation through discussion and advice. In the first six months of operation, a brochure will provide guidelines on proposal preparation, and workshops will assist private firms wishing to submit proposals. It is possible that a proposal reflecting prior extensive effort or not requiring extensive analysis will skip this and the next step and go immediately into Step 3, detailed proposal submission.

- Step 2: Preliminary Proposal Review. This step, a preliminary screening by the TTEM staffs will be based on general guidelines provided by the TTEM Subproject Selection Committee. The staff will review estimates of system costs, estimated savings, net savings to the Philippine economy, and technical and economic risks. Proposals that meet minimum requirements established by the Subproject Selection Committee will be considered further for selection, those not doing so will be eliminated or sent back to their sponsors for further development.

- Step 3: Detailed Proposal Submission. Projects passing the preliminary screening will be the subject of a detailed subproject proposal prepared by the sponsor. This proposal will entail significantly more work and cost than the preliminary proposal of Step 1, although the content will be similar. For example, a full energy audit of the facility may be conducted during this step with the possible assistance of project staff.

Table 6
TTEM Subproject Management Process

Process Step	Key Participants 1/
1. Preliminary proposal submission	Users, vendors, A/E firms, TTEM staff
2. Preliminary proposal review	TTEM staff
3. Detailed proposal submission	Users, vendors, A/E firms, TTEM staff
4. Detailed proposal review	TTEM staff
5. Subproject selection	TTEM Subproject Selection Committee
6. Subproject design	
- selection of project officer/ management team	TTEM Project Director
- detailed engineering	Users, A/E firms, vendors, TTEM staff
- financial structuring	Users, participating banks, TTEM staff
- information dissemination strategy	TTEM staff
7. Subproject financing	Participating banks, users, CB, TTEM staff, USAID
8. Final subproject approval	TTEM Subproject Selection Committee, BEU
9. Local Procurement and construction	Users, (vendors, A/E), bank, USAID (foreign procurements), TTEM staff
10. Subproject montoring	TTEM staff
11. Information dissemination	TTEM staff, users, vendors, Steering Committee members, trade associations

1/ Lead responsibility is first in line

- Step 4: Detailed Proposal Review. The project staff will carry out a detailed review perhaps with aid from outside experts when proposed technologies are beyond the staff's expertise. This step will produce a formal report summarizing the major subproject characteristics, to be presented to the TTEM Subproject Selection Committee.

- Step 5: Subproject Selection. The Subproject Selection Committee will select the most attractive subprojects, using selection criteria approved by the Steering Committee and the individual subproject analyses. Proposed selection criteria are discussed in more detail below. In the selection process, the Committee will rank the proposed projects from most to least attractive. This ranking will be compared with available funding to determine which projects will actually be funded.

- Step 6: Subproject Design. Projects selected for funding will enter a detailed design and engineering phase. At the same time, a subproject staff officer will be designated and will have primary responsibility for structuring the TTEM contribution to the subproject and enhancing the probabilities of its success. Normally, he will have simultaneous responsibility for more than one subproject and he will be assisted by the technical, financial, and administrative expertise of other staff members as needed for the specific subproject. Detailed engineering designs and final cost and performance estimates will be prepared by the subproject proposer. Depending on the proposer's requirements, the TTEM subproject officer may simply review this design effort, or support it more actively with technical assistance or funding. Overall outlines of the financial structuring--such as the terms of the loan and grant expected from the TTEM payment--must be agreed to between the TTEM subproject officer and the sponsor with the understanding that such agreement is subject to approval of the Subproject Selection Committee and endorsement by the BEU. The subproject officer must also develop an information dissemination strategy for the results of the demonstration, including an analysis of the technical, financial and economic viability of the demonstration and an identification of the primary audience and the most effective avenues for reaching it.

- Step 7: Subproject Financing. Once the design is complete, the sponsor, assisted by the project staff, will negotiate financing terms with the participating banks. In addition, details will be finalized on foreign currency purchases, the loan recipient's contributions, and legal covenants governing factors such as access to the facilities and dissemination of information.

- o Step 8: Final Project Approval. The eighth step is subproject approval by the TTEM Subproject Selection Committee and endorsement by BEU. BEU will then instruct the Central Bank to release funds to the subproject for local currency costs and initiate procedures with USAID for purchase of offshore commodities payable in foreign exchange.

- o Step 9: Local Procurement and Construction. The host company is responsible for this step, although the TTEM subproject officer may provide technical assistance when necessary.

- o Step 10: Subproject Monitoring. Normally, monitoring is carried out both before and after the installation of the equipment, so that detailed data can be collected on actual system installation costs, energy savings, operating costs, and reliability. Instrumentation may be installed at TTEM expense. Depending on the subproject, monitoring may last from a few months to several years. The demonstration sponsor will be responsible for collecting on a regular basis performance and energy saving information on the subproject.

- o Step 11: Information Dissemination. In this final step, the subproject officer will follow the strategy outlined in subproject design (Step 6). He will coordinate the efforts of the energy user, equipment vendors and trade associations to disseminate widely the results of the demonstration. He will prepare or have prepared an analysis of the technical, financial and economic viability of the demonstration plus various papers, reports, brochures, and other communications for presentation to the Project Steering Committee and at trade shows, conferences, workshops, training courses, and seminars. These publications will summarize the nature and results of the demonstration and identify factors affecting proper design, installation, and operation. He will assist companies or others wishing to install similar systems, and collect data on later installations and operating experience where available. Economic calculations will be presented as they would actually be seen by other energy conservation investors. For example, although the demonstration may have been financed with grants or loans at favorable interest rates, the economic analysis prepared for other potential users will evaluate the economic performance using normal market rate loans.

3. Demonstration Subproject Selection Criteria

Discussions with Philippine energy experts and a review of studies on Philippine energy use indicate that there are many attractive subprojects suitable for demonstration. The problem, in fact, will be to select the most attractive from those suggested by users, vendors, consultants, TTEM staff, and other interested parties. To achieve an initial ranking of relative subproject attractiveness, a two-step procedure is suggested.

The first step is a simple decision on whether to proceed further. This will depend on whether TTEM has the manpower and funds required, whether the proposer is willing to share information, and whether the subproject is likely to stimulate similar investments by the private sector resulting in energy savings. If the answer to these questions is positive, the second step of doing a more detailed quantitative analysis can be carried out based on the important parameters of the subproject costs and benefits, risks, economy-wide costs and savings, and benefits to the TTEM loan fund. Subproject costs and benefits can be evaluated using relatively simple criteria such as the payback period to the energy consumer and the foreign loan payback period. Discussions with Philippine energy users indicate that more sophisticated criteria incorporating the impacts of taxes and government incentives (such as tax credits or import duty allowances) are not normally used at this stage because of the difficulty of determining what incentives will actually be approved for a subproject and when. An economic analysis estimating the economic internal rate of return (EIRR) under normal lending interest rates and terms should be performed to determine if the investment is economically viable. The minimum acceptable EIRR will be determined annually by the Steering Committee. For the first year, it will be 20%.

The risk parameter can be divided into technical risk (will the technology work and generate measurable energy savings?), financial risk (will it be cost-effective, and can it be financed?), and institutional risk (will regulatory or social factors adversely affect it?). These assessments will be made on a "low," "medium," or "high" scale with "low" risk subprojects being more attractive than "high" risk subprojects. Evaluation of these risks requires experience and sound judgment on the part of the project staff reviewing the proposed subproject.

Evaluating economy-wide costs and benefits is similar to evaluating the costs and benefits for a particular site, but also requires estimates of the replicability of the subproject (how many additional subprojects will be stimulated by the demonstration?). This evaluation will require a market study of industrial or commercial sectors to which the proposed energy conservation systems are applicable. Judgments must also be made on whether and how a demonstration will actually stimulate other users to implement the technology. The indirect costs and benefits likely to result from the subproject, such as the potential for local manufacturing, exports, and rural development, can be judged as well. From these estimates of total economic costs and savings and of TTEM project costs for monitoring, training, and information dissemination, an overall EIRR for the demonstration effort can be estimated.

Finally, the costs and benefits to the TTEM Project must be evaluated, most simply by using a simple benefit-to-cost ratio such as energy savings per peso of TTEM funding and project manpower costs. Thus, subprojects entailing a higher user contribution to total project costs will generally look more attractive in these terms than those requiring a large TTEM contribution. These selection criteria are summarized in Table 7.

A four-step process is used to rank the proposed demonstration subprojects on the basis of these criteria. First, the TTEM Subproject Selection Committee must determine the relative importance of each selection criterion and assign it a numerical weighting. For example, foreign exchange savings, technical and economic attractiveness to users, technical risk, and number of replications are expected to be most important in determining the attractiveness of a subproject proposal and could be given each a weighting of 10.0. Economic risk, user contribution, and energy savings per TTEM investment dollar (or peso) could be considered slightly less important, and could be given each a weighting of 7.0. Institutional risk and indirect costs and benefits could be considered least important, and could be given each a relative weighting of 5.0.

Next, each subproject proposal is scored on each of the criteria and given a relative score from 0 to 10. A composite score for each proposal would be the multiple of each criterion weighting by the criterion score and summing across all the criteria. A "perfect" subproject that scored 10 along each dimension discussed above would have a maximum score of 710.

In the third step, the proposed subprojects scores are compared with scores for other projects, the resulting rankings are examined by the Subproject Selection Committee, and adjustments are made in the ordering to reflect factors that this simple model could not readily handle, such as a special priority which they wish to give to an export-oriented industry.

Experience in the United States and other countries indicates that this type of scoring model is effective, easy to understand and operate, and flexible in responding to changing priorities since criteria can be added or deleted and relative criteria weightings and scoring methods can be changed.

4. Subproject Financing Terms

A major objective of the TTEM project is to develop and demonstrate in the Philippines innovative financing mechanisms for energy conservation that might overcome the reluctance of energy users and financial institutions to finance these investments themselves. The financing instruments being considered for the first phase of TTEM include straight loans, loans with repayments tied to savings, grants (for limited high-risk projects) and various combinations of these.

Table 7
Subproject Selection Criteria for Technology Demonstrations

- o DECISION TO PROCEED
  - Does TTEM have resources for subproject (manpower, funds)?
  - Is user willing to freely share information?
  - Will a successful demonstration stimulate additional energy conservation investments?
- o SUBPROJECTS COSTS AND BENEFITS
  - What is the technology's technical and financial attractiveness to potential users?
  - What is the economic performance of the technology?
- o RISK
  - Will the technology work reliably and demonstrate energy savings?
  - Can it be shown to be cost-effective?
  - Will regulatory or social factors adversely affect it?
- o ECONOMY WIDE COSTS AND BENEFITS
  - What is the economic internal rate of return of the subproject?
  - How many replications of the technology should the demonstration stimulate?
  - What indirect costs and benefits to the nation should result, such as potential for local manufacturing, exports, and rural development?
  - Are replications financially sustainable at conventional commercial lending rates?
  - Is the propcsed investment economically viable using shadow pricing of all inputs and outputs?
- o TTEM COSTS AND BENEFITS
  - What are users or vendors willing to contribute?
  - What are the expected energy savings per TTEM investment?

Straight loans for technology demonstrations will be made at the Manila Reference Rate (MRR)[1/] plus a fee to the commercial bank for administering the loan (not to include loan risk). Loans with repayment tied to savings will be made at MRR plus the bank administrative fee plus a premium for the lowered risk to the borrower. Other reference rates and terms may be set by the Project Steering Committee within the guidelines established in the Demonstration Loan Fund Policy Manual. The reference point and the relationship of the lending rates to the reference point will be reviewed in the development by the Central Bank and the Bureau of Energy Utilization and approval by USAID of the Demonstration Loan Fund Policy Manual.

The financing terms for the project's demonstrations will reflect the economic and financial conditions in the country at the time the loan is made. This is necessary in order to ensure that rational choices are made based on the opportunity cost of using the capital and that the real value of the loan funds are maintained over time (or at least the decapitalization is minimized).

The loan rate stated above is a minimum rate, calculated as sufficient to allow the demonstration loan fund peso reflows to fully amortize the project dollar AID loan to the GOP, taking into account the risk of deveLuation of the peso against the dollar during the period that demonstration loans are outstanding. It is intended that demonstration loan rates and terms be established at a level which will fully cover foreign exchange risk to the GOP for the project and that the Demonstration Loan Fund Policy Manual will be established to do so and will be revised as necessary to continue to do so during the life of the project.

Annex I is a draft of the policy manual for the TTEM fund. The Steering Committee may add additional financing instruments or modify or delete existing ones as the project progresses.

Grants are the simplest form of assistance and by far the most attractive to users. In the initial years of the project, grants will be few since the subprojects will generally be low in risk. These grants will be earmarked for expenses beyond those that the user would normally incur in implementing the technology, such as detailed monitoring and information dissemination. Later, as the project takes on riskier efforts, the grant might be expanded to reduce user risk. However, in no case will a 100% grant be given; the user will always be required to shoulder a significant portion of the project risk. Grants will be limited to 50% of a subproject's cost. Total grant funds will be no more than 25% of total project loan funds in any given year. The maximum

1/ The Manila Reference Rate (MRR) refers to the weighted average of the interest rates paid on deposit substitutes, such as money market placements, by the top ten Philippine commercial banks with the largest volume of deposit substitutes, as published by the Central Bank of the Philippines.

grant in the first year of operation will be $75,000. Grants will be channeled from the TTEM fund through participating banks, who will receive a handling fee of no more than 1/2%, or be granted directly to the user by the Subproject Selection Committee, whichever seems most economical.1/

Straight loans (i.e. loans made on conventional lending terms) are expected to be the most common form of financing for technology demonstrations. These loans will be offered at the favorable end of the range of current commercial rates and for longer terms (up to 5 years) than usually available as incentives to participate.

For purposes of calculating the financial viability of the project the 1983 average MRR of 15% has been used as the lowest MRR likely to occur during the life of the project as Philippine economic conditions return to normal. The commercial bank administrative fee has been estimated at 3% and a 5% premium has been used for loans tied to savings. These rates, which are exemplary only, appear in Table 8, in the analysis below and in Annex M.

If the financial institution assumes 100% of the business and credit risks associated with a project, it will be allowed a maximum spread of 7%. In the event the participating financial institution assumes none of the risks the maximum spread allowed will be only 3%. A financing institution may choose, however, to share the risk with TTEM. In this case the spread is adjusted accordingly. For example, if the financial institution assumes 50% of the risk, then the allowed spread is 5%.2/ During the first year of the TTEM project each subproject straight loan will not exceed $200,000. As noted above, interest rates and loan ceilings can be changed by the Steering Committee within the guidelines established in the Demonstration Loan Fund Policy Manual. The loans will be repayable in pesos. At present, effective "market" rates for short-term loans (less than 1 year) are in the mid thirties and there is generally no long-term lending available for commercial borrowers.3/

A second loan option is to tie loan repayments to savings. In this option, which is designed to give energy consumers additional incentives to invest in conservation measures, the annual savings from the technology are monitored and split between the energy user and the TTEM project fund. For example, the user might initially put up 20% of the capital investment and the TTEM Project 80%. The savings are split, with 80% going to the project fund and 20% to the user until the loan is paid

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1/ It should be noted here that while funds may be provided to final users in grant form, these grants will come from the USAID loan to the GOP and thus are not an AID grant-financed project contribution.

2/ Refer to Table 8 for the spread allowed at various levels of risks, assuming a MRR average of 15% over the previous four week period.

3/ Interest rates quoted by banks are usually around 33%. However, fees legally added by the banks significantly increase the effective rate.

Table 8
Proposed Financing Terms[1/]

Type of Financing	Who takes risk?	Spread (percent) TTEM Fund	Commercial Bank	Central Bank	Loan Rate (LR) to Borrower	Loan Origination Fee (%)	Maximum Amount
Grant	-	-	-	-	-	1/2	$ 75,000[2/]
Straight Loan	Bank	10	7	1	18	1	200,000[3/]
(MRR + 3 points)	TTEM Fund	14	3	1	18	1	200,000[3/]
	Shared (50/50)	12	5	1	18	1	200,000[3/]
Loan with repayments tied to savings	Bank	12.5	9.5	1	23	1	200,000[3/]
(MRR + 8 points)	TTEM fund	17.5	4.5	1	23	1	200,000[3/]
	Shared (50/50)	15	7	1	23	1	200,000[3/]

1/ This table assumes that the average Manila Reference Rate (MRR) over the four weeks prior to the loan agreement is 15%. For purposes of analysis of project financial viability the 1983 average MRR of 15% has been used in this and other tables and calculations as the lowest MRR likely to occur as Philippine economic conditions return to normal in coming years. A bank administrative fee of 3% has been estimated for purposes of these calculations. All interest rates and fees used in this table are exemplary only and actual rates and fees may be adjusted at the TTEM Project Steering Committee within the guidelines established in the Demonstration Loan Fund Policy Manual.

2/ This is also limited to 50% of the total subproject cost.

3/ This is also limited to 75% of the total suproject cost.

off. To the extent possible, the user will also receive tax benefits such as duty free imports or local tax credits, and is thus assured that his investment will result in a positive cash flow. In return, he would pay a higher interest rate than that for a straight loan to compensate for the greater risk to the financing institution as well as the additional administrative costs. This loan would have a variable term that depends on the size of the projected annual savings and thus how quickly the principal and accrued interest are paid off. The Subproject Selection Committee shall review subprojects made under this arrangement which are not paid off after seven years (or some earlier period to be negotiated between the user, TTEM, and banks), and decide on the treatment of the remainder of the loan including the possibility of a write-off if the circumstances so justify. The loan must have a finite life because a poorly performing investment may never pay off, and could result in significant problems in identifying and allocating future savings as processes are changed. Moreover, most industrial users would be extremely reluctant to agree to a completely indefinite payment schedule. It must be emphasized that the user's maximum effective interest rate is capped; if the subproject is very successful in saving energy and pesos, he only pays until the principal and accrued interest are paid off, often a year or less for conservation investments.

Because of unfamiliarity with this type of financing and additional administrative costs, the returns to the commercial bank and/or to the TTEM fund must be greater. If the TTEM fund assumes the full loan risk, with a MRR of 15% the TTEM fund will receive 17.5%, with 4.5% going to the commercial bank and 1% to the CB, giving the borrower an effective interest rate of 23%. If the commercial bank takes the full risk, it will receive 9.5% with the TTEM fund receiving 12.5% and the CB 1%. The effective rate to the borrower is the same: 23%.

Intermediate sharing of risks will have the commercial bank's spread adjusted proportionately. For example, a 50/50 split of the loan risk will give the commercial bank 7%, the TTEM fund 15% and the CB 1%.1/ The commercial banks will be allowed a one-time 1% loan origination fee on both types of loans to cover their administrative and credit evaluation costs. During the first year of the TTEM project, these types of loans will not exceed $200,000. The rates and terms of the loans as well as loan ceilings may be modified from time to time by the Steering Committee within the guidelines established in the Demonstration Loan Fund Policy Manual.

1/ Refer to Table 8, for the spread allowed at various levels of risks, assuming a MRR average of 15% over the previous four week period.

VII. DETAILED PROJECT ANALYSIS

A. Technical Feasibility

The technologies demonstrated by this project will, in general, have little or no technical risk, particularly in the initial year. All proposed demonstrations already identified have been well demonstrated in industrialized countries but have had limited used in the Philippines because of a lack of reliable information on the costs and benefits, a lack of experience in proper evaluation, design, and implementation, or a lack of funds. Generally, these proposed technologies and procedures are not complex, can be easily understood and operated by appropriate industry or business personnel, and can be implemented with a small amount of training.

In later stages of the project, demonstrations with slightly higher technical risk may be undertaken. However, because of the limited funding which will effectively preclude any significant R&D efforts, the TTEM project will limit its efforts to technologies that have already been demonstrated as technically viable elsewhere. The major technical risks will be only those required to prove the technology's viability in the Philippines with the specific systems, processes or fuels used by Philippine industry and commercial buildings.

As described in Section VI (C) above, selection of demonstration subprojects will be carried out with the help of explicit selection criteria which will evaluate the relative cost effectiveness, risk, and potential energy savings of the proposed subprojects. Thus, the limited funding will be used for those efforts which are the most cost effective from a user standpoint and have replicability potential from a national standpoint. In short, the TTEM project will draw on an array of proven energy conservation technologies which exist and which have not yet been widely applied in the Philippines.

The training and information activities of the project are traditional approaches which have proven successful in innumerable assistance projects. The project will focus on improving the capability of government and private-sector personnel to evaluate, design, finance, and implement the technologies. Consequently, technical constraints will not impede the implementation of the project, and the proposed design is technically responsive to the problems of energy conservation in the Philippines. Considerably greater detail on technical feasibility, including preliminary assessments of candidate technologies, can be found in Annexes G and H.

B. Economic Analysis

1. Potential Demonstration Subprojects

Since the TTEM project will consist of a large number of demonstration subprojects whose final designs will not be determined until the project is implemented, economic costs and benefits cannot yet be determined precisely. However, if the demonstration subprojects generally are assumed to be similar to the eight technologies suggested by Philippine interviewees for the initial phase, estimates of the economic return on investments for the proposed demonstration subprojects can be made. The analysis is made using present parameters. The economic internal rate of return (EIRR) for each individual technology can be estimated with the following assumptions:

1) The shadow price (that is, economic value) of foreign exchange is 1.20 over its market value.

2) The economic values of local materials and domestic labor used for installation and for operation and maintenance (O & M) are the same as their market values.

3) The net value of oil savings is $5.97/mmBTU. This is computed on the basis of the 1984 average crude oil acquisition cost of $28.84/bbl, divided by 5.8 mmBTU/bbl, multiplied by the 1.20 shadow price of foreign exchange.

4) The net value of electricity savings is $0.043/kwh. This is computed on the basis of the present average Meralco rate (excluding charges) for large industrial users and assuming that fuel cost accounts for only 66% of the basic rate of ₱1.15/kwh. It is then divided by the ₱21.00 peso/dollar exchange rate, multiplied by the 1.20 shadow price of foreign exchange.

5) The peso/dollar rate used is ₱21.00 = $1.00; while the prevailing exchange rate is ₱18.50 = $1.00, this is deemed to be not reflective of market forces.

6) The operating life of the system is 15 years plus one-year installation period. This is the period of time the technology will actually be in use before its retirement because of normal wear and tear and/or technical obsolescence.

7) The annual energy savings for each technology are based on an estimate of the potential energy savings resulting from a single application.

With these assumptions, the EIRRs of the different technologies or proposed subprojects vary from 3% to over 3,336% (see Table 9). The subprojects with extremely high returns (e.g. combustion monitoring systems and steam system maintenance) are primarily "housekeeping" projects having little capital investment but with potentially large energy savings. Two proposed technologies, i.e., outside air temperature compensation for chillers (OATCC) and building roof insulation (BRI), have relatively low EIRRs of only 1% and 5% respectively. These returns are well below the opportunity cost of capital (estimated to be about 20%), and thus these subprojects would probably not be undertaken without more detailed study to determine if the actual EIRR is in fact much higher than that estimated in these preliminary analyses. The other subprojects have EIRR estimates of over 20% or higher, and thus appear economically viable and attractive.

A sensitivity analysis shows the same trend (see Table 10). Given various scenarios where (1) investment costs are increased by 20%; (2) annual energy savings are reduced by 10%; and (3) a combination of scenarios 1 and 2, the EIRR of most of the proposed subprojects remain attractive. (Again, the exceptions are the two technologies, OATCC and BRI. The EIRR of OATCC even becomes negative in all three scenarios. This implies a real need to review more closely the potential for getting greater economic benefits from these types of technology before further investments will be made.) In general, there are good reasons to expect that the proposed subprojects could achieve results that would justify investments in these technologies and potentially yield a reasonable rate of return on the investment.

2. Overall TTEM Project

There is a need to determine whether the TTEM project's economic impact justifies the resources to be used during its five-year life. To estimate its overall EIRR, the project's cash flows must be divided into their uses, the economic value of each use must be determined, and the economic value of the resulting potential energy savings from such investments must be calculated. The uses of TTEM project funds can be divided into the following categories:

-- Total energy system investment. This is the total investment in energy conservation equipment made by the TTEM project and by the energy user. Of this amount, 90% is assumed to be for foreign exchange purchases (with an economic value of 120% of market costs); and 10% is for local materials and labor for installation (the economic value of both are the same as their market costs).

-- GOP contribution. This primarily includes personnel and commodities, including office space. The economic value is the same as the market value.

Table 9
Economic IRR for Proposed Energy Conservation Technologies

Technology	Market Value ($)						Economic Value ($)				
	Foreign Purchases	Domestic Purchases	Domestic Installation Costs	Foreign O&M Costs	Domestic O&M Costs	Annual Energy Savings 1/	Total Investment Costs 2/	Annual O&M Costs 3/	Annual Fuel Savings 4/	Annual Net Savings 5/	EIRR (Percent) 6/
Combustion monitoring systems:											
Small	340	-	-	-	1,316	2,500 7/	408	1,316	14,925	13,609	3,336
Large	5,100	-	52	1,000	1,216	12,500 7/	6,172	2,416	74,625	72,209	1,170
Flue gas heat recovery systems	51,000	-	3,243	-	162	2,484 7/	64,443	162	14,829	14,667	22
Industrial insulation	65	240	54	-	-	460 7/	372	-	2,746	2,746	738
Power factor control equipment	72,250	-	540	-	130	*	87,240	130	110,151*	110,021	126
Steam system maintenance	1,700	-	573	-	-	11,030 7/	2,613	-	65, 849	65,849	2,520
Outside air temperature compensation for chillers	12,000	-	3,243	-	162	33,000 8/	17,643	162	1,419	1,257	1
Building energy management systems	17,000	-	1,946	-	259	189,300 8/	22,346	259	8,140	7,881	35
Building roof insulation	540	5,676	270	-	-	14,500 8/	6,594	-	624	624	5

1/ See Annex H (Part C) for details on how the annual energy savings for each technology were computed.
2/ Computed as (1.20) (Foreign Purchases) + (1.00) (Domestic Purchases) + (1.00) (Installation Costs).
3/ Computed as (1.20) (Foreign O&M Costs) + (1.00) (Domestic O&M Costs).
4/ Net value of oil savings is $5.97/mmBtu.
Net value of electric savings is $0.043/Kwh.
5/ Annual net savings equal annual fuel savings less annual O&M costs.
6/ Computed on the basis of 15 years' operating life of each system.
7/ Million British Thermal Unit.
8/ Kilowatt Hour.
* See Table H1 for footnote.

Table 10
Economic IRR Sensitivity Analysis of Potential TTEM Subprojects
(In Percent)

	Base Case	Investment Increase by 20%	Energy Savings Drop by 10%	Investments Go Up by 20% and Savings Drop by 10%
Combustion Monitoring System				
Small	3,336	2,777	2,710	2,256
Large	1,170	975	1,024	854
Flue Gas Heat Recovery Systems	22	17	20	15
Industrial Insulation	738	616	627	523
Power Factor Control Equipment	126	105	109	91
Steam System Maintenance	2,520	2,100	2,191	1,826
Outside Air Temperature Compensation for Chillers	1	(1)	(2)	(4)
Building Energy Management Systems	35	29	30	25
Building Roof Insulation	5	2	3	1

-- Other costs. These include AID grant and loan funds and contributions from the Philippine private sector for technical assistance, training, studies, and information dissemination. Approximately 80% of these costs require foreign exchange, e.g., for funding U.S. technical suport contractor for technical assistance, while 20% are spent in-country for personnel and service. The external expenditures are valued at 120% of the market value, and the internal expenditures valued at their market cost.

5) Estimated annual energy savings accruing from the project are based on the proposed number of TTEM Demonstration Subprojects and their corresponding annual energy savings (volume), shown in Table 5.

The mix of TTEM demonstration projects are expected to be concentrated on subprojects with high economic returns with only a very limited number of subprojects having low EIRRs to be undertaken. However, it is estimated that only about 60% of the proposed number of subprojects could be undertaken for the available amount for investment, assuming a 10% inflation factor during the five-year project life. Correspondingly, the project's estimated annual energy savings would be only 60% of what would have been generated in investment for all proposed subprojects were made.

Table 11 summarizes these flows for the TTEM Project Base Case Scenario, calculates their economic value, estimates the economic value of the net savings resulting from the project energy conservation investments, and calculates the net project economic value flows. The EIRR calculated from these flows for the entire TTEM project is 164% at a 100% success rate for each investment. If it is assumed that only 80% of the total energy system investments will be successful (i.e., a 20% failure rate), the level of energy savings to be derived from the project would still yield a very high 140% EIRR. This economic return exceeds the NEDA-supplied social discount rate of 15%, and the Philippine opportunity cost of capital of 30%, and thus, the Project should be an attractive economic investment, particularly if it focuses more on high-return subprojects.

In reality, the project's EIRR or economic impact may be much higher than this for two reasons. First, the 2 average years payback estimated for the energy system investments may be a maximum acceptable payback period in the current economic situation. Many of the suggested subprojects have much faster paybacks. Thus, the average subproject will probably have a better economic return, resulting in a higher overall EIRR. Second, this analysis does not consider "spread" effects of additional replications of the technologies resulting from the technical assistance, the demonstrations and training. Potentially, these can lead to savings many times those of the subprojects funded directly by the TTEM project. These spread effects should increase the overall EIRR substantially.

Table 11
Summary of TTEM Project Costs and Benefits[1]
($000)

Year	Energy System Investment	GOP Contribution	Other Costs	Total TTEM Project Expenditures	Economic Value of Total TTEM Expenditures [2]	Economic Value of Net Savings[3]	Net TTEM Project Economic Value Flows[4]	Economic Value of Net Savings at 20% Failure [5]	Net Economic Value Flows 20% Failure
FOREX	₱21 = $1								
1	-	90	-	656	747	-	(747)	-	(747)
2	1,290	129	566	1,892	2,200	-	(2,200)	-	(2,200)
3	1,804	131	473	2,377	2,772	5,488	2,716	4,390	1,618
4	141	125	442	561	634	10,976	10,342	8,781	8,147
5	152	120	295	353	846	16,464	15,618	13,171	12,325
6	-	-	-	-	-	21,952	21,952	17,562	17,562
7	-	-	-	-	-	27,440	27,440	21,952	21,952
8	-	-	-	-	-	27,440	27,440	21,952	21,952
9	-	-	-	-	-	27,440	27,440	21,952	21,952
10	-	-	-	-	-	27,440	27,440	21,952	21,952
11	-	-	-	-	-	27,440	27,440	21,952	21,952
12	-	-	-	-	-	27,440	27,440	21,952	21,952
13	-	-	-	-	-	21,952	21,952	17,562	17,562
14	-	-	-	-	-	16,464	16,464	13,171	13,171
15	-	-	-	-	-	10,976	10,976	8,781	8,781
16	-	-	-	-	-	5,488	5,488	4,390	4,390

EIRR of Overall TTEM Project at 100% success rate = 164%
EIRR of TTEM Project assuming 20% failure rate of investment = 140%

1/ Project costs and benefits are valued in constant prices; i.e., the 10% inflation factor has been removed from the stream of costs; reflows are likewise excluded.
2/ Computed as (1.18) (Total Energy System Investment) + (1.00) (GOP Contribution) + (1.16) (Other Costs). The factor 1.18 is derived as follows (0.90) (1.20) plus (0.10) (1.00). The factor 1.16 is derived as follows: (0.80) (1.20) + (0.20) (1.00).
3/ Based on the estimated annual energy savings to be derived from the proposed TTEM subprojects (See Table 5), using the net value of oil savings of $5.97 mmBTU and electricity savings of $0.043/KWH and assuming 60% of the subprojects would be undertaken.
4/ Equal to (economic value of net savings) less (economic value of TTEM Project expenditures.
5/ Equal to (0.80) (economic value of net savings).

C. Social Soundness Analysis

The TTEM project addresses itself to the private industrial, commercial and financial communities. It develops institutional capacity to: heighten Philippine awareness of energy conservation potential, provide technical assistance in adopting energy saving technologies and offer credit facilities to assist financing of conservation measures.

The industrial and commercial sectors of the Philippines, while not fully modernized in all areas, generally share many of the values, orientation and basic techniques of modern industrial and financial management. There is no reason to believe that Philippine managers would resist energy saving and therefore money saving and profit-enhancing investments, provided they know what the possibilities are, have adequate technical assistance to realize what improvements are available, and can access credit facilities where necessary. On the contrary, rising energy costs and problems of the reliability of the energy supply are a matter of great concern in the community. Thus, the program does not appear to raise issues of socio-cultural feasibility.

1. Project Beneficiaries

Energy consumers in the industrial and commercial sectors are the primary beneficiaries of this project. These sectors are high energy users, together representing 65% of the Philippines' total primary energy consumption. Particularly in the industrial sector, energy use is concentrated in a relatively small number of large consumers having similar processes or technologies. For example, 315 industrial firms each consuming more than one million liters of oil per year represent 79% of the industrial sector oil consumption and 53% of the national oil consumption. Much of this consumption is in boilers, furnaces, and kilns, most of which can benefit from energy conservation measures such as combustion monitoring and control equipment. Thus, demonstration, training, and financial programs focused on these consumers and technologies offer the greatest potential energy savings per dollar or peso invested. The food processing, sugar, coconut and vegetable oil, paper, and textile industries in particular are expected to benefit from the proposed energy conservation measures through a reduction of energy costs which will improve their productivity, competitiveness, and profitability.

Secondary benefits will accrue to those private- and public-sector individuals and organizations who participate in the project's technical assistance efforts, training programs, seminars, and workshops. These participants will improve their ability to evaluate, design, and implement cost effective energy conservation measures. The project will enhance the ability of trade associations, particularly ENMAP and PPCI, to meet their members' needs for assistance in energy management. It will provide individual participants with skills which will improve their value to current and prospective employers.

Tertiary benefits will accrue to energy consumers outside the group participating directly in the project as they use the technical and economic information provided by the project to make their own energy conservation investment decisions. In addition to making these firms more productive and competitive in Philippine and world markets, their savings will help reduce energy imports, thus freeing scarce foreign exchange earnings for productive investments in both the modern and the rural sectors. This will contribute to GNP growth and improve the well being of all Filipinos.

2. Receptivity

Few firms have instituted adequate energy efficiency programs in the Philippines at the present time. The impediments to wider adoption of energy efficiency measures, as discussed earlier, have included lack of awareness of available energy efficiency technologies, of the favorable returns on investment they offer, and of the steps needed to achieve energy conservation.

A recent energy use study funded by the Asian Development Bank, along with discussions between the project design team and leaders, managers, engineers, owners of industrial firms, commercial units, and financiers indicate strong interest in participating in an energy conservation program.

Good lines of communication are needed to stimulate participation. The Philippines has well-organized industrial, commercial and professional associations to communicate the project's objectives and activities to possible clients through meetings, newsletters and other means. The PCCI, ENMAP, and the BAP will be especially effective at stimulating participation. Analysis of the business and industrial communities indicates that owners and managers will react positively to energy conservation measures and technologies which are proven to provide energy and cost savings in only a few years.

3. Ripple Effects

Because the project creates an institutional capacity to encourage widespread action for energy conservation, its effects extend far beyond its immediate beneficiaries to the rest of the industrial and commercial sectors and ultimately to other sectors including agriculture, transportation and services. Energy efficiency measures and technologies are expected to spread to the several thousand industrial and commercial units of the Philippines. To help accomplish this objective, almost $1.0 million of the project budget has been earmarked for promotion, extension services, seminars, and other activities designed to reach beyond the groups actively involved in technology demonstrations. In addition, the project staff will be prepared to answer all inquiries which deal with energy efficiency and arrange visits to demonstration projects for interested groups or individuals. BEU, PCCI, ENMAP and other participating organizations will help with these tasks.

D. Administrative Feasibility

1. General

As part of the project design effort, the study team conducted over 150 interviews with representatives of more than 70 Philippine private- and public-sector organizations. The team used the results of these interviews to evaluate the ability of Philippine organizations to implement energy conservation programs, to identify specific organizations that could help with the project, and to obtain the views of these organizations on the proposed project organization. The study team's assessment of institutional capabilities is presented in Annex K, and the organizations interviewed during the design effort are listed in Annex L.

The Bureau of Energy Utilization (BEU), the Philippine Chamber of Commerce and Industry (PCCI), the Energy Management Association of the Philippines (ENMAP) and the Central Bank (CB) are the four organizations most essential for project success. The first three organizations have been working together on energy matters and their cooperation will be greatly enhanced by this project. The Central Bank will be a new partner. As part of the project design, many hours of consultation occurred with key individuals in these organizations, both individually and as groups. Their concerns and perceptions have been incorporated in the project design, which they have reviewed and endorsed.

Given the number and diversity of the actors involved in the TTEM project, the administration of the project is potentially complex. For this reason, the project design team has taken special care to see that the roles, relationships and procedures are clearly established in advance. Overall project planning, budgeting and policy determination will rest with a Steering Committee comprised of senior representatives of five GOP agencies (the Ministry of Energy, the Board of Investments, the National Economic and Development Authority, the Central Bank and the Ministry of Finance); three non-governmental organizations (the Philippines Chamber of Commerce and Industry, the Energy Management Association of the Philippines and the Banker's Association of the Philippines), and, in a non-voting capacity, the Project Director who will serve as secretary of the committee. The USAID Energy Officer will serve as an advisor to the committee. The chairmanship of the Steering Committee may rotate.

Oversight of day-to-day project management will rest with the Project Director and TTEM staff. Further details on the roles and relationships of both committees appear in Section VI, Project Organization and Management.

Detailed procedures for subproject selection, financing arrangements, dissemination of the results of demonstration subprojects and other key TTEM activities are found throughout this paper. The point here is that an unusual level of pre-project effort has been directed at creating

workable administrative arrangements, and a clear consensus exists among the key actors that these arrangements will be effective. Finally, the Project Director, with assistance from the U.S. resident consultant, will be charged with responsibility for coordination among the parties to ensure administrative efficiency.

The remainder of this section summarizes the institutions involved and their responsibilities; their capabilities to carry out their prescribed work are described in Annex K. Overall, the institutions involved are eager to participate in the project and are capable of meeting their responsibilities. Where deficiencies exist, such as in the number of experienced technical personnel in some specialized areas, additional capabilities will be available for the project through either the U.S. contractor or other participating Philippine organizations, thus ensuring the project can provide effective technical assistance. The institutions' own capabilities will be greatly strengthened by the project.

2. Institutions

a. Bureau of Energy Utilization (BEU) is one of two main operational subdivisions of the Ministry of Energy and is the focus of the GOP's efforts in this project. BEU will be responsible for providing the GOP contribution in the form of personnel, facilities, and services. To ensure project success, it has agreed to assign some of its most experienced personnel to the project. The MOE representative will serve as the first chairman of the Steering Committee, and the BEU Director and Chief of the BEU's Conservation Division will serve on the Subproject Selection Committee as chairman and member, respectively. Key BEU personnel will provide technical assistance to both project and subproject evaluation, design, and implementation efforts.

The BEU Conservation Division has a staff of 30 employees with experience in project and program development and implementation. The staff has been responsible for successfully implementing numerous conservation activities. It has, with assistance from the Asian Development Bank (ADB) and the United Nations Industrial Development Organization (UNIDO), initiated training for energy managers and auditors, evaluation of energy conservation opportunities in the industrial and commercial sectors, energy audits, data collection on industrial energy consumption and on conservation measures being implemented, drafting of energy consumption standards, and establishment of a fuel and appliance testing laboratory. In conjunction with ENMAP, BEU offers introductory and advanced training courses for energy managers. The BEU staff has been able to carry out these activities successfully and has received high praise for its accomplishments.

Inadequate technical expertise among the BEU staff, however, has constrained its activities. This problem is being alleviated through training programs funded by BEU, AID, ADB, and UNIDO. However, additional progress remains to be made. The TTEM project will address

this constraint by providing training programs for project staff in the Philippines and in the United States. In addition, a significant portion of the U.S. contractor's effort will be providing consultants with specific expertise in energy technologies, financing, and program planning and implementation to buttress and provide on-the-job training to BEU staff.

b. The Philippine Chamber of Commerce and Industry (PCCI) is the major voice for Philippine industry. At present, PCCI has approximately 1,050 corporate and associate members, with a full-time staff of 29. It offers an excellent information dissemination network through its publications (including the monthly magazine "Philippine Business") and its ability to convene task forces to address specific problems, and is becoming increasingly active in educational work and management training. For this project, PCCI will provide a member of the Steering Committee and will serve as the primary communications channel to and from senior Philippine private-sector executives, disseminating the results of the demonstrations, assisting in structuring and conducting workshops and seminars, and providing feedback from the private sector on the project's effectiveness.

In meetings involving USAID and top PCCI officials, PCCI indicated a strong interest in participating actively in the TTEM efforts. As in its role in USAID's Small and Medium Enterprise Development (SMED) Project (492-0359), PCCI is eminently qualified to fulfill its obligations and ensure the TTEM effort responds to private sector needs and concerns.

c. The Energy Management Association of the Philippines (ENMAP) comprises corporate and plant energy managers and engineers, most of whom have completed a formal course in energy management. Founded five years ago, ENMAP now has 368 members and seven regional chapters. At present, ENMAP is establishing committees to address the energy problems of specific industry subsectors in collaboration with the major trade associations of those sectors. It is negotiating with the Philippine Licensing Board to develop professional requirements and an examination for licensing energy managers and engineers, and it is also developing energy auditing courses and capabilities for regional ENMAP chapters. ENMAP will play a major role in the project by providing technical inputs to the evaluation of subprojects. It will also serve as a forum to identify demonstration, technical assistance, and training needs through its membership. ENMAP will use its information channels such as its publication "Energy Manager" to disseminate cost and performance information obtained from the demonstrations. Finally, ENMAP has offered to identify experienced technical personnel to serve on the project staff.

ENMAP's major constraint is its lack of a full-time staff. However, it has performed quite effectively over the past five years, using volunteers and paid consultants for specific efforts and is confident it should have no problems meeting its responsibilities; in fact, several firms contacted by ENMAP have offered to detail energy managers to the

project on a short-term basis. In addition, the project will have funds to pay short-term ENMAP consultants, where they are required for specific subprojects.

d. The Central Bank (CB) provides a number of financial management services to programs that are funded jointly by the GOP and by foreign governments and international lending institutions (e.g., accrediting the banking institutions participating in the programs, disbursing moneys to the banks, and auditing the loans to ensure proper handling by the banks and proper use by the borrowers). The Central Bank has extensive experience managing such funds and has earned particular praise for its management of the highly successful Industrial Guarantee and Loan Fund (IGLF). This fund was originally set up by USAID and later expanded significantly by the World Bank. The World Bank now uses the IGLF format (and has used CB staff as consultants) as a model for introducing similar programs in other developing countries. The CB's role in administering the TTEM loan fund will be similar to its role in managing the IGLF program, and will be administered by the same CB office. Therefore, funds administration will present no problems because of the CB's impressive experience with the larger program. In addition, a separate loan policy manual is being developed for this project in order to assist private banks and end-users in understanding the loan fund's policies and loan and repayment procedures. A preliminary draft of the manual appears as Annex I.

3. Conclusion

Three of the four major participants have worked successfully together in similar efforts, both formally and informally, for more than five years. The fourth, the CB, has demonstrated its ability to perform the kind of tasks required of it in this project. Each has taken direct part in project design, particularly the administrative, management, and financial arrangements, and each feels these arrangements are conducive to project success. Each of the organizations is considered sufficiently capable to implement the project now, and their capabilities, as well as those of other groups involved, will increase as a result of training and experience as the project progresses.

In short, careful pre-project design on organizational and administrative arrangements has produced feasible roles and relationships for TTEM project participants.

E. Energy Impact Analysis

While the TTEM project is expected to have highly beneficial effects on Philippine energy use in the industrial and commercial sectors, detailed projections of potential energy savings cannot now be made. However, some estimates on these impacts can be made based on the suggested set of initial projects. These first projects (see Annexes G and H, and Table 12 below) represent the energy conservation technologies the project will demonstrate.

Table 12
Potential TTEM Demonstration Projects
Payback Period

Technology	Primary type of energy saved	Estimated user payback	Estimated foreign exchange payback
Combustion monitoring and control systems			
Small	oil	11.2 days	1 week
Large	oil	31.4days	3 weeks
Flue gas heat recovery systems	oil	4.4 years	3 years
Increased use of insulation in industrial processes	oil	1.5 months	10.4 days
Power factor control equipment	electricity	8 months	2.2 months
Steam distribution system maintenance procedures	oil	15 days	1.3 months
Outside air temperature compensation for chiller systems	electricity	8.1 years	4.7 years
Building energy management systems	electricity	1.6 years	1.2 years
Increasing roof insulation in existing buildings	electricity	7.2 years	7.3 months

The proposed demonstrations focus on saving oil or electricity.1/ By improving efficiency (e.g., boiler combustion monitoring and control equipment) or reducing losses (e.g., flue gas heat recovery systems), most of these measures offer attractive user paybacks ranging from a remarkably short eleven days to 7.2 years and thus will be cost effective for the energy consumer. In addition, most offer attractive foreign exchange paybacks ranging from one week to 4.7 years and thus represent effective investments of the country's foreign exchange. Therefore, the suggested subprojects will conserve scarce energy resources and foreign exchange, reduce oil imports, increase productivity, and reduce operating costs.

F. Environmental Analysis

The technical assistance component of the Project will consist of analysis, training and information transfer, none of which will have a direct effect on the environment.

The loan component of the Project will primarily fund demonstrations of equipment and process modifications to show the applicability and feasibility of energy-saving technologies in the Philippines and will bring environmental benefits to the country. The equipment to be demonstrated, varying from pre-heaters and heat recovery units to climate and lighting management systems and instrumentation, will have neither individual nor cumulative adverse environmental impacts. Indeed, any environmental effects stemming from the project will be positive, as increased efficiency means more complete fuel combustion, a reduction in fossil fuel use, and less pollutants discharged to the environment.

In accordance with regulation 16, since none of the components of the Project will have adverse environmental impacts, neither an Environmental Impact Statement nor an Environmental Assessment is required.

VIII. FINANCIAL ANALYSIS AND PLAN

A. Source of Funds

Total expenditures, including reflows, over the five year-life of the project are estimated at $9.1 million. USAID will make $5 million available to the project, the GOP approximately $.7 million, and the

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1/ Since over 58% of the 1982 electric power generated was by oil, electricity savings will be almost entirely oil savings.

private sector $1.5 million. In addition, the reflow of funds from TTEM loans is estimated to account for another $1.9 million. The USAID funding will consist of a $2 million grant and an $3 million loan. The loan is to be repaid (in dollars) over 40 years in semi-annual installments with a 10 year grace period. Interest on the loan is 2% during the grace period and 3% during the repayment period.

The GOP will contribute $0.7 million* to the project, mostly in the form of in-kind support such as personnel detailed to the project and administrative and logistic support. The 1985 component of GOP counterpart funds is already included in BEU's 1985 budget request. Private-sector recipients of demonstration assistance will contribute at least 25% of the initial cost of each demonstration subproject, for an estimated total of $1.3 million over the five-year period.1/ The private sector representatives on the Steering Committee (PCCI, ENMAP, BAP) and the advisory panel will also contribute time and logistic support to the project, particularly for information dissemination. Their in-kind support is estimated at $37,838 per year. Finally, the loans will generate substantial monies as they are repaid, conservatively estimated at more than $4 million over the life of the project (see Annex M for a detailed analysis of the reflow of loan funds).

Project expenditures by year and by sources of funds are summarized in Table 14. The project will be incrementally funded. At this time, USAID is expected to allocate $3.4 million for fiscal year 1985--$0.8 million for the grant and $2.6 million for the loan.

B. Uses of Funds

The funds will be applied to six major activities over the course of the project, as shown in Table 15: technical assistance; studies, training and information dissemination; purchase of commodities and monitoring instruments; demonstration financing; project operations and management; and project evaluation. The bulk of the USAID grant ($1,875,000) will be used to finance technical assistance and training activities (93.8% of the total grant). A small portion of the grant ($50,000) will be used to purchase project start-up equipment, mainly vehicles, several programmable calculators, and some basic instruments needed to conduct energy audits. The balance of the grant ($75,000) will be used for project evaluation. Most of the grant (96.1%) is expected to be used to purchase dollar-denominated goods and services (see Annex N).

Most of the USAID loan will be used to finance demonstration projects ($2,660,000 or 88.67% of the total). The balance ($340,000) will be used to hire project staff, including several senior project officers, and purchase instruments and other equipment. A portion of the loan is expected to be used to purchase

* Dollar equivalent of GOP contribution at ₱18.5 = $1 exchange rate.

1/ Annual operating and maintenance costs will also be the responsibility of the user.

Table 13
Projected AID Obligations (000s)

	U.S. Fiscal Year		
	FY 85	FY 86	Total
Loan	2,567	433	3,000
Grant	800	1,200	2,000
Total	3,367	1,633	5,000

Table 14
Estimated Annual Project Expenditures by
Sources of Funds
(000s)

	YEAR					
	1	2	3	4	5	Total 1/
AID Grant	388	385	394	354	479	2,000
Loan	140	1,161	1,699	-	-	3,000
Subtotal	528	1,546	2,093	354	479	5,000
GOP	90	142	158	167	175	732
PRIVATE SECTOR	38	393	625	226	260	1,542 2/
Total	656	2,081	2,876	747	914	7,274

Note: Exchange rate: ₱18.5 = $1

1/ See Table 14, Estimated Project Expenditures by Type of Output.

2/ Assuming a 25% financial contribution (on the average) to user for each subproject and $37,838 annual contribution to studies, training and information dissemination.

Table 15
Estimated Project Expenditures by Type of Project Specific Inputs
($000s)

	SOURCES OF FUNDS				
	AID			Private	
	Grant	Loan	GOP	Sector 1/	Total
1. Technical assistance	1,289	218	160	-	1,667
2. Studies/Workshops/ information dissemination	586	72	77	190	925
3. Demonstration	-	2,660	-	1,352 1/	4,012
4. Commodities/monitoring instruments	50	50	3	-	103
5. Project operations/ management	-	-	492	-	492
6. Project evaluation	75	-	-	-	75
Total 2/	2,000	3,000	732	1,542	7,274

1/ Assuming a 25% financial contribution (on the average) by users for each subproject and $37,838 annual contribution to studies, training and information dissemination.

2/ A 10% contingency factor has been built into each line item.

peso denominated goods and services, the final proportion of which will depend on the need for U.S. manufactured equipment in each demonstration subproject. (A preliminary budget for the U.S. technical assistance contractor, details of estimated project expenditures by type of input, and estimated annual expenditures by source of funds and type of input are shown in Tables N1, N2 and N3 in Annex N.)

C. Disbursement Procedures

The five major activities of this project using AID loan and grant funds, as outlined in Table 16, will use standard AID methods of funding.

(1) Technical assistance will be committed under a host country contract. Payments, whether in dollars or local currency, will be made directly to the contractor by USAID.

(2) Studies, training and information dissemination will either be: (a) paid for by the GOP using its own appropriated funds subject to reimbursement by USAID; or (b) paid directly by USAID under a host country contract with TA contractor(s).

(3) Commodities, including an estimated $100,000 to provide the project staff with vehicles, a computer and instruments to monitor projects and an estimated $2,660,000 for demonstration subproject equipment, will be procured primarily from U.S. suppliers through a procurement services agent. Procurements within the Philippines will be made by the GOP subject to reimbursement by USAID or purchased directly by USAID under a purchase order with payment made directly to the supplier by USAID.

(4) A fund to be established at the Central Bank will cover the local currency costs of the demonstration subprojects. Added to these local costs will be the foreign exchange costs of the commodities procured for subprojects. Operating procedures for the fund will be set forth in a manual and approved by AID prior to any AID disbursements for subprojects. Moreover, operating procedures for the procurement of foreign commodities through AID and the PSA and proper accounting of the foreign exchange costs as part of the total loan to users through private banks will be included in the loan fund policy manual to be prepared by the CB and BEU. AID will advance funds to the Central Bank to maintain a balance of 30-90 days of cash requirements.

The Central Bank, upon formal advice by the Bureau of Energy Utilization, will transfer cash from the fund to qualified participating financial institutions for the local currency costs of subprojects. AID will advise the participating financial institutions, BEU, MOF, OBM, NEDA and the CB of all foreign exchange costs paid directly to suppliers of subproject commodities by AID. The foreign exchange purchases will be converted to pesos at the prevailing rate on the date of payment and added to any local currency disbursements to determine the total amount of the subproject loans.

Table 16
Methods of Implementation and Financing
($000s)

Method of Implementation	Method of Financing	Approximate Amount
TA-HC Contract	Direct payment (perhaps under Direct L/COM)	$ 1,507
Studies/Training - HC Contracts	Direct payment (perhaps under Direct L/COM) or Direct Reimbursement	658
Commodities - HC Contract	Direct payment	50
Commodities: PIO/C with US PSA or fund in Central Bank to finance local currency costs of subprojects	Bank L/COM with Direct L/COM to PSA and perhaps some Direct L/COMs with suppliers; and periodic advances to fund CB to keep balance at between 30-90 days cash requirements	2,710
Evaluation AID direct Contract	Direct payment	75
		$ 5,000

Borrowers will make loan payments to the participating financial institutions, who in turn will remit the pesos to the Central Bank fund. Repayment terms, including the interest rate structure and determination of who assumes the risk, are discussed in Section VI and Annex I. AID will closely monitor the first round of subproject loans. AID will not be involved in monitoring the resulting reflows. Reflows into the Central Bank fund are to be used for approved activities consistent with the goals of this project.

(5) Project evaluation costs will be funded under an AID direct contract with payments being made directly by AID.

The Mission believes the GOP has demonstrated over the past five years that it has the ability to prepare host country contracts in accord with AID Handbook requirements. We continue to support the use of host country contracts.

The Controller's Office and the USAID project officer will monitor releases of pesos from the Central Bank fund to ensure that local currency costs are reasonable and that adequate records are maintained for audit purposes. We will require the Central Bank and participating financial institutions to maintain separate records for project funds.

IX. IMPLEMENTATION PLAN

A. Implementation Strategy

The project will be implemented in three phases. In the first, the objective is to structure the project and start developing a successful track record. To achieve this, efforts will focus on attracting competent, motivated personnel and coordinating the operation of the administrative, financial and technical components. Subprojects will be limited to a few with broad applications and low technical risk, many of which will originate with the TTEM staff, based on previous studies of Philippine energy problems. Because of the low risk, financing will normally be through straight loans and loans with repayments tied to savings. Relatively few grants will be awarded.

In the second phase, a more comprehensive program will be developed. Increasingly, subprojects will be suggested by energy users and equipment vendors and in some instances may target particular industrial subsectors such as tire or textile manufacturing. As the project staff is completed and becomes more experienced, it will undertake more subprojects with larger elements of risk. Because of this greater risk, a larger grant component for demonstrations is likely to be necessary.

The final phase will seek funding from other agencies such as the Asian Development Bank, the World Bank, other financing institutions and private-sector firms, to continue the program beyond the life of the project. Many of the procedures and assumptions of the first two phases will need review at that point to determine the best method of operating a future fund. It is probable that some additional private sector groups and individuals will be prepared to offer technical and financial services to Philippine companies by that time.

B. Implementation Steps and Schedule

The project has been defined in close consultation with all the key project participants, who have endorsed the project administrative structure, scope of activities, and operational guidelines. Thus, no major problems are anticipated in implementation, which will begin with preparation of an annual budget and plan to be approved by the Steering Committee, and procurement of the services of a U.S. technical assistance contractor and a Procurement Services Agent (see below, Procurement Plan).

1. Role of U.S. Technical Assistance Contractor

The contractor will provide technical and management support to the project. In particular, it will provide the core technical staff (both Filipino and U.S.) and will be responsible for training project staff as needed. The contractor will be hired by the BEU under a host country contract and will report directly to the Director of the BEU or his designee. The duties of the contractor will include assistance to the project in the following areas:

- Preparing annual detailed work plans and budgets.
- Jointly with BEU, identifying and hiring project staff.
- Developing and recommending final subproject evaluation criteria and selection procedures. (Preliminary criteria and procedures have been developed and can be found in Section IV (C).)
- Training project staff in subproject evaluation and implementation including system design, financing and installation, and designing, organizing and arranging special training.
- Identifying technical assistance needs and organizing courses, seminars and workshops to meet these needs.
- Organizing data collection to support the policy research needs of the TTEM project.

The contractor will provide five full-time consultants to form the core of the project staff, who will be selected jointly with BEU:

- o One full-time U.S. technical consultant with broad work experience in the energy conservation field and a background in implementing energy conservation programs in the industrial and commercial sectors.

- o Three full-time Filipino senior project officers with experience in industrial and commercial building energy conservation, including energy auditing and hands-on experience in project development and implementation.

- o One full-time Filipino senior financial analyst with experience in venture capital financing and computer based financial simulation, preferably in a major universal bank.

In addition, the contractor will provide access to a number of short-term U.S. consultants (approximately 0.5 person-year per year) and Filipino consultants (approximately two person-years per year) as needed, with the following qualifications:

- o Industry expertise in process engineering and energy conservation, including energy auditing, particularly in the following subsectors: sugar, coconut and vegetable oils, other food processing, textiles, pulp and paper, logging/wood products, cement, mining, chemicals, steel and metal processing, glass and ceramics, commercial centers, hotels, and apartment and office buildings.

- o Experience in the design, construction, operation, and maintenance of energy conservation projects such as building energy management systems, and efficient combustion technologies and electrical systems.

- o Experience in preparing and conducting a variety of technical training courses for plant engineers and maintenance personnel.

- o Experience in the use of innovative energy conservation financing mechanisms such as split savings contracts and loans with repayments tied to savings.

The contractor will also provide some support services directly from the home office. These services will include tracking technical information relevant to the project, organizing and coordinating training programs, arranging study tours and visits to U.S. facilities for TTEM staff, and procuring some basic equipment and materials necessary for starting project activities. The initial contract will be for three years, with two optional one-year extensions.

2. Action Plan

Project implementation must be flexible to meet changing needs. The project context is likely to change over time as new technologies are introduced, energy markets change, and the structure of the Philippine economy evolves. Thus, for project effectiveness, activities and focus must be continually reassessed, especially in the annual planning and budgeting cycle. A work plan will be submitted annually in October to the Steering Committee for approval, and subsequently to BEU and USAID for concurrence. The plan will be prepared by the project staff under the guidance of the Project Director, and will include at a minimum a review of the previous year's activities a description of the overall thrust of TTEM activities in the coming year and the operating budget for the project. The plan must also address any proposed changes to subproject selection criteria and financing terms, as well as the use of reflow funds. Implementation of project activities will proceed according to the approved annual plan and funding level. The annual budget and implementation plan may be revised periodically with the agreement of the Steering Committee, BEU and USAID.

3. Schedule of Major Activities

A schedule of major activities over the five-year duration of the project is shown in Table 17. The Project Agreement is expected to be signed by mid-May 1985; the U.S. contractor will be hired and the project organization constituted by October 1985; and the project will be ready to finance demonstrations by November 1985.

C. Procurement Plan

1. Responsible Agency

During the life of the project, up to $3 million worth of commodities are expected to be financed by USAID. Much of that amount will be used to procure and install energy-saving equipment and allied technologies. These purchases will be conducted through a U.S.-based Procurement Services Agent (PSA). The BEU will be responsible for contracting for the Procurement Services Agent and for approving procurement orders (PIO/Cs) to the agent. The BEU Director or his authorized representative will be delegated the authority to sign PIO/Cs for BEU. The Director of External Assistance at NEDA will sign the PIO/C for the government.

To familiarize BEU personnel with USAID procurement procedures and the proper use of the PSA, the USAID Supply Management Officer will conduct a one day training seminar at BEU within one month of the signing of the Project Agreement.

Table 17
Schedule of Major Activities

Pre-Start-Up Activities

o	Project Paper approved	May 1985
o	Signing of Project Agreement	May 1985
o	Project announcement by sponsoring organizations	June 1985
o	U.S. contractors' proposals updated, evaluated and contract awarded	July 1985
o	Standard project-wide CPs satisfied	September 1985
o	Project start-up, including arrival of U.S. consultant	October 1985
o	Conditions Precedent to disbursement of funds met	November 1985

First Quarter - Start-Up

- o Finalize Loan Fund Policy Manual with CB
- o Prepare guidelines for proposals
- o Prepare detailed work plan and budget for first 12 months, with review Steering Committee
- o Develop and finalize proposal evaluation criteria and subproject selection procedures in consultation with Steering Committee

- o Organize office: hire core staff (project director, 2 senior project officers, 1 senior financial analyst)
- o Initiate subproject identification
- o Initiate public relations efforts with key industrial, financial and commercial trade associations
- o Develop staff training efforts, project evaluation procedures and information dissemination techniques
- o Initiate energy use data base to guide project identification, evaluation and selection
- o Organize workshops and training sessions on conservation financing with banks, industries, project staff.

Second Quarter - Test Procedures on a Limited Number of Projects

- o Structure advisory panels; define role, responsibilities
- o Complete initial subproject identification efforts
- o Select limited number (2-6) subprojects for more detailed evaluation (preliminary technical and financial evaluation)
- o Recruit additional staff
- o Select initial subprojects for implementation (1-3)
- o Initiate project implementation
  - Detailed engineering
  - Financial structuring
  - Design of monitoring program
  - Design of information dissemination
  - Commodity procurement
- o Refine subproject selection and implementation procedures, and prepare operations manual
- o Develop and initiate TTEM studies

6-12 Months - Expand Organization

- Hire and train additional staff
- Expand project identification, evaluation and selection efforts
- Begin construction, operation, monitoring and information dissemination efforts on initial projects
- Prepare first brochure or newsletter on TTEM efforts (background, procedures, accomplishments to date)
- Initiate workshops and seminars on various technical and financial topics
- Prepare work plan and budgets for next two years and submit to Steering Committee for approval
- Develop or purchase software for:
  - Project evaluation and financial analysis
  - Project tracking
- Prepare office procedures and personnel policies manual
- Prepare first annual report

Second Year

- Expand scope of TTEM efforts
  - Initiate new subprojects
  - Continue monitoring
  - Expand information dissemination, public relations efforts
- Bring energy users and equipment vendors more actively into project identification and implementation
- Prepare training courses on energy conservation technologies and maintenance procedures
- Initiate sectoral energy conservation training programs, workshops and seminars with such organizations as ENMAP and trade/professional associations

- o Review subproject selection criteria and loan terms
- o Prepare work plan and budget for subsequent 2 years
- o Prepare second annual report
- o Complete and disseminate initial TTEM studies

Third Year

- o Continue subproject identification, evaluation, selection, implementation, information dissemination and training efforts
- o Assess continuing need for U.S. technical assistance
- o Review selection criteria and loan terms
- o Prepare work plan and budget for next two years
- o Prepare third annual report
- o Initiate discussions with other financing sources (ADB, industrial firms and trade organizations)

Fourth and Fifth Years

- o Continue subproject identification, evaluation, selection, implementation, information dissemination and training efforts
- o Prepare complete evaluation of TTEM costs and benefits
- o Initiate assessment of future need for TTEM project follow-on
- o If needed, prepare transition to new structure or continuation of old (goal, funding and activities)
- o Review subproject selection criteria and loan terms
- o Prepare fourth and fifth annual reports

2. Procurement Services Agent (PSA)

BEU has advertised for a PSA through a Request for Proposals in the Commerce Business Daily and the AID-Financed Export Opportunities Bulletin. After contracting for the services of a PSA, the BEU will prepare PIO/Cs, with the assistance of USAID staff, to initiate actual procurements. Commodities so purchased will be financed under either a USAID issued Direct L/Com or an AID/W issued L/Com to a bank designated by the PSA and by subsequent commercial Letters of Credit. The PSA fees will be paid under a separate USAID Direct L/Com issued to the PSA. The PSA will be appointed by BEU within 90 days of the signing of the Project Agreement. The PSA will handle procurements in accordance with the requirements of USAID Handbook 11, Chapter III. The PSA contractor will also ensure that USAID marking and shipping requirements are met.

3. Technical Assistance Contractor

The technical assistance contractor will be selected according to standard AID competitive procurement procedures and a host country contract will be awarded. Advertisement has been made in the Commerce Business Daily and Requests for Technical Proposals have been made available to interested parties by the Embassy of the Republic of the Philippines. The contract will be awarded within 90 days of the signing of the Project Agreement.

4. Other Procurement

A limited amount of commodities will be purchased outside the PSA. Approximately $100,000 has been set aside for administrative supplies and equipment for use by the project staff, much of which will be purchased locally. All of the commodities purchased in this category shall be the property of BEU.

5. Source/Origin

The authorized source/origin for imported commodities purchased with USAID funds under this project is AID Geographic Code 941 and the Philippines for loan funded purchases, and AID Geographic Code 000 and the Philippines for grant funded purchases. Preference will go to U.S., then Philippine and then Other Free World technologies. This designation is made because one objective of the project is to introduce applicable U.S. energy technologies to the Philippines. The authorized source for ocean and air shipping is AID Code 941 and the Philippines for loan funded procurements and AID Code 000 and the Philippines for grant funded procurements. The 50-50 shipping regulation will be met. At this time, there is no need for source/origin waivers.

Local procurement of office equipment and expendable supplies as well as small value (less than $5,000 per unit item) commodities and building materials is authorized. Such procurements will be conducted in accordance with Chapter 18 of USAID Handbook 1B.

6. Proprietary Procurement Authorization

Because of the commercial opportunities which can grow out of the successful demonstration of energy saving technologies in a large market such as the Philippines, manufacturers of such equipment are often willing to finance part of the cost of the equipment in order to enter a potentially lucrative market. The Bureau of Energy Utilization from time to time receives unsolicited proposals from manufacturers willing to finance a percentage of the cost of the equipment. To take advantage of such opportunities and the savings inherent in such procurements, proprietary procurement of equipment and allied technologies is authorized in cases where 50% of the cost of the equipment is financed by the supplier. In order to ensure real cost savings to the project, such procurements will be reviewed by the USAID Supply Management Officer and M/SER/COM to establish that the supplier is in fact providing the equipment and/or technology with at least a 50% discount from his normal prevailing export price.

X. CONDITIONS, COVENANTS AND NEGOTIATING STATUS

A. Conditions Precedent to Initial Disbursement of Funds

The standard conditions precedent to disbursement regarding the opinion of the Secretary of Justice, the statement of names of the representatives of the Borrower and BEU (including specimen signatures of each person specified in such statement) and evidence of their authority will be included in the loan agreement. In addition to the standard conditions, the following conditions precedent will be met prior to disbursement of AID loan financed assistance are proposed:

1. Formal designation of the members of (a) the Steering Committee for the first year, including its chairperson; and (b) the Subproject Selection Committee.

2. A memorandum of understanding between PCCI, ENMAP, BAP and the BEU detailing the role and responsibilities of PCCI, ENMAP and BAP in the implementation of the project.

3. A master agreement entered into between the BEU and the CB detailing the role and responsibilities of the CB and the TTEM fund administration and lending procedure.

4. Completion of a loan fund policy manual by the Central Bank and BEU. The manual will be similar in format to the IGLF manual and the draft manual provided in Annex I of this Project Paper, and will include definition of the reference interest rate and parameters or mechanism for determination of the relending rate relative to the reference rate.

Before any grant funds can be disbursed for technical assistance, the following conditions must be met:

1. Formal selection and procurement of a U.S. technical assistance contractor and of a U.S. Procurement Services Agent. The contracts will be bid and awarded in accordance with USAID regulations as described in USAID Handbook 11 which details the responsibilities of the GOP in adhering to USAID procedures.

2. The GOP, through the BEU, will provide AID with a letter reiterating its commitment to continue a policy dialogue and policy formulation which influences the adoption of energy-saving technologies and supports the objectives of the project.

Before any funds can be disbursed in a given GOP fiscal year the following conditions must be met:

Annual Budget and Plan: The TTEM Steering Committee will provide a detailed annual budget and implementation plan to BEU and AID for approval. This will form the basis for project objectives during the designated year. This plan shall describe the types of technical assistance, studies, training, information-dissemination and demonstration activities to be undertaken. It will also specify the criteria that will be used to evaluate and select demonstration projects, together with the terms and conditions of the financial assistance available in the coming year, including but not limited to interest rates and repayment periods.

B. Covenants

1. USAID and the GOP agree to establish an evaluation program as an integral part of the project. Except as the parties otherwise agree in writing, the program will include, during the implementation of the project, and at one or more points thereafter:

- o Evaluation of progress toward attainment of project objectives;
- o Identification and evaluation of problem areas or constraints that may inhibit such attainment;
- o Assessment of how such information may be used to help overcome such problems, in this or other projects; and
- o Evaluation of the overall development impact of the project.

2. The GOP through BEU will assure that the project has adequate staff working full-time or on an ad hoc basis to implement the TTEM project in an effective and timely manner.

C. Negotiating Status

All the above conditions and covenants have been discussed with appropriate GOP officials, and no problem with their inclusion in the Project Agreement is anticipated.

D. Audit

The Commission on Audit (COA) will review, in accordance with standard GOP procedures the activities of this project. BEU is audited regularly by the COA under its audit procedure which consist of two components: a financial audit which is done monthly and a performance audit at the end of the calendar year.

All accounts, activities and transactions pertaining to revenues, receipts and expenditures as well as to use of government funds and properties, grants in aid, etc. are reviewed, analyzed, examined and are audited in accordance with PD 1445 (State Audit Code of the Philippines) and various COA circulars.

Likewise, the agency's accomplishments for the year are reviewed and assessed by comparing them with the performance target formally presented and submitted at the beginning of the year taking into consideration the funds approved and actually released.

The systems and procedures as well as auditing and accounting practices are also evaluated. A formal report is rendered by the COA branch office to the Control Office which in turn is referred to the Agency head for comments and action as necessary.

In view of the established procedures of the COA and their satisfactory reputation, AID has determined that an external audit by an A.I.D. contractor is not required for this project.

XI. EVALUATION PLAN

As a pioneering effort in financing demonstrations of energy conservation technologies to encourage their wide dissemination in a developing country, the TTEM project experience will be of particular interest and value to a broad audience in AID, other donors, and other countries. The technical assistance and institution-building aspects of the project will also be of interest. It is important, therefore, that the project receive careful evaluation both during and after its lifetime.

The essential questions to be answered in evaluating the project are:

1. Has the project met its basic objective of improving energy efficiency in the economic sectors of the Philippines that are heavily dependent on fossil fuels and electricity?

2. Are there measurable improvements in the Philippines' balance of payments position, foreign exchange reserves, and ratio of oil imports to export earnings that can be attributed at least in part to the impact of the project?

3. Have the technologies demonstrated in the project been accepted for use by substantial numbers of energy consumers outside the group directly involved in the demonstrations?

4. Has the private commercial lending community increased its receptivity toward financing conservation-related investments, and has the level of such lending increased measurably as a result of the project?

5. Has the GOP established a strong and permanent capacity to promote efficient energy use in the Philippine economy, both through the BEU's increased capability to carry out its mandate and a general GOP policy environment favorable to conservation?

6. Is there evidence that energy consumers are beginning to finance conservation-related improvements under standard or innovative non-subsidized market mechanisms, as a result of the removal of constraints on such investments by the project?

7. Have private sector enterprises in the Philippines, especially manufacturers and importers of energy equipment, trade associations and architecture/engineering firms, begun to develop markets and provide services in conservation-related areas such as energy auditing and monitoring, design, retrofits, and maintenance of energy-using systems?

8. Have other donors made financial commitments to continue funding conservation investments based on the leverage of the project's demonstration program?

9. Is technical and economic information about viable ways to achieve energy efficiency broadly available to consumers as a result of the project?

Some of these questions cannot be answered in the short run, and a retrospective look at the project's impact needs to be taken not only at the end of the project, but also several years later. In the more immediate future, attempts will be made to measure progress in each of the areas. A minimum of three evaluations will be conducted: a mid-term evaluation at the end of two project years, an end-of-project evaluation in 1990, and a retrospective review in 1991 or later.

In each instance, a team composed of U.S. and Philippine personnel with expertise in energy efficiency technologies and practices, finance, and organizational development will carry out the evaluation. Sources of information the evaluation teams will use will include:

- Macroeconomic and national-level energy supply and demand data;
- Annual project budgets and work plans;
- Feasibility studies, monitoring data, reports and articles related to the demonstration subprojects financed under the project;
- Technical/financial/economic analyses conducted by the Project staff of each demonstration subproject after it is operational for one year.
- Training curricula, workshop and seminar proceedings, and reports generated in the project's technical assistance program;
- Appropriate financial records of the Central Bank and the lending institutions involved in the demonstration finance program;
- Progress reports of the technical assistance contractor;
- Publications and materials such as manuals, brochures public service advertisements or posters produced under the project to promote energy efficiency.

Throughout the project period, the BEU and the technical assistance contractor will make efforts to improve baseline data on industrial and commercial energy use and to monitor changes resulting from demand management activities. This information will form part of the basis of the answer to the first question raised above.

A budget of $75,000 has been allocated to the mid-term and end-of-project evaluation efforts. It is expected that the Mission and, funds permitting, the Central Office of Energy (S&T/EY) will jointly finance the later retrospective review, and that S&T/EY and/or the AID Policy and Planning Coordination Bureau's evaluation unit will undertake broad dissemination of evaluation results for maximum usefulness to others.

ANNEXES

Annex A

ACT: AID-6 INFO: DCM CPU/8

VZCZCML0595
RR RUEHML
DE RUEHC #6771/01 3091040
ZNR UUUUU ZZH
R 0506492 NOV 83
FM SECSTATE WASHDC
TO AMEMBASSY MANILA 5975/5976<----------
BT
UNCLAS STATE 316771

AIDAC

E.O. 12356: N/A
TAGS: APLD
SUBJECT:1) APAC PID REVIEW

1. SUMMARY:

- APAC, ON OCTOBER 7, 1983, REVIEWED PID FOR TECHNOLOGY TRANSFER FOR ENERGY MANAGEMENT PROJECT WITH USAID REPRESENTATIVES M. KILGOUR AND L. ERVIN IN ATTENDANCE. APAC SUPPORTED PID CONCEPT OF PROMOTING PRIVATE ENTERPRISE SOLUTION AND ENCOURAGED PROJECT DEVELOPMENT TO ENSURE PROPER ROLE OF BUREAU OF ENERGY UTILIZATION IN ACHIEVING THIS OBJECTIVE. CONCERN, HOWEVER, WAS EXPRESSED OVER (1) FOCUS AND BENEFICIARIES OF PROJECT ACTIVITIES(BOTH PUBLIC AND PRIVATE), (2) LENDING INSTITUTIONS, AID (3) PROJECT'S CONTRIBUTION (PARTICULARLY GIVEN LIMITED RESOURCES) TO GOP ENERGY CONSERVATION STRATEGY. AA/ASIA HAS GIVEN APPROVAL TO PROCEED WITH PROJECT DESIGN. AUTHORIZED REPRESENTATIVE(S) SHOULD APPROVE, AUTHORIZE PROJECT AND SIGN AGREEMENT. APAC COMMENTS AND GUIDANCE FOR PP DEVELOPMENT FOLLOWS BELOW.

- - -

2. ROLE OF BEU

- APAC ASKED THAT PP CLEARLY IDENTIFY THE ROLE OF THE BUREAU OF ENERGY UTILIZATION (BEU).

-- WE ARE CONCERNED THAT WHEN PROJECT IS IMPLEMENTED, BEU WILL VIEW THEIR ROLE AS MORE OPERATIONAL,(I.E. DOING TECHNOLOGY DEMONSTRATIONS,ENERGY AUDITS,ETC.) INSTEAD OF DEVELOPING THE CAPABILITY OF THE LENDING INSTITUTIONS OR THE A AND E COMMUNITY TO CARRY OUT THE OPERATIONAL SIDE OF THE PROJECT.
-- WE UNDERSTAND THAT BEU'S ROLE WILL BE FOCUSED ON POLICY REFORM AND INFORMATION DISSEMINATION. THEREFORE, PP SHOULD INDICATE (1) WHAT POLICY REFORMS (E.G. GOP PRICE, TAX, AND FISCAL POLICY CORRECTIONS TO ENCOURAGE ENERGY EFFICIENCY) WILL COME FROM PROJECT SUPPORT TO BEU, (2(SPECIFIC PLAN FOR DEVELOPING A AN; E CAPABILITY IN ENERGY AUDITS, AND (3) HOW DEMONSTRATIONS WILL BE STRUCTURED TO STIMULATE FURTHER PRIVATE INVESTMENT.

3. ROLE AND BENEFICIARIES OF PRIVATE SECTOR:

- APAC NOTED VARIANCE BETWEEN THE PROJECT'S SMALL AMOUNT OF FUNDING AND ITS GOAL TO PROMOTE THE ADOPTION OF ENGERY EFFICIENT TECHNOLOGIES. THEREFORE, APAC ASKING THE FOLLOWING:

-- PROJECT DEVELOPMENT SHOULD ADDRESS HOW PROJECT ACTIVITIES WILL ACTUALLY LEAD TO WIDE-SCALE INVESTMENT IN MORE EFFICIENT TECHNOLOGIES WITHIN THE FUNDING PROPOSED.
-- PP SHOULD DESCRIBE THE STRATEGY INTENDED TO ACHIEVE DESIRED RESULTS INCLUDING ROLE OF ORGANIZATIONS OTHER THAN BEU (E.G. CHAMBER OF COMMERCE AND OTHER PRIVATE ASSOCIATIONS).
-- PROJECT DEVELOPMENT SHOULD PROVIDE FOR NECESSARY FOCUS AND CRITERIA TO SELECT ELIGIBLE FIRMS IN KEY SECTORS (I.E. TRANSPORTATION, INDUSTRY BUILDING, AND COMMERCIAL SECTOR'S),
--PROJECT DEVELOPMENT SHOULD ADDRESS THE RANGE OF CONSTRAINTS TO IMPROVE ENERGY EFFICIENCY IN SPECIFIC INDUSTRIES WITHIN ONE OR MORE SECTORS.
-- PP SHOULD CLEARLY STATE WHICH INDUSTRIES WILL ,E TARGETS FOR DEMONSTRATIONS.

4. JUSTIFICATIONS FOR EQUIPMENT LOANS:

- PP SHOULD GIVE GOP'S JUSTIFICATION FOR PROVIDING LOAN FUNDS (AND AT PREFERENTIAL RATES) TO FIRMS FOR DEMONSTRATION PURPOSES AND FOR GENERAL ACQUISITION.
-- WE SUGGEST JUSTIFICATION SHOULD BE DEVELOPED FROM REASONS GIVEN BY USAID REPRESENTATIVES DURING APAC. OUR UNDERSTANDING IS THAT LOANS ARE CATALYST TO (1) INTRODUCE BUSINESSES TO OTHER USES OF LIMITED CAPITAL TO PROMOTE GROWTH, (2) CREATE DEMAND FOR ENERGY CONSERVATION EQUIPMENT TO ENCOURAGE SUPPLIERS TO BUILD QUALITY EQUIPMENT, (3) ENCOURAGE CONSERVATIVE BANKERS TO USE EXISTING LENDING PRACTICES FOR EQUIPMENT PURCHASES, AND (4) DEVELOP A AND E CAPACITY TO PREPARE AND IMPLEMENT CONSERVATION PROJECTS.

5. LOAN FUND, FINANCIAL ARRANGEMENTS:

- APAC IS UNCLEAR ABOUT WHAT PART BEU AND LENDING INSTITUTIONS WILL PLAY IN THE PROPOSED LOAN FUND FOR ON-SITE DEMONSTRATIONS OF NEW TECHNOLOGIES AND GENERAL ACQUISITIONS BY BENEFICIARIES.
-- CONSEQUENTLY, PP SHOULD STATE (1) TERMS OF GOP FUNDS MADE AVAILABLE TO SUBLENDLRS, (2) TERMS OF SUBLENDER LOANS TO ULTIMATE USERS, AND (3) USE OF FUNDS GENERATED FROM INTEREST SPREAD. IN CONSIDERING THESE ITEMS,

2/2 UNCLASSIFIED

PROJECT DEVELOPMENT SHOULD ASSESS THE FOLLOWING:

(A) AVOID PLACING UNDUE BURDEN ON LENDING INSTITUTIONS,

(B) AVOID PROVIDING UNDUE BENEFITS TO LENDING INSTITUTIONS,

(C) DEFINE REPROGRAMMING OF LOAN FUND REFLOWS,AND

(D) AVOID SUBSIDIES TO BORROWER(BUT IF BELOW MARKET RATES ARE PROPOSED, PP SHOULD PROVIDE JUSTIFICATION LINKED TO THE BROADER PROJECT PURPOSES).

6. RELATIONSHIP TO CDSS AND SECTOR STRATEGY:

- APAC RECOGNIZED THAT PROJECT IS IN ADVANCE OF REVISED AID POLICY PAPER AND NEW ENERGY SECTOR STRATEGY . APAC ALSO RECOGNIZED THE AMOUNT OF INFORMATION AVAILABLE AND THE ROLE OTHER DONORS ARE PLAYING IN THE PHILIPPINES' ENERGY CONSERVATION FIELD. NEVERTHELESS, APAC AGREED TO PERMIT PROJECT DEVELOPMENT GO FORWARD TO AVOID DELAY BEFORE USAID/MANILA CDSS IS REVIEWED. SHULTZ
BT

AID 1420-28 11-73A

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Life of Project:
From FY 1985 to FY 1988
Total U. S. Funding $5,000,000
Date Prepared: April 22, 1985

Project Title & Number: Technology Transfer for Energy Management (492-0381)

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Program or Sector Goal: The broader objective to which this project contributes: (A-1) To increase the productivity of energy use in the modern sector, and reduce dependence on imported oil.	**Measures of Goal Achievement: (A-2)** 1. Reduction of modern sector energy consumption per unit of output (physical or service). 2. Less oil imported for modern sector use.	**(A-3)** 1. Interviews with modern sector owners/managers, review of fuel purchasing records, and analysis of monitoring data and evaluation reports from demonstration sites. 2. Review of Ministry of Energy import records. 3. Interviews with users associations, BEU records and Ministry of Industry records.	**Assumptions for achieving goal targets: (A-4)** 1. That energy conservation thr[illegible] of new technologies can contribute to an effective energy demand management program. 2. That GOP is prepared to make additional policy change as identified, to support sector goals.
Project Purpose: (B-1) Higher Level Purpose The primary purpose of this project is to promote and accelerate the adoption of energy efficient technologies (equipment processes and management systems) by the modern sector. Lower Level Purpose a. Improved institutional capabilities of BEU and private sector groups to implement energy conservation initiatives. b. Improved private sector understanding of energy conservation potential and greater awareness of available options.	**Conditions that will indicate purpose has been achieved: End-of-Project status. (B-2)** 1. Increased number of industrial, commercial and building owners/managers adopting new technologies. 2. Increased volume of private sector requests for analytical and technical assistance from local institutes and local and U.S. consultants. 3. Increased private sector energy conservation promotion activities. 4. Increased number of loan applications processed for equipment purchase and requests for energy tax returns. 5. More local consulting groups formed to provide energy conservation services.	**(B-3)** 1. Review individual and association records, as well as BEU surveys. 2. Survey of banks and Bureau of Internal Revenue records. 3. Survey of private sector in-house and association promotion programs. 4. BEU records and survey of end-users and consulting groups.	**Assumptions for achieving purpose: (B-4)** 1. That modern sector consumers are interested in reducing energy consumption. 2. That new energy efficient equipment, processes and management systems can increase productivity. 3. That consumers can realize economic and financial advantage from new technologies and can be encouraged to act. 4. That BEU and private consultants, can develop capabilities to respond to increased demand, and in fact stimulate demand. 5. That private groups want to and are encouraged by the GOP to play a major role in the project.
Project Outputs: (C-1) 1. Energy efficiency of new technologies and management systems demonstrated. 2. Awareness and understanding of energy conservation options increased through seminars and workshops. 3. On-the-job training and study missions completed. 4. Increased awareness of future role of technologies and management systems achieved through studies. 5. Increased number of better trained plant engineers/technicians through seminars, workshops, training and demonstrations. 6. Innovative financing mechanisms for energy conservation introduced in private sector banks. 7. Stimulation of additional funding from private financial institutions and international donors.	**Magnitude of outputs: (C-2)** 1. Demonstrations completed. 2. Seminars - 1 per demo or study - 80 during LOP. 3. Approximately 70 training sessions and 30-40 study missions. 4. Approximately 70 technology and 10 policy studies. 5. Average workshop/seminar has 20 attendees, plus technicians trained in demos - approximately 1600 LOP. 6. Banks adopting new financial mechanisms. 7. Bankers and donors starting new funding efforts.	**(C-3)** BEU, USAID and consultants' project assessments and reports, and interim and final evaluations.	**Assumptions for achieving outputs: (C-4)** Initial support and interest by GOP, energy producer and ultimate energy users.
Project Inputs: (D-1) 1. Technical assistance. 2. Commodities for training and energy efficiency measurement and monitoring. 3. Studies to analyze sector or industry specific problems and solutions, or policy development. 4. Seminars and workshops to present new technologies for and approaches to energy conservation. 5. Industry and production specific equipment or management system demonstration. 6. Evaluation. 7. Operations and maintenance.	**Implementation Target (Type and Quantity) (D-2)** ($000) USAID Funding: $ 5,000 GOP Funding: $ 2,274 1. 1,507 160 2. 100 3 3. 164 67 4. 494 200 5. 2,660 1,352 6. 75 - 7. - 452	**(D-3)** Project records and reports.	**Assumptions for providing inputs: (D-4)**

Annex B

5C(2) - PROJECT CHECKLIST

Listed below are statutory criteria applicable to projects. This section is divided into two parts. Part A. includes criteria applicable to all projects. Part B. applies to projects funded from specific sources only: B.1. applies to all projects funded with Development Assistance Funds, B.2. applies to projects funded with Development Assistance loans, and B.3. applies to projects funded from ESF.

CROSS REFERENCES:	IS COUNTRY CHECKLIST UP TO DATE? HAS STANDARD ITEM CHECKLIST BEEN REVIEWED FOR THIS PROJECT?	Yes Yes

A. GENERAL CRITERIA FOR PROJECT

1. FY 1985 Continuing Resolution Sec. 525; FAA Sec. 634A; Sec. 653(b).

   (a) Describe how authorizing and appropriations committees of Senate and House have been or will be notified concerning the project; — Congressional Notification

   (b) is assistance within (Operational Year Budget) country or international organization allocation reported to Congress (or not more than $1 million over that amount)? — Yes

2. FAA Sec. 611(a)(1). Prior to obligation in excess of $100,000, will there be (a) engineering, financial or other plans necessary to carry out the assistance and — Yes

(b) a reasonably firm estimate of the cost to the U.S. of the assistance?	Yes
3. FAA Sec. 611(a) (2). If further legislative action is required within recipient country, what is basis for reasonable expectation that such action will be completed in time to permit orderly accomplishment of purpose of the assistance?	No further legislative action is required.
4. FAA Sec. 611(b); FY 1985 Continuing Resolution Sec. 501. If for water or water-related land resource construction, has project met the standards and criteria as set forth in the Principles and Standards for Planning Water and Related Land Resources, dated October 25, 1973? (See AID Handbook 3 for new guidelines.)	N/A
5. FAA Sec. 611(e). If project is capital assistance (e.g., construction), and all U.S. assistance for it will exceed $1 million, has Mission Director certified and Regional Assistant Administrator taken into consideration the country's capability effectively to maintain and utilize the project?	N/A. Project consists of technical assistance with loan fund available to facilitate demonstration of new technology
6. FAA Sec. 209. Is project susceptible to execution as part of regional or multilateral project? If so, why is project not so executed? Information and conclusion whether assistance will encourage regional development programs.	No
7. FAA Sec. 601(a). Information and conclusions whether project will encourage efforts of the	

country to: (a) increase the flow of international trade; (b) foster private initiative and competition; and (c) encourage development and use of cooperatives, and credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture and commerce; and (f) strengthen free labor unions.	(a) Yes (b) Yes (c) N/A (d) Yes (e) Yes (f) N/A
8. FAA Sec. 601(b). Information and conclusions on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).	Project will use primarily U.S. energy conserving technologies (equipment, processes and systems), and U.S. consultants will bid for project services.
9. FAA Sec. 612(b), 636(h); FY 1985 Continuing Resolution Sec. 507. Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the U.S. are utilized in lieu of dollars.	The project agreement will contain a requirement for at least 25% contribution from host country government and private sector sources.
10. FAA Sec. 612(d). Does the U.S. own excess foreign currency of the country and, if so, what arrangements have made for its release?	N/A
11. FAA Sec. 601(e). Will the project utilize competitive selection procedures for the awarding of contracts, except where applicable procurement rules allow otherwise?	Yes

12. FY 1985 Continuing Resolution Sec. 521. If assistance is for the production of any commodity for export, is the commodity likely to be in surplus on world markets at the time the resulting productive capacity becomes operative, and is such assistance likely to cause substantial injury to U.S. producers of the same, similar or competing commodity? — No

13. FAA 118(c) and (d). Does the project comply with the environmental procedures set forth in AID Regulation 16? — Yes
Does the project or program take into consideration the problem of the destruction of tropical forests? — N/A

14. FAA 121(d). If a Sahel project, has a determination been made that the host government has an adequate system for accounting for and controlling receipt and expenditure of project funds (dollars or local currency generated therefrom)? — N/A

15. FY 1985 Continuing Resolution Sec. 536. Is disbursement of the assistance conditioned solely on the basis of the policies of any multilateral institution? — N/A

B. FUNDING CRITERIA FOR PROJECT

1. Development Assistance Project Criteria

a. FAA Sec. 102(b), 111, 113, 281(a). Extent to which activity will

(a) The project focuses on increased productivity in the industrial and commercial sectors of the economy.

(a) effectively involve the poor in development, by extending access to economy at local level, increasing labor-intensive production and the use of appropriate technology, spreading investment out from cities to small towns and rural areas, and insuring wide participation of the poor in the benefits of development on a sustained basis, using the appropriate U.S. institutions; (b) help develop cooperatives, especially by technical assistance, to assist rural and urban poor to help themselves toward better life, and otherwise encourage democratic private and local governmental institutions; (c) support the self-help efforts of developing countries; (d) promote the participation of women in the national economies of developing countries and the improvement of women's status; and (e) utilize and encourage regional cooperation by developing countries?	(b) N/A (c) Project beneficiaries will share project costs. (d) N/A (e) N/A, although there is a strong possibility of this as a ripple effect.
b. FAA Sec. 203, 103A, 104, 105, 106. Does the project fit the criteria for the type of funds (functional account) being used?	Yes
c. FAA Sec. 107. Is emphasis on use of appropriate technology (relatively smaller, cost-saving, labor-using technologies that are generally most appropriate for the small farms, small businesses, and small incomes of the poor)?	Yes and N/A

d. FAA Sec. 110(a). Will the recipient country provide at least 25% of the costs of the program, project, or activity with respect to which the assistance is to be furnished (or is the latter cost-sharing requirement being waived for a "relatively least developed" country)?	Yes, including host country government and private sector contributions
e. FAA Sec. 110(b). Will grant capital assistance be disbursed for project over more than 3 years? If so, has justification satisfactory to Congress been made, and efforts for other financing, or is the recipient country "relatively least developed"? (M.O. 1232.1 defined a capital project as "the construction, expansion, equipping or alteration of a physical facility or facilities financed by AID dollar assistance of not less than $100,000, including related advisory, managerial and training services, and not undertaken as part of a project of a predominantly technical assistance character."	N/A
f. FAA Sec. 122(b). Does the activity give reasonable promise of contributing to the development of economic resources, or to the increase of productive capacities and self-sustaining economic growth?	Yes
g. FAA Sec. 281(b). Describe extent to which program recognizes the particular needs, desires, and capacities of the people of the country; utilizes the country's intellectual resources to encourage institutional	The project will contribute to increased productivity and, in turn, a more competitive market environment and reduced foreign exchange loss through importing oil. The project will draw heavily on Philippine intellectual/technical resources and will make an important contribution to institutional development, especially in the private sector.

development; and supports civil education and training in skills required for effective participation in governmental processes essential to self-government.

2. Development Assistance Project Criteria (Loans Only)

a. FAA Sec. 122(b). Information and conclusion on capacity of the country to repay the loan, at a reasonable rate of interest. — Available

b. FAA Sec. 620(d). If assistance is for any productive enterprise which will compete with U.S. enterprises, is there an agreement by the recipient country to prevent export to the U.S. of more than 20% of the enterprise's annual production during the life of the loan? — N/A

3. Economic Support Fund Project Criteria — N/A

a. FAA Sec. 531(a). Will this assistance promote economic or political stability? To the extent possible, does it reflect the policy directions of FAA Section 102?

b. FAA Sec. 531(c). Will assistance under this chapter be used for military, or paramilitary activities?

c. FAA Sec. 534. Will ESF funds be used to finance the construction or the operation or maintenance of, or the supplying of fuel for, a nuclear facility? If so, has the President certified that such use of funds is indispensable to non-proliferation objectives?

d. FAA Sec. 609. If commodities are to be granted so that sale proceeds will accrue to the recipient country, have Special Account (counterpart) arrangements been made?

5C(3) - STANDARD ITEM CHECKLIST

Listed below are the statutory items which normally will be covered routinely in those provisions of an assistance agreement dealing with its implementation, or covered in the agreement by imposing limits on certain uses of funds.

These items are arranged under the general headings of (A) Procurement, (B) Construction, and (C) Other Restrictions.

A. Procurement

1. FAA Sec. 602. Are there arrangements to permit U.S. small business to participate equitably in the furnishing of commodities and services financed?	Yes - Commodities
2. FAA Sec. 604(a). Will all procurement be from the U.S. except as otherwise determined by the President or under delegation from him?	Procurement can be from the U.S., the Philippines and Code 941 countries.
3. FAA Sec. 604(d). If the cooperating country discriminates against marine insurance companies authorized to do business in the U.S., will commodities be insured in the United States against marine risk with such a company?	Yes

4. FAA Sec. 604(e); ISDCA of 1980 Sec. 705(a). If offshore procurement of agricultural commodity or product is to be financed, is there provision against such procurement when the domestic price of such commodity is less than parity? (Exception where commodity financed could not reasonably be procured in U.S.)	N/A
5. FAA Sec. 604(g). Will construction or engineering services be procured from firms of countries otherwise eligible under Code 941, but which have attained a competitive capability in international markets in one or these areas?	N/A
6. FAA Sec. 603. Is the shipping excluded from compliance with requirement in section 901(b) of the Merchant Marine Act of 1936, as amended, that at least 50 per centum of the gross tonnage of commodities (computed separately for dry bulk carriers, dry cargo liners, and tankers) financed shall be transported on privately owned U.S. flag commercial vessels to the extent that such vessels are available at fair and reasonable rates?	No
7. FAA Sec. 621. If technical assistance is financed, will such assistance be furnised by private enterprise on a contract basis to the fullest extent practicable? If the facilities of other Federal	Yes

agencies will be utilized, are they particularly suitable, not competitive with private enterprise, and made available without undue interference with domestic programs? N/A

8. International Air Transport. Fair Competitive Practices Act, 1974. If air transportation of persons or property is financed on grant basis, will U.S. carriers be used to the extent such service is available? Yes

9. FY 1985 Continuing Resolution Sec. 504. If the U.S. Government is a party to a contract for procurement, does the contract contain a provision authorizing termination of such contract for the convenience of the United States? Yes

B. Construction N/A

1. FAA Sec. 601(d). If capital (e.g., construction) project, will U.S. engineering and professional services be used?

2. FAA Sec. 611(c). If contracts for construction are to be financed, will they be let on a competitive basis to maximum extent practicable?

3. FAA Sec. 620(k). If for construction of productive enterprise, will aggregate value of assistance to be furnished by the U.S. not exceed $100 million (except for productive enterprises in Egypt that were described in the CP)?

C. Other Restrictions

1. FAA Sec. 122(b). If development loan, is interest rate at least 2% per annum during grace period and at least 3% per annum thereafter? — Yes

2. FAA Sec. 301(d). If fund is established solely by U.S. contributions and administered by an international organization, does Comptroller General have audit rights? — N/A

3. FAA Sec. 620(h). Do arrangements exist to insure that United States foreign aid is not used in a manner which, contrary to the best interests of the United States, promotes or assists the foreign aid projects or activities of the Communist-bloc countries? — Yes

4. Will arrangements preclude use of financing:

a. FAA Sec. 104(f); FY 1985 Continuing Resolution Sec. 525: (1) To pay for performance of abortions as a method of family planning or to motivate or coerce persons to practice abortions; (2) to pay for performance of involuntary sterilization as method of family planning, or to coerce or provide financial incentive to any person to undergo sterilization; (3) to pay for any biomedical research which relates, in whole or part, to methods or the performance of abortions or involuntary sterilizations as a means of family planning; (4) to lobby for abortion? — N/A

b. FAA Sec. 620(g). To compensate owners for expropriated nationalized property?	Yes
c. FAA Sec. 660. To provide training or advice or provide any financial support for police, prisons, or other law enforcement forces, except for narcotics programs?	Yes
d. FAA Sec. 662. For CIA activities?	Yes
e. FAA Sec. 636(i). For purchase, sale, long-term lease, exchange or guaranty of the sale of motor vehicles manufactured outside U.S., unless a waiver is obtained?	Yes
f. FY 1985 Continuing Resoultion, Sec. 503. To pay pensions, annuities, retirement pay, or adjusted service compensation for military personnel?	Yes
g. FY 1985 Continuing Resolution, Sec. 505. To pay U.S. assessments, arrearages or dues?	Yes
h. FY 1985 Continuing Resolution, Sec. 506. To carry out provisions of FAA section 209(d) (Transfer of FAA funds to multilateral organizations for lending)?	Yes
i. FY 1985 Continuing Resolution, Sec. 510. To finance the export of nuclear equipment, fuel, or technology or to train foreign nationals in nuclear fields?	Yes
j. FY 1985 Continuing Resolution, Sec. 511. Will assistance be provided for the purpose of aiding the efforts of the government of such country to repress the	No

legitimate rights of the population of such country contrary to the Universal Declaration of Human Rights?	
k. FY 1985 Continuing Resolution, Sec. 515. To be used for publicity or propaganda purposes within U.S. not authorized by Congress?	Yes

Annex D

REPUBLIC OF THE PHILIPPINES
NATIONAL ECONOMIC AND DEVELOPMENT AUTHORITY
NEDA sa Pasig, Amber Avenue
Pasig, Metro Manila

Cable Address: NEDAPHIL
P.O. Box 419, Greenhills
Tels. 673-50-31 to 50

9-123
RECEIVED

04 September 1984

Mr. Frederick W. Schieck
Director, USAID Mission
M a n i l a

DIV	ACT	INF
OD		✓
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OBAL	✓	w/att.
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AR		
DUE DATE		
9-29-84		

Dear Mr. Schieck,

I wish to refer to the Project Paper for the Technology Transfer for Energy Management Project.

Following consultation with the Ministry of Energy, this Office endorses the project paper subject to incorporation of the changes indicated in the attached sheet.

This Office also hereby requests for a $10.0 million USAID assistance consisting of $2.0 million grant and $8.0 million loan for the aforecited project.

Sincerely yours,

Vicente B. Valdepeñas Jr.
VICENTE B. VALDEPEÑAS, JR.
Minister of Economic Planning
Director-General

Enclosure: a/s

ACTION TAKEN
Sept. 17

Annex E

U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT
Manila, Philippines

Ramon Magsaysay Center Building
1680 Roxas Boulevard, Manila

Telephone: 521-5116

CERTIFICATION PURSUANT TO SECTION 611 (e) OF THE FOREIGN ASSISTANCE ACT OF 1961, AS AMENDED

I, FREDERICK W. SCHIECK, the principal officer of the Agency for International Development in the Philippines, having taken into account, among other things, the maintenance and utilization of projects in the Philippines previously financed or assisted by the United States, do hereby certify that in my judgment, the Philippines has both the financial capability and the human resources to effectively maintain and utilize the proposed Technology Transfer for Energy Management Project.

This judgment is based upon the project analyses as detailed in the Technology Transfer for Energy Management Project Paper and is subject to the conditions imposed therein.

Frederick W. Schieck
Director, USAID/Philippines

May 27, 1985
Date

PHILIPPINE ENERGY SITUATION, GOP PROGRAMS AND AID ENERGY STRATEGY

This Annex presents an overview of the Philippines' current energy situation and highlights the key features of the strategy being implemented by the Government of the Philippines (GOP) to reduce its dependency on oil imports. Next, it relates the AID energy assistance strategy to the problems that the country faces in developing its rural and modern sectors and finally, it summarizes the specific AID/Philippines energy assistance initiatives.

A. The Energy Situation

The Philippine energy situation is characterized by two factors. First, the Philippines is composed of over 7,000 islands, 11 of which constitute 95% of the total land mass. Thus, the country will always depend on dispersed and small scale power generating systems on all but the largest islands. Second, the Philippines remains a mainly agrarian society, with one-half of its labor force engaged in crop growing and per capita energy consumption still substantially below that of countries with similar income levels.

This section first reviews the current and prospective energy supply situation in the Philippines. Next, it looks at sectoral energy demand. Then, it briefly reviews the current institutional and organizational framework for the energy sector. Finally, it places the Philippines' energy situation in perspective.

1. Energy Supply

The Philippines is highly dependent on energy imports, primarily crude oil. In 1983, these oil imports represented almost 65% of its primary energy requirements. Indigenous energy sources accounted for about one-third of primary energy requirements in 1983, although this share has grown significantly in recent years (see Table F1).

2. Energy Demand

In 1983, the industrial sector accounted for approximately 63% of total energy consumption, including noncommercial energy and 57% of all commercial energy use (see Tables F2 and F3). It is the largest consumer of oil, with 49% of the total and by far the largest consumer of electricity with 64% of the total (on a primary energy basis). Industrial oil consumption is summarized by sector and firm size in Table F2. The table indicates that most Philippine firms are relatively small oil consumers. For example, about one-half have a total firm consumption of 2,500 KL/yr or less (which implies an annual oil bill of $600,000/year or less).

In the transportation sector, there has been a dramatic shift since 1972 from gasoline to diesel engines. The reasons for the shift are the higher fuel

Table F1
Primary Energy Consumption, 1981-1983
(In million barrels of oil equivalent (MBOE))

				Percent of total		
	1981	1982	1983	1981	1982	1983
Oil	68.53	68.20	68.19	73.3	71.4	69.2
Imported	67.16	65.25	63.54	71.9	68.4	64.5
Local	1.37	2.95	4.65	1.4	3.0	4.7
Non-oil	24.94	27.26	30.28	26.7	28.6	30.8
Commercial						
Coal	0.9	1.11	3.54	1.9	1.2	3.6
Geothermal	4.75	6.25	7.03	5.1	6.5	7.1
Renewable						
Nonconventional	0.34	0.08	0.07	0.4	0.1	0.1
Hydro	6.38	6.65	5.12	6.8	7.0	5.2
Agro-Industrial						
Waste	6.34	5.82	9.05	6.8	6.1	9.2
Bagasse	6.22	7.35	5.47	6.7	7.7	5.6
Total	93.47	95.46	98.47	100.0	100.0	100.0

Source: Bureau of Energy Utilization.

Note: Reliable data on traditional fuels (fuelwood and charcoal) are not available.

Table F2
1983 Sectoral Distribution of Primary Energy Use
(Thousand Barrels of Fuel Oil Equivalent)

Sector	Oil	Coal	Noncon-ventional	Bagasse	Agro-Waste	Elec-tricity 1/	Total
Industrial 2/	23,674	3,538	-	4,959	8,998	20,932	62,101
Transport	21,763	-	-	-	-	-	21,763
Commercial and Residential	2,862	-	65	-	-	11,681	14,608
Total	48,299	3,538	65	4,959	8,998	32,613	98,472

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.

1/ Including hydro and geothermal.
2/ Includes agriculture.

Table F3
Industrial Oil Consumption (1980)

Sector	Number of companies having annual consumption between: (KL/yr) 1.0-2.5	2.6-5.0	5.1-10.0	10.1-25.0	15.1-50.0	50.0-100.0	100.0-250.0	over 250.0	Total	Estimated consumption of reporting companies (KL) 1/	Estimated 1980 sector consumption (KL)	Percent of total sector consumption represented by reporting companies
Power generation	3	6	3	6	3	1	1	4	27	2,709,047	2,713,812	99.8
Mining	8	1	2	5	2	1	--	2	21	1,389,011	1,393,635	99.7
Petroleum refining	--	--	--	--	--	1	2	1	4	648,243	648,243	100.0
Cement	1	--	2	5	8	2	--	--	18	534,558	534,558	100.0
Paper processing	5	4	3	2	--	--	1	--	15	237,461	254,241	93.4
Construction	14	9	1	1	1	--	--	--	26	126,295	228,801	55.2
Logging/wood products	27	9	5	2	--	--	--	--	43	137,689	222,123	62.0
Sugar	20	2	3	2	--	--	--	--	27	164,185	185,553	88.5
Coconut and vegetable oil	12	3	5	1	--	--	--	--	20	95,194	163,134	58.4
Textile mills	20	8	--	1	--	--	--	--	29	131,672	149,460	88.1
Steel	9	4	3	2	1	--	--	--	19	102,651	124,656	82.3
Glass manufacturing	4	3	1	1	--	--	--	--	9	83,581	111,618	74.9
Food processing	10	3	4	--	--	1	--	--	18	220,132 2	99,534	221.2
Chemicals	13	4	1	--	--	--	--	--	18	64,399	91,584	70.3
Ceramics	10	2	--	--	--	--	--	--	12	36,285 2	32,436	111.9
Rubber and tires	1	1	2	--	--	--	--	--	4	16,560	28,461	58.2
Tobacco	1	--	1	--	--	--	--	--	2	12,537	14,310	86.2
Fertilizer	--	1	--	--	1	--	--	--	2	32,199	78,705	40.9
Total	158	60	36	28	15	5	4	7	315	6,741,499	7,074,864	94.6
Percent of industry										79.07	82.97	
Percent of country										63.03	55.60	

Source: Bureau of Energy Utilization

[1]All firms having consumption of 1,000 KL/yr or greater are required to report consumption to the Bureau of Energy Utilization.
[2]Data include consumption of plants belonging to other sectors but not identified in the company reports.

mileage achieved by diesel engines and government policies that heavily tax gasoline but not diesel fuel. Between 1972 and 1980, the population of cars, jeepneys, buses and trucks nearly doubled, and the share of diesel-powered vehicles increased from 11.2% to 17.5%. The shift to diesel engines explains energy demand's low growth rate in the transportation sector--1.3% annually between 1973 and 1978.

The commercial sector relies overwhelmingly (almost 90%) on electricity. Air conditioning accounts for about 40% of electricity use, air handling for 27%, and lighting, elevators, equipment, and other uses for the remainder. There is little possibility of reducing electricity's share of commercial sector energy use, but there is significant potential for reducing the total electricity demand through proper building design, new technologies, and maintenance of electricity-using equipment.

Most Filipino households still rely largely on noncommercial fuels firewood, charcoal, coconut wastes. The nature of residential energy use is poorly documented and rapidly changing, however, because of the government's aggressive plan to achieve 100% electrification throughout the residential sector by 1987. Under this plan, the proportion of households supplied with electricity has grown from an estimated 28% in 1973 to about 53% in 1982.

Despite the rapid growth of commercial energy consumption in the past two decades, per capita energy consumption in the Philippines is still estimated to be 20% to 40% below the consumption of countries with similar income levels.1/. Thus, there is scope for major increases in energy demand, which could severely strain the economic and political structures of the country.

3. Institutional Setting

One of the government's major responses to the energy problems of the 1970s has been to consolidate and strengthen the institutional and organizational framework of the energy sector. The Ministry of Energy (MOE) was created in 1977 to formulate and implement government policies, plans, and programs on energy resource development. Two MOE bureaus have specific tasks: the Bureau of Energy Development is responsible for the development of the country's energy resources; and the Bureau of Energy Utilization (BEU) formulates and

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1/ These statistics must be used with care. For example, a 1978 household survey indicated that nonconventional energy consumption might be 100% greater than estimated in official statistics. Furthermore, an overvalued exchange rate has inflated dollar per capita incomes over the last decade so the correct comparison might be with countries of lower per capita incomes.

implements the country's energy conservation programs, collects and interprets energy statistics, and regulates certain energy-related activities. To promote policy coordination and integration with sectoral programs, several 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 rural electrification program is the responsibility of an autonomous agency the National Electrification Administration which receives general policy guidance from the Ministry of Human Settlements.

The GOP relies on the private sector for 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, and geothermal energy as well as the development of nonconventional energy resources. The government, however, controls all electricity production.

4. Magnitude of the Problem

The Philippines is estimated to have consumed the equivalent of 98.5 million barrels of oil in 1983 of which 63.5 million barrels were imported oil. The Philippine oil import bill was $2.1 billion in 1982, and despite a 13.2% increase in the volume of oil imports in 1983, the oil bill for that year was still about $2.1 billion due to a decrease in crude oil price from $34/bbl. to about $29/bbl.

Until 1972, oil imports never accounted for more than 12% of total imports. By 1983, they accounted for 28%. Consequently, the country had to allocate nearly 42% of its 1983 export earnings to pay the fuel bill (see Table F4). Previously, the Philippines had little trouble obtaining sufficient financing for its imports, which exceeded its exports. However, the picture changed dramatically when a commercial debt moratorium was declared on October 17, 1983. Now, financing for imports is not only costly but difficult to obtain.

The fundamental energy problem facing the Philippines now is how to finance investment programs that will reduce the country's oil dependence while maintaining essential levels of oil imports for immediate needs. Given the present severe shortage of foreign exchange, the country can ill afford increased oil imports. Thus, any increases in energy use, which a resurgence in the country's economic growth implies, must come from domestic resources or must be offset by greater efficiency in the overall use of energy.

Table F4
Balance of Trade and Oil Importation
(CIF in million US $)

	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
Total exports	2,097	2971	2,608	2,964	3,739	3,946	5,291	6,555	6,557	5,830	5,005
Total imports	1,790	3,468	3,776	3,953	4,270	5,143	6,613	8,295	8,475	8,263	7,487
Balance of trade	307	(497)	(1,168)	(989)	(531)	(1,197)	(1,322)	(1,740)	(1,908)	(2,433)	(2,482)
Oil imports	231	681	833	917	1,040	1,034	1,597	2,516	2,534	2,151	2,116
Oil imports as % of total imports	12.9	19.6	22.1	23.2	24.4	20.1	24.1	30.3	29.9	26.0	28.3

Sources: Economic Research - International, Central Bank; BEU

B. The Philippine Energy Program

Given the importance of the energy sector to the country's development prospects, the government has made energy planning a key element of its development planning since the early 1970s. To formulate a comprehensive energy resource development and use policy and program, the GOP established a National Energy Plan which is reviewed and updated periodically. In the 1983-1987 Five-Year Plan, the Gross Domestic Product (GDP) is targeted by the GOP to grow by 1.4% annually. Energy consumption is expected to grow by 2% annually (see Table F5). This slower growth rate will be consistent with the sluggish growth in industrial output over the same period. Although total energy consumption is expected to rise between 1983 and 1987, imported oil's share of that consumption will decrease from 64.5% to 40%. This is in line with the energy program thrusts directed towards increased use of non-oil energy sources, as crude oil remains prohibitive for the economic system. In comparison, from 1976 to 1982, energy consumption grew by 1.8% annually, (down from 3.7% annually in the 1973-80 period) despite an annual GDP growth rate of 5.1%. Much of this reduction in energy growth is believed to be due to the GOP's policy, instituted in 1980, of passing on most price increases to consumers. The Five-Year Plan growth rate reflects the pressure of urbanization and industrialization and an aggressive electrification program. Moreover, future conservation efforts will be more costly, as many of the inexpensive efficiency improvements are expected to have been made, and thus fewer will be implemented. Although total energy consumption is expected to rise between 1983 and 1987, imported oil's share of that consumption will decrease. The GOP seeks to reduce oil imports by more than 5% annually to shrink the share from nearly 61% to 38%. Recent economic developments indicate, however, that real GDP growth during this period will be considerably less than targeted. Consequently, the growth in energy consumption is likely to be lower than expected.

Under the Philippine Structural Adjustment Program of the World Bank, initiated in 1980, the government is currently reviewing its policies and investments in the energy sector. An action program is expected to be formulated to adjust the structure of power tariffs and to make appropriate changes in retail and ex-refinery petroleum product prices. The Program's success will be strongly influenced, particularly in the near-term, by the country's economic situation. This section briefly summarizes the government's most recently published resource development and supply policies and its energy demand management policies, including pricing. Then it discusses the policies' accomplishments to date and some of the remaining challenges.

Table F5
Primary Energy Consumption, 1983 and 1987
(In Million Barrels of Oil Equivalent)

	Actual 1983	Target for 1987	Compounded annual growth rate (%) 1983-87
A. Oil	68.19	46.41	(9.2)
1. Imported	63.54	42.63	(9.5)
2. Domestic	4.65	3.78	(5.1)
B. Non-oil			
1. Commercial			
a. Nuclear	-	6.07	-
b. Coal	3.54	11.77	35.0
Imported	2.63	10.62	41.8
Domestic	0.91	1.15	6.0
c. Geothermal	7.03	10.51	10.6
2. Renewable			
a. Nonconventional	0.07	1.43	112.6
b. Hydro	5.12	13.88	28.3
c. Agrowaste	9.05	9.95	2.4
d. Bagasse	5.47	6.37	3.9
Total	98.47	106.39	2.0

Source: Energy Targets for NEDA's Update of its 5-Year Plan.

1. Resource Development and Supply Policy

To achieve a reduction in oil imports, the government has articulated an aggressive domestic energy resource development program. Between 1983 and 1987, coal production is targeted to grow by 35% annually, hydro power by about 28%, geothermal by 11%, and nonconventional energy supply by 112.6% (see Table F5). However, it is not certain that sufficient investment resources will be available to achieve these goals.

The major elements of the Philippine resource development and supply policy are:

- o Diversification of the origins of petroleum supply including the intensification of domestic oil and gas exploration programs.
- o Accelerated diversification to alternative sources of energy, with emphasis on indigenously abundant and renewable forms. The Energy Development Program places major emphasis on coal, which is expected to become the country's second largest energy source, after oil, by 1987.
- o Establishment of a logistical support infrastructure to enable efficient handling, storage, distribution and marketing of traditional and new energy sources, particularly coal.
- o Widespread application of appropriate decentralized energy technologies for use in rural areas. These technologies will be based on dendro-thermal, minihydro, and fuelwood/charcoal energy sources.
- o Establishment of adequate energy stockpiles to protect against possible supply disruptions.
- o Promotion of research and development of indigenous energy sources, particularly those that are rural-based, renewable, and compatible with countryside needs.

2. Demand Management Policy

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

- o The use of fiscal measures to reflect the real economic and social costs of energy while taking account of political timing sensitivities.
- o 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 used fuel allocation and rationing in emergencies.
- o Direct government intervention to accelerate development of certain markets for non-oil fuels, e.g., fuel substitution using indigenous coal and renewable resources.

- Institutionalization of energy conservation in the industry, transportation, and commercial sectors through regulations requiring energy managers in major energy-consuming facilities, through free industry energy audits, through the development of energy performance standards, and through the provision of energy conservation training programs.

- Incentives for use of energy conservation technologies, including a 10% tax credit on local content and a 50% or 100% forgiveness of import duties and taxes, depending on the innovativeness of the technology.

3. Accomplishments and Challenges

The success of the country's resource development and energy demand management policies is indicated by the following achievements:

- The ratio of total energy consumption to gross national product has declined by as much as 14% since 1973 (see Table F6).

- Non-oil energy has increased its share of total energy consumption from an estimated 8% in 1973 to 31% in 1983. In the same period, domestic energy (including agro-waste) increased its share of total energy consumption from an estimated 8% to 35%. Dependence on imported oil decreased from 92% in 1973 to 65% in 1983. The coal conversion program aims to increase coal consumption from 1.11 million barrels of oil equivalent (MMBOE) in 1982 to 3.54 MMBOE in 1983. Geothermal power, which began large-scale commercial production in 1979, already ranks as the fourth largest source of energy.

- The government has generally moved quickly to adjust domestic fuel prices in line with changing world oil prices. It has also imposed selective taxes to further discourage oil consumption (e.g., the land, air, and water transport taxes). Since 1973, the weighted average price of petroleum products has registered a sevenfold increase.

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

Although the GOP has been praised for its energy program by international energy authorities, multilateral banks, and bilateral assistance agencies, much remains to be accomplished.

Energy conservation investments present the GOP with one of the quickest and cheapest opportunities for relieving the foreign exchange problem. This potential, however, has not yet been tapped on a large-scale basis. The most important constraints appear to be: management's requirement for very short

Table F6
Ratio of Total Energy Consumption to Gross National Product

Year	GNP at 1972 prices (in MP)	Total energy consumption (in MBOE)	Total energy per GNP (in BBL/P1000)
1973	60,861	69,790	1.146
1974	64,739	75,185	1.161
1975	68,530	79,352	1.158
1976	72,718	83,878	1.153
1977	77,162	89,731	1.163
1978	81,995	94,135	1.148
1979	88,736	97,420	1.098
1980	92,597	96,875	1.046
1981	96,070	93,474	0.973
1982	98,679	95,462	0.967
1983	100,043	98,472	0.984

paybacks (particularly given the current unsettled economic situation); management's lack of understanding of potential savings and the resultant absence of consistent pressure by top management to ensure implementation of conservation opportunities; a lack of reliable technical information and support on energy conservation technologies; and a lack of expertise required to evaluate, design, install, and operate the technologies. In addition, major energy conservation investments are difficult to finance, for several reasons: financial institutions are unable to properly evaluate the economic performances of technologies; it is difficult to obtain foreign exchange to finance the foreign portion of the investment (since many of the energy conservation technologies must be imported at present); and there is a lack of alternative capital investment vehicles such as shared-savings ventures.

In the power sector, the level and structure of both wholesale and retail tariffs need revision. The current tariffs are inconsistent with the government's stated objective that prices reflect the real economic and social costs of energy. Without adjusting the tariffs (primarily increasing them), it is likely that the National Power Corporation will be unable to meet its investment program which accounts for more than one-half of the country's energy investments in this decade. Presently, the country is in the process of developing an electric power rate structure to meet World Bank lending requirements. This new structure may resolve these inconsistencies.

The country's conventional and renewable energy resource development programs require substantial investments. Unfortunately, the current economic and political problems are likely to slow down many of these programs until the country is able to establish its credit rating with international lending institutions. In addition, the government needs to concentrate on encouraging the private sector to participate in developing and disseminating information on nonconventional energy applications.

Other sectoral problems include: overcentralization of decision making and program design; a shortage of well-trained or experienced middle managers; interagency jealousy that impairs information transfer and cooperation; a lack of familiarity with appropriateness of many technologies to the Philippine situation; weakness in disseminating technical information (both technologies and systems management) to end users; and difficulties in balancing energy demand and supply, particularly in the coal sector.

C. The AID Assistance Strategy in Energy

USAID's overall assistance strategy in the Philippines is to foster sustained and more productive employment for the rural poor to reduce poverty. Help in increasing energy availability and production in rural areas at reduced costs will be a factor in alleviating rural poverty. The modern sector[1/] commands a substantial portion of direct and indirect oil resources and thus the financial resources needed to pay for the oil. Assistance in reducing the modern sector's need for oil-related resources will free up financial resources that can be used in rural development and thus increase employment in rural areas.

The USAID strategy is to assist the Philippines in meeting its objectives of making energy more available and more affordable. The strategy has two elements: a rural sector energy strategy and a modern sector energy strategy.

1. The Rural Sector Energy Strategy

In the rural sector, shortages of conventional fossil fuels continue to have an immediate adverse impact on food production costs and on the lives of the poor, thus diminishing the prospects for increasing food production and alleviating rural poverty. It is becoming increasingly clear that alternative energy technologies and systems, based on renewable resources, will be key to

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1/ The modern sector is composed of those firms or groups in the economy that 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.

the development of the rural sector. Such development seeks to improve employment and income levels, productivity, health standards, and living conditions. In the rural sector, however, the demand for wood and charcoal is outstripping natural regrowth and reforestation efforts, resulting in deforestation, soil erosion, reduced upland water storage capacity, and siltation of reservoirs and coastal waters. Thus, care must be taken that development of renewable resources such as wood does not worsen this problem.

Four projects have been initiated under the rural sector energy strategy. The purpose of the Nonconventional Energy Development Project, which was 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 were completed or are being implemented. Two others have been approved to begin by January 1984 and two more were expected to start by February 1984. The project is funded at $7.1 million.

The second project under the rural sector energy strategy is the Rural Energy Development Project, which is composed of three components. The wood-fired power plants component calls for the construction of three 5 MW wood-fired power plants, together with the development of the tree farms and related facilities needed to fuel the plants. The plants will be operational in early 1986. The second component, gasifiers for irrigation, seeks to help convert diesel engine pump sets to producer gas/diesel fuel operations at 495 irrigation installations. Gasifiers have been installed at 125 sites already; approximately 200 units will be installed in the next 12 months. The third component is the charcoal production project. Its objective is to produce readily available charcoal for industrial, commercial, and household use, primarily in rural areas. The program includes the development of 19,500 hectares of tree farms, the construction of road networks, and the construction of 975 charcoal kilns. Twenty-one tree farms (2,000 hectares) have been started. Pending an amendment under preparation, the project will be funded with $38 million in economic support funds.

The National Energy Plan focuses on two critical factors for controlling this sector's demand: 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 and thus limit per capita oil consumption to less than one barrel by 1987.1/ USAID's strategy in this sector supports the National Energy Plan with three projects.

1/ In 1980, per capita oil consumption was 1.5 barrels; in 1983, it was estimated to be 1.25 barrels.

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 handling practices while using biomass energy to reduce costly fossil fuel consumption and reliance on outside fuel sources. The project will be DA funded at $9.8 million.

2. The Modern Sector Energy Strategy

The modern sector of the Philippines is the principal consumer of imported fuels and electricity, accounting for approximately 90% of the nation's total commercial energy consumption.

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 to other Philippine cities. This project is centrally funded at $350,000 (S&T Bureau).

The purpose of the Technology Transfer for Energy Management project, which is the subject of this Project Paper, is: to promote and accelerate the adoption of energy efficient technologies, equipment, processes and improved management systems by the modern sector; and to improve the institutional capabilities of the government and private-sector groups to implement energy conservation initiatives. The project will be DA funded in FY 1984 at $10.0 million.

The Rural Energy Technical Assistance Project provides technical consultants, field research and skills training in support of the Rural Energy Development Project. The project is funded with $2 million in economic support funds. Finally, the Technical Assistance in Coal Development project, which is also in the preparation state, 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 ensure proper timing between supply availability and coal demand. This project is centrally funded at $2.8 million.

3. Training

Each of the USAID projects contains a training component which promotes institutional development and skills training. The kind of training and level of effort is tailored to project goals and beneficiaryneeds. In addition, the USAID has made and will continue to make considerable use of centrally funded training projects in the areas of energy planning and management, resource (coal and oil) exploration, development and management, alternative energy systems development, conservation, electricity systems management, and financial management in energy production and use.

SELECTION OF TTEM SUBPROJECT TARGETS

This Annex describes the selection of an initial set of energy technology demonstration subprojects and their demonstration targets for the Technology Transfer for Energy Management (TTEM) Project. The following sections present the general guidelines, constraints, and assumptions that apply to the selection process, and summarize the subproject technologies. The Annex also presents detailed descriptions, cost and benefit estimates, and subproject demonstration requirements for each technology.

A. General Guidelines, Constraints, and Assumptions

This section summarizes the general guidelines, constraints, and assumptions with respect to target sectors, project financing, user priorities, and GOP priorities that were taken into account in selecting demonstration targets.

1. Target Sectors

The TTEM project seeks to reduce energy use, particularly imported petroleum, in the industrial, commercial, and transportation sectors. The electric utility sector was not addressed because it is the focus of other studies and financing programs by organizations such as the World Bank and the Asian Development Bank, and because the funding available to the project ($10 million) was not enough to effectively address its problems. The agricultural sector was not included because it is addressed in other USAID-funded projects as well as in projects of other international aid organizations.

In the industrial, commercial, and transportation sectors, no effort is being made initially to strictly target small- and medium-scale Philippine enterprises to the exclusion of larger energy users, because the GOP wishes to encourage the maximum energy conservation as quickly as possible. Although a recent ADB project involving industrial energy audits and training was aimed at large consumers, it by no means filled the full need for conservation in this group of industries; on the contrary, it produced tangible evidence of the need for financing assistance and produced information on a number of promising conservation measures that can be implemented through the TTEM project. Small- and medium-scale enterprises will, however, benefit most from demonstration activities, as they are more likely to need the information and training that are part of the demonstration than are large enterprises.

Finally, in its initial phase, the project will focus on the industrial and commercial sectors. The subprojects suggested for the transportation sector are not considered suitable for the initial phase because: they require significant research and development (such as lightweight vehicles or more

efficient motors); they have already been demonstrated; the reasons for theirlack of use stem from economic and similar problems that cannot be resolved by a simple demonstration (such as coco-diesel and alcogas motor fuels); or the costs of a full-scale demonstration are beyond the project's resources (such as major mass-transit system modifications).

2. Project Financing

The TTEM project has total funding of $10 million, of which $7.66 million is available for loans and grants to stimulate energy conservation investments. Compared with the total energy conservation investment needs of Philippine energy users, the funding level is relatively low. For example, a recent study sponsored by the Ministry of Energy's Bureau of Energy Utilization (BEU) and the Asian Development Bank (ADB) on the energy conservation potential in the industrial sector indicated that potential energy conservation investment requirements were nearly $1.2 billion, exclusive of major plant modifications to make industrial processes more energy-efficient (See Table G1). Thus, the project must focus on identifying and demonstrating high-payoff technologies and then stimulating users and financing institutions to finance and implement that technology with their own funds or funds provided by other international aid organizations such as the ADB or the World Bank.

Because of its limited funding, the project will focus initally on relatively low-cost technologies with total installed costs of less than $200,000. This limitation will rule out major boiler conversions, medium and large cogeneration systems, and major process changes. However, many technologies that have the potential to significantly reduce Philippine industrial- and commercial-sector energy consumption will qualify for consideration. In addition, users will be expected to fund a significant portion of the installed cost themselves (25% or more). In this way, the project will be able to fund more subprojects and ensure that users have a significant financial interest in the subproject's success. Subproject loans will be channeled through participating private banks to give them experience in financing energy conservation efforts, develop their understanding of the technologies' role in conservation, and to encourage them to make more of their own funds available for this purpose.

TTEM subprojects will not only demonstrate energy conservation technologies, but will also demonstrate new financing vehicles for these technologies. For example, the loan repayments can be set at a fraction of the actual savings until the principal and accrued interest are paid off, which guarantees that the user realizes immediate savings. Alternatively, Philippine venture capitalists might raise the money for the technology, install it, and operate it. The user would pay them a fee based on use, and the venture group would guarantee the user a net reduction in overall energy costs.

Table G1
Energy Conservation Savings Potential and Investments in the Philippines

Conservation Measures	Annual National Cost Savings) ($ Millions)	National Investments ($ Millions)
A. Industrial Boilers		
1. Combustion control	51.3	20.8
2. Flash steam, condensate recovery, economizers	9.7	27.0
3. Insulation, steam traps, repair leaks	16.0	9.0
4. Fuel switching (oil to coal)	42.0	142.0
5. Fuel switching (oil to waste)	53.0	156.0
Subtotal	172.0	354.8
B. Utility Sector		
1. Boiler/turbogenerators upgrade	36.0	55.0
2. Turbogenerators: achieve desi[illegible] heat rates	35.0	0.2
3. Combustion control	3.6	0.6
Subtotal	74.6	55.8
C. Heaters including furnaces, kilns, dryers		
1. Combustion control	27.8	0.3
2. High temperature heat recovery-recuperators, heat exchanges	21.0	60.0
3. Low temperature heat recovery-waste heat boilers, low temperature heat exchanges	0.4	0.4
Subtotal	49.2	60.7
D. Electric Energy		
1. Cogeneration	127.0	730.0
2. Self generation-diesel, steam, electric energy use	70.0	3.0
Subtotal	197.0	733.0
Grandtotal	492.0	1,204.0

Source: BEU/ADB

To encourage participation, the net loan terms to the user would be set slightly lower than current market terms, in order to compensate the users for costs associated with monitoring, site disruption from observers, information dissemination requirements, and risk. At present, market rates for straight loans range between 22 and 35% (depending on the term); the TTEM fund loans will be at 18%. The length of the TTEM loans will be from 3 to 5 years, compared with the less than 1 year usually available. For loans with repayments tied to savings, the rate will be 5% higher to cover the increased risk to the lenders, and the term will be variable, depending on the actual savings. The loan principal and interest repayments (or "reflows") will be reinvested in additional energy conservation loans, grants, studies, and training programs.

The Asian Development Bank has indicated that it is interested in making up to $120 million available for energy conservation investments in the Philippines, if a way can be found to provide the money in a single loan and ensure that it is used effectively. The TTEM project offers a vehicle for such a loan, as it provides technical evaluations and a loan fund with established channels to commercial banks. The TTEM project could evolve similarly to the Industrial Guarantee and Loan Fund (IGLF), which was established in the Philippines by USAID to finance industrial development and received a substantial increase in funding from the World Bank.

User Priorities

Discussions with energy users, equipment vendors, service firms, and financing institutions have identified several factors that will affect the design of the TTEM demonstrations. First, the major constraint to energy conservation investments is a financial one. In the current economic crisis, loan funds--particularly foreign exchange--are often not available to other than the most creditworthy firms. When funds are available, they bear high interest rates. Borrowers are particularly reluctant to take on foreign exchange debt because of the risk of a major currency devaluation. Thus, energy conservation investments must pay off very quickly, preferably in a year or less. Review of 66 energy conservation investments made by the food industry provided by BEU showed that 83% had paybacks of 1 year or less, and only 4 had paybacks greater than 2 years.

A second constraint is an institutional one. Senior Philippine executives are reluctant to invest in energy conservation because they do not understand the technologies, they do not believe that their personnel can properly evaluate, install, operate, and maintain the systems, and they do not believe cost and savings estimates provided by vendors. Thus, they view energy conservation as a comparatively "risky" investment, and do not give energy matters the required attention.

A final constraint is a technical one. Many energy-conserving technologies are not used because of a lack of awareness of them or the inability of plant personnel to properly evaluate system costs and benefits or properly operate and maintain the technologies. In some cases, vendors cannot provide the performance information needed, or the reliability of their data is questioned. If a system is installed, monitoring equipment may not be available to inform management of the improvement in performance.

In light of these constraints, energy users give highest priorities to conservation investments with quick paybacks, adequate accompanying technical assistance and training, and clear evidence of technical viability. The TTEM project will provide all three.

GOP Priorities

The major priority of the GOP is to reduce energy imports and thus save foreign exchange. There is little concern about where the savings come from; thus, TTEM funds need not be targeted on small- and medium industry, rural areas, or specific energy-consuming sectors.

However, an initial GOP preference leans towards projects that substitute indigenous resources or improved manufacturing capabilities for imports.

In addition, the GOP does not want the program to be perceived as a "giveaway" to private industry. Thus, loans must be made at close to market rates. Moreover, because the GOP is responsible for repaying the loan to the United States, the GOP must have the decisive voice in setting TTEM project policies and financing terms.

Finally, through the Bureau of Energy Utilization (BEU), the GOP wishes to use the TTEM efforts to leverage its own efforts in encouraging energy conservation. Such leverage will be achieved through training efforts aimed both at private-sector energy users and the BEU staff, and through joint information dissemination efforts.

B. Major Subprojects

Discussions with Philippine energy users, vendors, service firms, and government organizations have yielded a large number of suggested subprojects. The problem, in fact, is not one of identifying potential subprojects, but rather of selecting the most attractive from among those proposed. This section summarizes the demonstration strategy and identifies subprojects recommended for the first phase of project implementation.

The project will be implemented in three phases. In the first phase, expected to last up to two years, the project team will establish itself and develop a

performance record. Subprojects will be of relatively low risk, of broad application, and the numbers will be limited to avoid overextending the team's and cooperating group's capabilities. In the second phase, projects with higher risks and more specialized applications will be undertaken, and the number will be significantly expanded. In the final phase, demonstration will continue and increased efforts will be made to stimulate additional funding from other aid organizations (such as the Asian Development Bank, the World Bank and the Philippine private sector) as well as commercial lenders.

The initial demonstration subprojects will be proposed by users, vendors, and TTEM staff members based on information collected during the project design phase. The demonstrations will serve to develop user and vendor wareness of project efforts and to stimulate them to propose their own demonstrations. These demonstrations were developed from:

- Discussions with users, vendors, and energy experts to determine what the major energy conservation problem areas are and what types of technologies could be most effectively demonstrated.

- A questionnaire sent by the Energy Management Association of the Philippines (ENMAP) to plant energy managers to determine what types of technologies they would like to see demonstrated.

- A review of recent extensive studies on industrial and commercial sector energy use and energy conservation opportunities conducted by BEU and other organizations.

- Analyses of the costs and benefits of specific technologies.

These sources indicated that Philippine energy users could achieve significant savings by applying energy-conserving technologies and specific demonstration efforts were selected on the basis of:

- They are not now extensively used in the Philippines. Less than 25% of the potential facilities are using the technology, based on estimates provided by users, vendors, and studies.

- They have low technical risk. The technologies have all been used successfully in other countries and equipment is readily available, but they are not well known in the Philippines.

- They provide short simple payback periods, based on analysis using real-world market assumptions, not the more favorable terms available for TTEM financing. The simple paybacks to the user or in foreign exchange are 6.2 years or less. Payback for most of the technologies

- is 1 year or less.

- They have wide applicability. The technologies are useable in a number of industrial or commercial subsectors and their use is not confined to a few firms or plants. This insures the greatest potential savings per demonstration dollar.

Table G2 summarizes the major demonstration subprojects (Annex H presents detailed descriptions of subprojects). Each demonstration subproject includes the following steps:

- Technical evaluation. This evaluates the applicability of the technology to a particular site and develops estimates of the capital and operating costs and energy savings. Normally, this will be done by the project sponsor (e.g., user or vendor) often with technical assistance from the TTEM Staff. And reviewed by a TTEM staff engineer. For certain complex projects, the TTEM staff may take a more active role or hire outside consultants to prepare the technical evaluation.

- Economic/financial evaluation. This determines the economic feasibility of the project and appropriate financing mechanisms. Normally, this will be done by the project sponsor and participating banks, with review and assistance by TTEM staff. Again, complex projects may require more TTEM staff involvement and possibly outside assistance.

- Performance monitoring. To develop a reliable and credible estimate of actual savings, the process or building energy consumption must be monitored before and after the installation of the equipment. Normally, the TTEM project will pay for these efforts.

- Information dissemination. A major effort will be made to disseminate demonstration results through presentations, workshops, seminars, and publications. This will be done with the user, with trade associations (particularly PCCI and ENMAP), and with the BEU.

The specific technologies proposed for demonstration are described in detail in Annex H. They include:

- Combustion monitoring and control systems. These systems improve boiler and furnace efficiency by allowing more precise control of combustion air. Increased use of such systems was the recommendation of a major BEU/ADB energy audit study. These low-cost systems, with paybacks of less than 2 weeks to users, are economically very

Table G2
Potential TTEM Demonstration Projects

Technology	Capital Investment (Single Installation) Equipment	Installation	Annual Operation & Maintenance Manpower (₱)	Supplies (₱)	Annual energy Savings	Annual Savings Value (₱)	Net (₱) Savings	Payback	Foreign Exchange Benefit Cost ($)	Net Savings ($)	Payback
Combustion monitoring and control system											
Small	$ 340	-	22,500	₱ 1,400	2,500[1/]	235,000	₱233,600	6 days	240	13,800	1 week
Large	$ 5,100	$960	22,500	14,400	12,500[1/]	1,150,000	1,136,000	10 days	3,500	67,600	19 days
Flue gas heat recovery systems	$51,000	₱60,000	3,000	3,000	2,484[1/]	231,000	228,000	3.1 years	30,000	13,836	2.2 years
Increased use of insulation in industrial processes	₱4,000	₱1,000	-	-	460[1/]	40,800	40,800	1.5 mos.	50	2,562	1-2 weeks
Power factor control equipment	$72,300	₱10,000	2,400	-	-	2,037,800	2,035,400	6 mos.	51,000	321,200	1.9 mos.
Steam distribution system maintenance procedures	₱23,800	₱600	10,000	-	11,030[1/]	1,021,000	1,021,000	2 weeks	1,200	12,300	1.2 mos.
Outside air temperature compensation for chiller systems	$12,000	₱60,000	30,000	-	33,000[2/]	39,600	36,600	6.2 years	8,400	2,000	4.2 years
Building energy management systems	$17,000	$36,000	4,800	-	189,300[2/]	227,160	222,360	1.2 years	12,000	11,600	1 year
Increasing roof insulation in existing buildings	₱47,500	₱22,600	-	-	149[1/]	17,400	17,400	6.9 years	700	900	9 mos.

1/ Million British Thermal Unit.

2/ Kilowatt Hour.

attractive, but are not used extensively because of a lack of knowledge of their existence and a lack of expertise in their operation. The demonstration will focus on showing the savings possible and developing training programs for boiler operators in the proper use of these systems.

- Flue gas heat recovery systems. These systems reduce fuel use by recovering energy from flue gases that would otherwise be wasted. These systems typically offer users paybacks no more than of 3.1 years, and often less. The major hindrance to their use has been their proper design, selection, and installation. The main thrust of the demonstration is to indicate the proper design and selection of these systems and illustrate the potential savings.

- Increased use of insulation in industrial processes. Insulation reduces energy losses from boilers, steam pipes, tanks, and similar equipment. Properly designed and installed, it offers paybacks of 2 months or less. However, there is a lack of expertise in designing economically optimal systems. Therefore, the focus of the demonstration is proper selection and design of insulation.

- Power factor control systems. Such control systems reduce wasted electrical power and thus utility oil consumption. Properly designed systems can pay back in 6 months or less. However, there are many technical and economic trade-offs in the system design which require expertise to evaluate, which is not always available. This demonstration will emphasize the proper selection of capacitor banks and their optimization in plant electrical systems.

- Steam distribution system maintenance procedures. Proper maintenance reduces energy losses through steam and traps. Interviews with users and vendors indicate that few plant personnel understand how these should be properly designed and maintained, thus resulting in significant energy waste. This demonstration will include training courses that emphasize proper procedures and show savings (e.g., paybacks of implementing such a program can be as short as 2 weeks) that can be realized.

- Outside air temperature compensation for chillers. These compensation devices raise the chiller water temperature when the outside air temperature is less (i.e., when the cooling load is less), thus reducing the commercial building electricity demand. These systems appear marginally attractive in the Philippines, with a payback of 6.2 years. The focus of this demonstration will be the proper design and application of these systems and the likely level of savings.

- Building energy management systems. These systems use a variety of technologies, from simple time clocks to elaborate computers, to reduce energy demand. They are becoming very common in industrialized countries, although few have been applied in the Philippines because of a lack of expertise in design, intallation, and operation. They offer a payback of 1.2 years. This demonstration will focus on the proper design, selection, installation, and operation of the system and indicate the level of savings achievable.

- Increased roof insulation. Such insulation reduces the heat loss through roofs, a major source of loss in commercial buildings. It has not been extensively used because of generally marginal economic performance (payback of 6.9 years) as well as a lack of expertise in economic design optimization. It provides an interesting demonstration of a technology that is unattractive to potential users because of the long payback, yet offers a very attractive foreign exchange payback (9 months) because the insulation is available locally.

Table G3 summarizes the estimated costs for monitoring and disseminating the information for the first set of proposed demonstrations.

Table G4 provides total estimated costs (i.e., capital investment plus monitoring costs) for the first set of proposed demonstrations. All of these are between $60,000 and $250,000.

Evaluation of the replicability of these demonstrations is difficult because no comprehensive data base is available on industrial boiler inventory or commercial building inventory. Rough estimates, however, can be made using information provided by BEU.

Combustion monitoring, flue gas heat recovery, and steam distribution maintenance can be applied to all active oil-fired boilers. A BEU/ADB study[1/] estimates the number of these in the Philippines to be 964, with another 264 inactive (i.e., standby or cycling duty). Four hundred to five hundred industrial heaters can use combustion control, while one hundred to two hundred can also use waste heat recovery.

1/Industrial Energy Audits and Conservation Program for the Philippines -- Draft, "prepared for Philippine Ministry of Energy's Bureau of Energy Utilization and the Asian Development Bank by Arthur D. Little, Inc., Broken Hil Proprietary Company Ltd.; Engineering Corporation of the Philippines; September 1983.

Table G3
Summary TTEM Demonstration Monitoring Costs (P)

Technology	Number of demonstration	Equipment	Manpower	Information dissemination	Total
Combustion Monitoring and Control System	6	1,680,000	80,000	20,000	1,800,000 ($130,000)
Flue gas heat recovery systems	4	1,120,000	60,000	240,000	1,200,000 ($86,000)
Increased use of insulation in industrial processes	4	810,000	180,000	30,000	1,200,000 ($74,000)
Power factor control equipment	4	168,000	60,000	20,000	248,000 ($17,000)
Steam distribution system maintenance procedures	4	840,000	60,000	20,000	920,000 ($66,000)
Outside air temperature compensation for chiller systems	4	560,000	60,000	20,000	630,000 ($45,000)
Building energy management systems	8	112,000	100,000	20,000	232,000 (16,600)
Increasing roof insulation in existing buildings	4	560,000	60,000	20,000	630,000 ($45,000)

Table G4
Summary TTEM Demonstration Costs ($000)

Technology	Number of Demonstrations	Total Capital Investment 1/	Net Capital Investment from TTEM Project 2/	Monitoring and Information Dissemination cost 3/	Total TTEM Obligation
Combustion monitoring and control system	6 4/	19.2	14.4	130.0	144.4
Flue gas heat recovery systems	4	221.2	165.9	86.9	251.9
Increased use of insulation in industrial processes	4	1.4	1.1	74.0	75.1
Power factor control equipment	4	292.1	219.0	17.0	219.1
Steam distribution system maintenance procedures	4	7.0	5.2	66.0	71.2
Outside air temperature compensation for chiller systems	4	17.1	12.9	45.0	57.9
Building energy management systems	8	156.6	117.4	16.6	134.0
Increasing roof insulation in existing buildings	4	20.0	15.0	45.0	60.0

1/ Capital investment in dollars and pesos for 1 project times the number of projects.
2/ Loans and grants, assumed to be 75% of total capital investment.
3/ Loans, grants and administrative, monitoring, and information dissemination costs.
4/ Three large and three small installations.

No good estimates are available for power factor control potential. If 3/4 of the large industrial firms reporting to BEU can utilize it as equipment vendors suggest, then potentially 216 firms could install it, many at several plants.

No comprehensive inventory of the existing commercial building stock exists. Data provided by the National Census and Statistics Office (NCSO) shows approximately 27.7 million square meters on non-residential facilities constructed since 1966, with ar average size of about 500 square meters (compared to an average U.S. non-residential building size of 1,200 square meters). If the size distribution of the Philippine buildings relative to the average size is similar to the United States, a rough estimate of the square footage and number of building in each size range can be made. This is summarized in Table G5. If it is assumed that buildings over 800 square meters (8,600 square feet) can use the suggested conservation options, then more than 6,650 commercial and industrial buildings in the Philippines are candidates for building energy management systems, roof insulation, and outside air chiller temperature controls.

The project's initial training activities will focus on providing training courses with wide applicability. The greatest need expressed by energy users and vendors was for courses which provided "hands on" practical experience with actual systems, rather than simply theoretical classroom work. These workshops and seminars will emphasize this; for example, an idle boiler at an industrial plant may be rented for a few days for the trainees to practice with.

Specific training courses suggested by users and vendors included:

- Industrial boiler operations
- Industrial energy auditing
- Commercial building "housekeeping" practices
- Commercial building controls
- Commercial building energy auditing.

Table G5 summarizes the estimated development and presentation costs of these courses.

The final type of subproject is specific studies geared to developing information needed by the project to identify or evaluate energy conservation options. The results of these studies will be made available to energy users, equipment vendors, service firms, business and professional associations and government agencies to help them make decisions on energy conservation investments or policies. Two studies are suggested for the initial phase of the project, one for the industrial sector and one for the commercial sector.

Table G5
Estimated Philippine Building Size Inventory

Size range (m^2)	Percentage of total floor area[1]	Estimated total floor area ($000m^2$)	Estimated number of buildings[1]
less than 400	19.8	5,488	45,800
400- 800	17.0	4,712	9,200
800-1,600	15.0	4,158	3,600
1,600-3,200	15.1	4,186	1,850
over 3,200	33.0	9,147	1,200
Total	100.0	27,719	61,650

1/ Estimated from building size distribution data provided by U.S. Department of Energy/Energy Information Administration, and renormalized to average Philippine building size of 500 m^2 by assuming the fraction of floor space in each size range relative to the average size (for example, from 1.0 to 2.0 times the average size) was the same in both countries.

2/ Based only on construction from 1966 to first quarter 1983. This does not include buildings outside Metro Manila and 32 chartered cities constructed prior to second half of 1976. Thus, the actual inventory is larger than this.

Table G6
Training Courses

Course	Initial Development cost (₱000)	One-Time Presentation cost (₱000)
Industrial boiler operations	130	30
Industrial energy auditing	160	80
Commercial building "housekeeping"	110	30
Commercial building controls	110	30
Commercial building energy auditing	110	30

The industrial sector study will develop estimates of energy consumption in various industrial processes in plants around the world, and compare them with consumption of similar plants in the Philippines. This will allow sectors having significant conservation opportunities to be identified and will also help identify specific technologies for demonstrations. Information on Philippine consumption is now being collected by BEU. Data on plants in other countries is available from various governmental agencies in the U.S., Japan, and Europe, from trade associations in various countries, and possibly from multinational corporations which collect energy data from their various plants. This is a continuing effort requiring 1/4 to 1/3 man-year per year.

The second study is a two-phase effort combining a study of building energy analysis programs with training for Philippine building designers in their use. It will compare the program predictions with actual consumption to help determine the "best" programs for use. It will also provide specific research studies to estimate the savings possible through improved building design and construction practices.

Other studies, not tied to specific demonstration subprojects, will address public policy issues related to constraints on wide adoption of energy conservation measures and potential ways to overcome them.

POTENTIAL TTEM SUBPROJECTS AND ECONOMIC ANALYSIS

The TTEM Project will fund subprojects consisting of technology demonstrations, training programs, technical assistance, and studies. Although the specific efforts will be developed after the project's startup, a number of potential efforts in the industrial and commercial sectors have been identified which are representative of the types of subprojects TTEM will implement. Table H1 summarizes the demonstration subprojects and their user paybacks, foreign exchange paybacks, and subproject costs, and detailed descriptions follow. Please note that these descriptions do not directly estimate the additional energy conservation investments and measures which will be stimulated by successful demonstrations, training programs, and technical assistance.

These descriptions and summaries should be used in conjunction with Annex M "TTEM Project Reflow Analysis". That annex summarizes the expected cash reflows of the TTEM Project. It shows that the reflow funds should be sufficient to easily repay the USAID loan under very conservative assumptions. Benefits accruing the Philippine economy from other replications of the technologies not funded by TTEM will be in addition to those estimated here.

Assessments of Industrial and Commercial Sector Energy Conservation Measures

Presented below are detailed assessments of specific energy conservation technology measures recommended for use in the initial stages of the TTEM Project. The measures are based on several site visits of industrial facilities and commercial buildings by the project design team and represent the knowledge and experience gathered by other teams and local energy managers. These measures accurately reflect real situations. Each assessment contains a description of the measure, an estimate of the potential energy savings resulting from a single application, an estimate of the possible foreign exchange payback, an estimate of the potential aggregate energy savings to the Philippine economy (where possible), replicability of application, and the requirements for demonstrating the technology.

Key assumptions that were used to develop these assessments include:

- The peso/dollar exchange rate is 14/1
- Philippine labor rates:
  - skilled = ₱120,000/year
  - semi-skilled = ₱ 60,000/year
  - unskilled = ₱ 30,000/year

Table H1
Potential TTEM Demonstration Projects

	Capital Investment (Single Installation)			Annual Operation and Maintenance			Annual Energy Savings		Annual Savings		
	Equipment	Installation	Total 1/	Manpower	Supplies	Total 1/	KLOE	mmBtu or Kwh	Value (P) 2/	Net Savings 3/	Payback 4/
A. Industrial equipment											
Combustion monitoring and control system											
Small	$340	-	P6,290	P22,500	P1,850	P24,350	68	2,500 mmBtu	P230,000	P205,650	11.2 days
Large	5,100	960	95,310	22,500	$1,000	41,000	337	12,500 mmBtu	1,150,000	1,109,000	31.4 days
Flue gas heat recovery systems	51,000	60,000	1,003,500	3,000	-	3,000	63	2,484 mmBtu	228,528	225,528	4.4 years
Increased use of insulation in industrial processes	P4,000	1,000	5,000	-	-	-	12	460 mmBtu	42,320	42,320	1.5 months
Power factor control equipment	$ 72,250	10,000	1,346,625	2,400	-	2,400	-	192,600*	2,037,800	2,035,400	8 months
Steam distribution system maintenance procedures	1,700	600 + 10,000	42,050	-	-	-	-	11,030 mmBtu	1,014,760	1,014,760	15 days
B. Building system maintenance procedures											
Outside air temperature compensation for chiller systems	12,000	60,000	282,000	3,000	-	3,000	-	33,000 Kwh	37,950	34,950	8.1 years
Building energy management systems	17,000	36,000	350,500	4,800	-	4,800	-	189,300 Kwh	217,695	212,895	1.6 years
Increasing roof insulation in existing buildings	115,200	5,000	120,000	-	-	-	-	14,500 Kwh	16,675	16,675	7.2 years

- Fuel oil costs = ₱3.404/liter (December 1983)
- Fuel oil foreign exchange costs = $5.57/mmBtu (equivalent is $32.30/bbl, which is the average 1983 acquisition cost).

A. Industrial Equipment

1. Combustion Monitoring and Control Systems

Application Sector: Industrial

Description

Efficient combustion requires careful monitoring of the air-to-fuel ratio. If the ratio is too low, incomplete combustion occurs, which is indicated by smoking and high carbon monoxide content in the flue gas. If the ratio is too high, incomplete heat transfer from the products of combustion to the boiler occurs, which is indicated by high oxygen content in the flue gases. Both situations result in low overall boiler efficiency and thus a waste of fuel.

On boilers and other combustion systems, the air-to-fuel ratio is generally controlled manually. In the Philippines, proper manual adjustment is impeded by a lack of instrumentation that indicates when the optimum ratio is achieved. Thus, in most boiler operations, the air-to-fuel ratio adjustment is generally based on the system operator's perception of proper flue gas temperature and the degree of smoking.

According to the authors of an Asian Development Bank/BEU,* in the sample of oil-fired boilers that they tested, the excess air in the boiler was about 75%, corresponding to a flue gas oxygen concentration of 9% by volume. As a result, boiler efficiency was less than it could have been with an optimal air-to-fuel ratio. With proper instrumentation, manual control could be improved, reducing excess air to 10-15% or 2-3% oxygen by volume. Combustion efficiency would thus increase from approximately 75% to 82%.

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* Industrial Energy Audits and Energy Conservation Program for the Philippines", Arthur D. Little, International, Inc.; Broken Hill Proprietary Company Ltd.; Engineering and Development Corporation of the Philippines; September 1983.

The instrumentation used to achieve these efficiency increases can vary from a simple, portable, wet-chemistry flue gas analysis kit (such as the Bacharach Fyrite) to an electrochemical oxygen analyzer mounted in the flue. In both case, air-to-fuel ratio adjustments would be made manually by the system operator, based on instrument readings.

The choice of instrumentation (wet chemistry or electrochemical) depends on the type of boiler application. The wet chemistry method is rather time-consuming, requiring about 15 minutes for each analysis. Because of the need to test a boiler before and after air-to-fuel ratio adjustments, the amount of time required for testing may be excessive in a boiler system that undergoes many changes in loading during the operating day. The electrochemical system yields virtually instantaneous measurement information; and thus is more practical in boilers with fluctuating loads. In general, fixed instrumentation (electrochemical) is used in larger boilers, while the wet chemistry method is used with smaller or less frequently used boilers.

Energy Savings (Single Application)

- Assumptions and Data

  - o Average Philippine boiler flue gas oxygen content: 9% oxygen by volume, equivalent to 75% excess air.
  - o Optimum flue gas oxygen content: 2 to 3% oxygen by volume, equivalent to 10 to 15% excess air.
  - o Boiler combustion efficiency improvement achieved by reducing excess air: increase of 7%, from 75% to 82%.
  - o Annual boiler utilization: 6,000 hours.

- Example of Savings

For a small 100-hp boiler operating 6,000 hours per year and producing saturated steam at 125 psig from 180^{o}F feedwater, savings are estimated as follows:

Enthalpy added to feedwater = 1,045 Btu/lb

Fuel required by average Philippine boiler = 1,393 Btu/lb (75% efficiency)

Fuel required with properly adjusted boiler (82% efficiency)	= 1,274 Btu/lb
Fuel savings owing to increased efficiency	= 119 Btu/lb
Annual savings in fuel	=

(119 Btu/lb) (34.5 lb/hp) (100 hp) (6,000 hr/yr) (10^{-6}) = 2,500 mmBtu/yr (68 KLOE*/yr).

The 2,500 mmBtu/year is worth ₱230,000.

The cost of a Bacharach Fyrite chemical analyzer kit is approximately $200, exclusive of duties and taxes. Shipping, duties, and taxes (estimated at 70% of purchase price), are another $140. The annual cost of spare chemicals, gaskets, tubing, and other expendable parts for upkeep of the Fyrite kit is estimated at $100.

The annual labor cost is estimated at ₱22,500, based on an hourly rate of ₱30 for semi-skilled labor, and an estimated labor concentration of 3 hours per day (one hour per shift). The actual cost to the plant owner will probably be less, because a large portion of these additional duties can usually be added to the boiler operator's normal responsibilities at little or no additional marginal cost.

The simple payback period is estimated as follows:

Cost of equipment	₱ 6,290
Annual savings	₱230,000
Increased manpower costs	₱ 22,500
Annual maintenance cost	₱ 1,850
Net annual savings	₱205,650

The simple payback period is thus 11.2 days.

For a larger 500-hp boiler, the annual savings would be 337 KLOE/yr. or 12,500 mmBtu, with a value of ₱1.15 million. The cost of a fixed oxygen analyzer is estimated to be $3,000. Shipping charges, duties,

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*KLOE = thousand liters of oil equivalent.

and taxes are estimated at 70% of the purchase price, or $2,100. The installation, including calibration, requires 16 man-hours of skilled labor (16 hours) at ₱60 per hour, or ₱960.

The annual cost of oxygen analyzer upkeep is estimated at $1,000, including periodic replacement of the oxygen sensor and other expendable parts.

The annual labor (operating and maintenance) cost is estimated at ₱22,500, based on an hourly rate of ₱30 for semi-skilled labor, and an estimated labor concentration of 3 hours per day (one hour per shift).

The simple payback period is estimated as follows:

Cost of equipment	₱ 95,310
Annual savings	₱1,150,000
Increased manpower requirements	₱ 22,500
Annual maintenance cost	₱ 18,500
Net annual savings	₱1,109,000

The simple payback period is thus 31.4 days.

Foreign Exchange Payback

The foreign exchange payback period is calculated as the ratio of the foreign exchange component of the initial investment to the net annual foreign exchange savings.

For the Fyrite kits, the foreign exchange component of the investment cost (material cost plus shipping) is estimated at $240, with additional foreign exchange material costs of $100/yr. The foreign exchange component of the net savings is represented by the foreign exchange cost of the fuel saved, less the annual foreign exchange portion of the maintenance cost (e.g., for equipment spares). The annual foreign exchange savings would be $12,425 (= 2,500 mmBtu/yr x $4.97/mmBtu) or a net foreign exchange savings of $12,325. Thus, the foreign exchange payback period is approximately 1 week.

For the fuel electrochemical oxygen sensors, the foreign exchange component of the investment cost is $3,600. The annual foreign exchange savings are represented by the fuel savings ($62,162), less the annual maintenance cost ($1,000) or a net foreign exchange savings of $61,162. Hence, the foreign exchange payback period for the electrochemical oxygen sensors is about 3 weeks.

Replicability of Application

Combustion monitoring and control with instrumentation can be applied to all active oil-fired units in the Philippines.

According to the Asian Development Bank/BEU report, 964 oil-fired boilers with a capacity of 125,375 hp are active in the Philippines. The report estimates that 25% of the existing oil-fired boilers have adequate instrumentation and control. Thus, 723 boilers with an aggregate capacity of 94,000 hp can benefit from improved control.

Using the same assumptions and data previously presented, annual savings are estimated to be:

(119 Btu/lb) (34.5 lb/hp) (94,000 hp) (6,000 hr/yr) (10^{-6})
= 2.3 million mmBtu/yr = 63,000 KLOE/yr.

The 2.3 million mmBtu/year is valued at ₱211.6 million in 1984.

In addition to oil-fired boilers, the control strategy outlined above may also be applied to:

- o Boilers fired by fuels other than oil
- o Kilns
- o Dryers
- o Industrial furnaces

Because there is no census of the above types of equipment, aggregate savings cannot be estimated. However, there is little or no technical risk in transferring the control systems for oil-fired boilers to other types of equipment.

Demonstration Requirements

To demonstrate monitoring and control of combustion, select between 6 and 12 boiler sites that represent a variety of Philippine industries, boiler sizes, and regions. The boilers should be at least 100 hp in capacity and should operate primarily at more than 50% of rated capacity. The annual boiler operating hours should be at least 50% of facility operating hours.

Next, conduct a comprehensive energy audit of the boiler plants. The purpose of the audit is two-fold. First, it is intended to identify operating problems other than those related to the air-to-fuel ratio and combustion efficiency. These problems may mask any improvements

achieved through air-to-fuel ratio control, and if significant, would eliminate the particular facility from participation in the demonstration program. The second purpose of the audit is to determine the boiler plant baseline performance in terms of fuel consumption and plant efficiency. At the same time, the audit will also identify operational factors that affect fuel consumption (e.g., production level, operating difficulties, scheduled and unscheduled plant downtime).

The next step is to determine the optimum boiler performance levels and estimate the fuel savings possible by improved combustion control. In addition, at this point a choice must be made between a wet chemistry system or an electrochemical analyzer. If the estimated savings do not justify participation in the program, select another site.

Then, select, procure, and install the equipment. Where necessary, procure and install additional meters and data collection equipment--such as steam metering or feedwater metering equipment, fuel oil metering equipment, and thermometers or thermocouples--to verify savings. In addition, train boiler operators in the proper operation of the equipment.

Once the equipment is operationl, track boiler performance on a per shift basis, or more often if boiler operating changes occur frequently. Institute a regular data logging procedure and analyze the logged data on a regular basis (at least weekly) to determine savings achieved. Determine and log boiler combustion efficiency every time a boiler test is performed.

The final step of the demonstration program is information dissemination, which can be done through papers prepared for trade association meetings, trade association publications, and personal contacts with senior executives. In addition, develop training courses for plant engineers and boiler operators on the proper design, installation, operation, and maintenance of control systems. The training will be accomplished with the assistance of BEU, ENMAP, and PCCI.

The cost of the demonstration at six sites (exclusive of control equipment) is estimated as follows:

Monitoring and metering equipment (₱280,000 per site, installed)	₱1,680,000
Skilled TTEM staff engineer (2 man-month plus 1 man-month per site)	₱ 80,000
Information dissemination	₱ 20,000
Total	₱1.78 million ($ 96,216)

2. Flue Gas Heat Recovery Systems

Application Sector: Industrial

Description:

Hot flue gases formed as a product of combustion are generally vented to the atmosphere without any attempt to recover the heat. These gases range in temperature from several hundred degrees Farenheit (for boilers and small combustion systems) to over 1,000°F for some high-temperature furnaces and kilns. The heat contained in the gases may be recovered with metal or ceramic heat exchangers (depending on temperature and gas composition) and used to preheat fuel boiler water or combustion air.

Energy Savings (Single Application)

- Assumptions and Data

  - o Boiler has combustion control implemented (82% combustion efficiency)
  - o Boiler feedwater temperature can be increased from 180°F to 200 °F by flue gas heat recovery.

- Example of Savings

For a 500-hp boiler, 20 Btu/lb of steam are added to the feedwater by heat recovery from the flue gas, which reduces the fuel requirements by 20/0.82 = 24 Btu/lb of steam.

The annual savings =

(24 Btu/lb) (34.5 lb/hp) (500 hp) (6,000 hr/yr) 10^{-6}) = 2484 mmBtu/yr (68 KLOE/yr).

The 2,484 mmBtu/year is valued ₱228,528 or $12,353 in 1984.

The cost of the heat exchanger and piping is estimated to be $30,000 (exclusive of taxes and duties). Shipping charges, duties, and taxes are estimated at 70% of purchase price, or $21,000. Field erection is estimated to require the equivalent of 1,000 man-hours of skilled labor, at ₱60 per man-hour or ₱60,000. The annual cost of upkeep of the system is estimated at 50 man-hours of labor or ₱3,000. There are no imported parts or materials required.

The simple payback period is thus 4.4 years.

Foreign Exchange Payback

To determine the foreign exchange payback period, divide the foreign exchange investment ($36,000) by the annual foreign exchange savings (2,484 mmBtu/yr valued at $12,191). The result is a payback period of 3.0 years.

Replicability of Application

Flue gas recovery can be extended to all active oil-fired boilers as follows:

According to the ADB/bEU report, of the 964 active oil-fired boilers in the country, 30% of the units with capacity above 100 hp--70 boilers with a capacity of 29,370 hp--can employ waste heat recovery.

The annual savings potential for these oil-fired boilers is then:

(24 Btu/lb) (34.5 lb/hp) (29,370 hp) (6,000 hr/yr) (10^{-6})
= 146,000 mmBtu/yr (4,000 KLOE/yr) valued at ₱1,343,200 in 1984.

The flue gas heat recovery equipment may also be applied to:

- o Boilers fired by fuels other than oil
- o Kilns
- o Dryers
- o Industrial furnaces.

The recovered heat may be used for:

- Boiler water preheating
- Combustion air heating
- Raw material preheating
- Fuel oil preheating.

Because there is no inventory of kilns, dryers, and industrial furnaces, it is difficult to estimate aggregate savings through waste heat recovery. However, there is little technical risk in applying flue gas waste heat recovery techniques to these types of equipment. The economics of such applications will vary, depending on such factors as the temperature of the waste gas source, the target application of the waste heat, the cleanliness of the flue gas, and the equipment's hours of operation.

Demonstration Requirements

To demonstrate the efficacy of flue gas waste heat recovery, select three to six sites that represent a variety of industry sectors and equipment sizes. In the early phases of the TTEM Project, boiler applications should be emphasized. The boilers should have a capacity of at least 100 hp, and should operate at least at 50% of rated capacity. Annual boiler operating hours should correspond to at least 50% of facility operating hours.

After selecting the sites, conduct a comprehensive energy audit of each boiler plant to identify operating problems that may mask savings achieved through waste heat recovery and thus eliminate the facility from participation in the demonstration program. The audit is also used to determine baseline performance in terms of fuel conserved and plant efficiency, and to identify operational factors that affect fuel consumption (e.g., production level, operating difficulties, scheduled and unscheduled plant downtime).

The next step is to size the economizer system and determine the savings possible through heat recovery. If the savings do not justify participation in the program, select another site.

Then, select, procure, and install the equipment and train the boiler operators in its use. Where necessary, install metering and data collection equipment to verify the savings achieved (e.g., steam, feedwater, and fuel and metering equipment, thermometers/ thermocouples).

Log the performance of the economizer system on a regular basis, preferably hourly. The logged data should be analyzed on a regular basis (at least weekly) to determine savings achieved and identify any operating difficulties with the economizer system.

The final step of the demonstration program is to disseminate information and develop training progrms in the design, installation, and use of these systems. This step will be carried out in conjunction with BEU, ENMAP, and PCCI.

The cost of the demonstration at four sites (exclusive of heat exchangers) is estimated as follows:

Monitoring and metering equipment (₱280,000 per site, installed)	₱1,120,000
TTEM staff man-power (2 man-months plus 1 man-month per site)	₱ 60,000
Information dissemination	₱ 20,000
Total	₱1.20 million ($64,865)

3. Increased Insulation in Industrial Processes

Application Sector: Industrial

Description:

The use of thermal insulating materials to reduce heat loss is well known. However, discussions with energy users and insulation vendors indicate that Philippine industry has been slow to use these materials because of a lack of information and practical experience in two main areas: selection of the optimum thickness, based on economic considerations. The purpose of the demonstration program will be to provide this type of information.

Insulating materials provide a barrier to the flow of heat between a heat source (a hot object) and a heat sink (a cooler object). Generally, insulation is applied to pipes, boilers, furnaces, kilns, and process equipment such as tanks. Insulation is available in a number of materials, depending on application and the temperatures involved. Fiberglass insulation is generally useful in applications up to 500°F, with specially produced Fiberglass insulations effective up to 800°F. Above these temperatures, other types of insulating materials must be used, as indicated in the table below:

Insulating material	Maximum operating temperature (°F)
Fiberglass	500-800
Mineral wood	1,500
Vermiculate	1,800
Calcium silicate	2,000
Refractory fiber	2,600
Insulating castables	2,800
Insulating firebrick	3,200
Dense firebrick	3,300
Dense castables	3,300

Energy Savings (Single Application)

The energy savings that could be achieved by implementing this measure are illustrated by the following example of a bare 2-inch steam line, 100 feet long. With 125 psig steam, the pipe temperature is about 350°F. Assuming ambient temperatures of 90°F, the heat loss per linear foot of pipe is about 680 Btu/hr. At 6,000 hours per year of operation, the total heat loss through the bare pipe is 408 mmBtu/yr. Insulation will reduce the loss by 90%. Assuming a boiler combustion efficiency of 80%, insulation will save about 460 mmBtu/yr or 12 KLOE/yr. Annual cost savings would be approximately ₱42,320.

The cost of the insulation (based on quotations from ACI Fiberglass) is estimated as follows:

Pipe insulation = (2 inch diameter, 2 inch thick)	₱130.54/meter
Installation =	₱ 30.00/meter
Subtotal cost =	₱160.54/meter
Total cost (100 feet, or 31 meters) =	₱ 5,000.

The annual cost of insulation upkeep is negligible. At net annual savings of ₱42,320, the simple payback period is estimated to be 1.5 months.

Foreign Exchange Payback

The foreign exchange payback period is calculated as the ratio of the foreign exchange component of the investment cost to the foreign exchange component of the net savings.

In the case of Fiberglass insulation, which is generally the most applicable, there is a Philippine manufacturer--ACI Fiberglass. This manufacturer is currently operating at about two-thirds of plant capacity and is exporting over half of the insulation produced. As nearly all the materials and labor entailed in this measure would be of Philippine origin, the foreign exchange cost is minor, between $40 and $90 or an average of $65. With annual savings of $2,286 (= 460 mmBtu/year savings x $4.97/mmBtu), the resultant foreign exchange payback period is 10.4 days.

Replicability of Application

Thermal insulation can be applied almost universally--with low technical risk--where there is a heat flux, but the economic performance may vary considerably from site to site. In the absence of statistics on the utilization of insulation in existing plants, the Philippine savings that could be achieved by using the optimum economic thickness of insulation cannot be estimated. However, ACI Fiberglass estimates that much less than 1/4 of Philippine industrial facilities are properly insulated, because plant managers are not always aware of the benefits of insulation, are unable to specify the proper types of insulation, and cannot determine the economic thickness.

Demonstration Requirements

The purpose of the demonstration program is to illustrate the economic benefits of insulation and to disseminate information to potential users.

The demonstration program proposed here consists of three elements:

- Preparing and disseminating materials on the proper selection and application of insulation
- Disseminating techniques for determining the economic thickness of insulation.
- Demonstrating the actual savings possible in two to six industrial sites.

First, prepare technical data on insulation, describing the types and suggested applications. These data will also include case studies outlining the successful application and documenting the savings achieved. Much of this information can be obtained directly from Philippine vendors such as ACI Fiberglass and Philippine Insulation). During project design interviews, vendors indicated a willingness to participate in this effort.

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Next, assess and make available techniques for selecting insulation based on economic criteria. In some cases, the vendors can provide these techniques, but their capabilities are limited. In the United States, the Thermal Insulation Manufacturers Association (TIMA) provides--at a nominal cost ($110)--a computer program that calculates the economic thickness of insulation, based on fuel rates, insulation costs, and the characteristics of the insulation proposed. Other computer programs are also available for hand-held calculators. The TTEM staff will collect and evaluate these and select or adapt the most appropriate ones for Philippine users. For complex installations, the TTEM staff, BEU, or ENMAP will provide computer programs and technical assistance for use by industrial companies. Plant energy engineers will complete data entry forms and send them to BEU/ENMAP, who will conduct a computer analysis of the data and send a report back to the plant engineer. This report will identify the optimal insulation type and thickness and will estimate the expected economic performance.

This part of the program should also be supported by insulation vendors, who will provide insulation cost and technical data.

Finally, for the demonstration, select two to six sites covering a variety of industry sectors and applications. Audit these sites and install portable monitoring equipment to provide objective "before" and "after" comparisons of energy use.

The cost of the demonstration (exclusive of thermal insulating materials) is estimated as follows:

I. Preparation and Dissemination of Information

Senior engineer/technical writer (4 man-months)	₱ 40,000
Clerical (3 man-months)	₱ 15,000
Information dissemination costs (assumes significant additional help provided by BEU, ENMAP, and vendors).	₱ 10,000

II. Computer Program Evaluation

Senior TTEM staff engineer (4 man-months)	₱ 40,000
Junior TTEM staff engineer (4 man-months)	₱ 20,000
Clerical (1 man-month)	₱ 5,000
Software acquisition and supplies (assumes microcomputer available).	₱ 10,000

III. Demonstration (at 4 sites)

Monitoring equipment (₱200,000 per site)	₱800,000
Senior TTEM staff engineer (6 man-months)	₱ 60,000
Information dissemination (₱10,000 per site)	₱ 20,000

The total cost will be ₱1.02 million or approximately $55,135.

4. Power Factor Control Equipment*

Application Sector: Industrial

Description

The power factor is expressed as the ratio of actual electrical power (measured in kilowatts) to apparent power (measured in kilovolt-amperes). The actual power relates to the power actually needed to perform useful work, while the apparent power relates to total system power, which includes both the actual power and the reactive power (power that does no work) needed to overcome circuit inductance. If the power factor is equal to 1.0, no power is lost to reactive loads; if it is less than 1.0, power is being lost to reactive loads. Reactive loads occur when devices such as electric induction motors, transformers, and fluorescent lighting ballasts form a magnetic field. Alternatively, they can result from such equipment operating practices as lightly loaded induction motors or unloaded distribution transformers.

If a facility's power factor is low, the electric utility must have additional generating capacity and transmission and distribution capability. Thus, in many areas utilities impose a power factor penalty in their rates to recover the cost of providing such capacity and capability.

The Manila Electric Company (MERALCO) incorporates a power factor penalty and incentive in its General Power (GP-7) rate schedule. Its normal rates assume an average monthly power factor of 85%. For average power factor above or below this average, the kilowatt-hours metered are multiplied by the following constants:

Power factor	Constant
0.951-1.000	0.951
0.901-0.950	0.965
0.851-0.900	0.981
0.801-0.850	1.000
0.751-0.800	1.023
0.701-0.750	1.050
0.651-0.700	1.0835
0.601-0.650	1.1255
0.551-0.600	1.1785
0.501-0.550	1.2455
less than 0.500	1.335

Thus, increasing the power factor effectively reduces the cost of electric energy.

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* The only update done on this section is the re-estimation of the equipment cost based on the new exchange rate of ₱18.50/$1. This change is reflected in the computation of the Simple Payback Period. (See Page 20 of this Annex).

In addition to its electricity cost savings, a plant that controls its power factor realizes other minor benefits. A high power factor reduces the current required to meet a particular demand, which in turn reduces the line and equipment losses and increases the power delivery capacity of the plant's existing electrical system.

The power factor may be improved in two ways. The first entails improving the operation of plant equipment. As mentioned previously, certain types of plant equipment operate at a low power factor under certain conditions (induction motors at low loads, unloaded distribution transformers). The power factor can be improved by ensuring that operation of equipment does not contribute to a low power factor. The second method of power factor correction entails the use of capacitors to balance the inductance in the electrical system. Capacitors are rated in kilovolt-amperes reactive (KVAR) and are available in standard sizes. Table H2 shows how to estimate the capacitance that must be added to a circuit to raise the power factor.

Energy Savings (Single Application)

The energy savings that could be achieved by installing capacitors are illustrated by the example below. The savings will depend on the method of installation. Capacitors can be installed in three ways. One way is to connect all capacitors together at the service entrance switch gear. While this is the least costly method, it does not remove the reactive current circulating between the capacitors and low power factor loads, thus reducing the realizable savings.

The second method, which is the one usually employed, is to divide total capacitor requirements into groups and connect each group around the plant's major electrical subcircuits. This option is sometimes carried out in conjunction with the third option.

The third option requires placing a properly sized capacitor at each motor, and switching the motor-capacitor as a unit. While this method achieves the greatest power factor improvement, it is the most expensive of the three options, and is seldom justified economically.

The following example indicates the cost savings that can be achieved by power factor improvement. A manufacturing plant uses about 1.2 million kilowatt-hours per month, with a peak monthly electric power demand of 2,800 KW. The average monthly power factor is 65%, and the plant wants to increase it to at least 91%. Using table H2, the KVAR factor is 0.713 x 2,800 = 1,996 KVAR, or roughly 2,000 KVAR.

Assuming that the capacitors are to be installed in five groups of 400 KVAR each, with each bank consisting of eight 50-KVAR capacitors, the capital cost will be approximately $42,500, including protection and switchgear. Shipping, duties, and taxes are estimated at 70% of capital cost, or $29,750. Total capital cost is thus $72,250 or ₱1,336,625.

Table H2
Power Factor Multiplier Table

DESIRED POWER FACTOR IN PERCENT

ORIGINAL POWER FACTOR IN PERCENT

	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
50	0.982	1.008	1.034	1.060	1.086	1.112	1.139	1.165	1.192	1.220	1.248	1.276	1.306	1.337	1.369	1.403	1.442	1.481	1.529	1.590	1.732
51	937	962	988	1.015	1.041	1.067	1.094	1.120	1.147	1.175	1.203	1.231	1.261	1.292	1.324	1.358	1.395	1.436	1.484	1.544	1.687
52	893	919	945	.971	997	1.023	1.050	1.076	1.103	1.131	1.159	1.187	1.217	1.248	1.280	1.314	1.351	1.392	1.440	1.500	1.643
53	850	876	902	928	954	980	1.007	1.033	1.060	1.088	1.116	1.144	1.174	1.205	1.237	1.271	1.308	1.349	1.397	1.457	1.600
54	809	835	861	887	913	939	966	992	1.019	1.047	1.075	1.103	1.133	1.164	1.196	1.230	1.267	1.308	1	1.416	1.559
55	768	795	821	847	873	899	928	952	979	1.007	1.035	1.063	1.090	1.124	1.156	1.190	1.228	1.268	1	1.377	1.519
56	730	756	782	808	834	860	887	913	940	968	996	1.024	1.051	1.085	1.117	1.151	1.189	1.229	1.277	1.336	1.480
57	692	718	744	770	796	822	849	875	902	930	958	986	1.015	1.047	1.079	1.113	1.151	1.191	1.239	1.300	1.442
58	655	681	707	733	759	785	812	838	865	893	921	949	976	1.010	1.042	1.076	1.114	1.154	1.202	1.263	1.405
59	618	644	670	696	722	748	775	801	828	856	884	912	939	973	1.005	1.039	1.077	1.117	1.165	1.226	1.368
60	584	610	636	662	688	714	741	767	794	822	850	878	905	939	971	1.005	1.043	1.083	1.131	1.192	1.334
61	549	575	601	627	653	679	706	732	759	787	815	843	870	904	936	970	1.008	1.048	1.096	1.157	1.299
62	515	541	567	593	619	645	672	698	725	753	781	809	836	870	902	936	974	1.014	1.062	1.123	1.265
63	483	509	535	561	587	613	640	666	693	721	749	777	804	838	870	904	942	982	1.030	1.091	1.233
64	450	476	502	528	554	580	607	633	660	688	716	744	771	805	837	871	909	949	997	1.058	1.200
65	419	445	471	497	523	549	576	602	629	657	685	713	740	774	806	840	878	918	966	1.027	1.169
66	388	414	440	466	492	518	545	571	598	626	654	682	709	743	775	809	847	887	935	996	1.138
67	358	384	410	436	462	488	515	541	568	596	624	652	679	713	745	779	817	857	905	966	1.108
68	329	355	381	407	433	459	486	512	539	567	595	623	650	684	716	750	788	828	876	937	1.079
69	299	325	351	377	403	429	456	482	509	537	565	593	620	654	686	720	758	798	846	907	1.049
70	270	296	322	348	374	400	427	453	480	508	536	564	591	625	657	691	729	769	817	878	1.020
71	242	268	294	320	346	372	399	425	452	480	508	536	563	597	629	663	701	741	789	850	992
72	213	239	265	291	317	343	370	396	423	451	479	507	534	568	600	634	672	712	760	821	963
73	186	212	238	264	290	316	343	369	396	424	452	480	507	541	573	607	645	685	733	794	936
74	159	185	211	237	263	289	316	342	369	397	425	453	480	514	546	580	618	658	706	767	909
75	132	158	184	210	236	262	289	315	342	370	398	426	453	487	519	553	591	631	679	740	882
76	105	131	157	183	209	235	262	288	315	343	371	399	426	460	492	526	564	604	652	713	855
77	079	105	131	157	183	209	236	262	289	317	345	373	400	434	466	500	538	578	626	687	829
78	053	079	105	131	157	183	210	236	263	291	319	347	374	408	440	474	512	552	594	661	803
79	026	052	078	104	130	156	183	209	236	264	292	320	347	381	413	447	485	525	587	634	776
80	000	026	052	078	104	130	157	183	210	238	266	294	321	355	387	421	459	499	541	608	750
81		000	026	052	079	104	131	157	184	212	240	268	295	329	361	395	433	473	515	582	724
82			000	026	052	078	105	131	158	186	214	242	269	303	335	369	407	447	489	556	698
83				000	026	052	079	105	132	160	188	216	243	277	309	343	381	421	463	530	672
84					000	026	053	079	106	134	162	190	217	251	283	317	355	395	437	504	645
85						000	027	053	080	108	136	164	191	225	257	291	329	369	417	478	620
86								026	053	081	109	137	167	198	230	265	301	343	390	451	593
87									027	055	082	111	141	172	204	238	275	317	364	425	567
88										026	056	084	114	145	177	211	248	290	337	398	540
89											028	056	086	117	149	183	220	262	309	370	512
90												028	058	089	121	155	192	234	281	342	484
91													030	061	093	127	164	206	253	314	456
92														031	063	097	134	176	223	284	426
93															032	066	103	145	192	253	395
94																034	071	113	160	221	363
95																	037	079	126	187	328
96																		042	089	150	292
97																			047	108	251
98																				061	203
99																					142

Power-factor multiplier to determine the kVARs needed to correct a low pf. The multiplier is found at the intersection of the original pf and desired pf. This number multiplied by the kW equals the amount of kVARs required to increase the existing pf to the desired pf.

Installation cost is estimated at ₱10,000, based on an installation time of 30 man-days using a skilled electrician.

The annual operating cost is estimated at ₱2,400, based on 40 man-hours per year of skilled labor.

The annual savings are calculated as follows, using MERALCO rate schedule GP-7.

Cost of Electricity Without Power Factor Correction

Billing kwh = 1,200,000 x 1.1255 =	1,350,600 kwh
Demand charge = 2,800 kw x ₱12.60/kw =	₱ 35,280.00
Billing KW = 2,800 KW.	
Energy charge:	
First 200 hours x 2,800 KW x ₱0.270 (560,000 KWh) =	₱ 151,200.00
Next 200 hours x 2,800 KW x ₱0.260 (560,000 KWh) =	₱ 145,600.00
Next 200 hours x 2,800 KW x ₱0.250 (80,000 KWh) =	₱ 20,000.00
Total =	₱ 352,080.00
Bulk sales discount (12.52%) =	(₱44,080.42)
Net Energy Charge =	₱ 307,999.58
Purchased power adjustment (₱0.8556/kWh)	₱1,155,573.36
Exchange rate adjustment (8.6%)	₱ 26,487.96
Total net annual bill =	₱1,489,860.90

Cost of Electricity with Power Factor Correction

Billing kWh = 1,200,000 x 0.965	1,158,000.00
Demand charge = 2,800/KW x ₱12.60/KW =	₱ 35,200.00
Billing KWh = 2,800 kW.	

Energy charge:

First 200 hours x 2,800 KW x ₱0.270 (560,000 KWh) =	₱ 151,200.00
Next 200 hours x 2,800 KW x ₱0.260 (560,000 KWh) =	₱ 145,600.00
Next 200 hours x 2,800 KW x ₱0.250 (80,000 KWh) =	₱ 9,500.00
Total =	₱ 341,580.00
Bulk sales discount (11.24%) =	(₱38,393.59)
Net Energy Charge =	₱ 303,186.41
Purchased power adjustment (₱0.856/kWh)	₱ 990,784.80
Exchange rate adjustment (8.6%)	₱ 26,074.03
Total net annual bill =	₱1,320,045.24

Savings

Monthly Savings	₱ 169,815.66
Annual Savings	₱2,037,800.00

Simple Payback Period

The simple payback period is estimated as:

Cost of equipment plus installation	₱ 1,336,625
Annual savings	₱ 2,037,800
Annual operating cost	₱ 2,400
Net annual savings	₱ 2,035,400

The simple payback period is 8 months.

The payback period for a power factor correction project is very sensitive to the amount of power factor correction required.

Benefit to Electric Utility

Improved power factor will benefit the electric utility as follows:

To provide 2,800 KW of real power to an industrial client at a power factor of 65%, the utility must be able to provide (with three-phase, 480 volt service)

$$(2,800) \times (1,000)/(1.737) \times (480 \text{ volts}) \times (0.65) = 5,167 \text{ amps.}$$

If the power factor is increased to 90% (as in the example above), the current in the circuit is reduced to

$$(2,800) \times (1,000)/(1,737) \times (480)\ (0.90) = 3,731 \text{ amps.}$$

This reduced current draw reduces heating in all elements of the power system upstream of the load, thereby reducing the utility's requirement for layer generators, transformers, switchgear and transmission and distribution conductors. Because heating is proportional to the square of the amperage, the relative heating is cut in half. As a result, the distribution system's capital and O&M costs are reduced and its reliability is improved.

Foreign Exchange Payback

Improving the power factor requires the use of capacitors and switch gear that are not produced in the Philippines. While there is at least one capacitor manufacturing facility, it mainly assembles capacitors from imported components, and has a limited product line. Thus, the foreign exchange cost for capacitors for the factory in the example above would be $51,000 (including shipping at 20% of capital cost).

The foreign exchange savings come from two sources: a reduction in the amount of oil burned by the utility to meet demand, and a reduction in the imported equipment needed for power conditioning, transmission, and distribution. The oil burned by the utility is directly related to the KVA required by the load. Thus, an improvement in the power factor from 0.65 to 0.91 reduces the oil consumption by approximately 29%. If the factory in the example used 1,200,000 kWh/month and had a marginal utility heat rate of 11,000 Btu/kWh, its monthly savings would be 4,800 mmBtu. With an oil foreign exchange cost of $4.97/mmBtu, the annual savings would be $286,272. Assuming a foreign exchange cost of $51,000 (including 20% shipping), the foreign exchange payback period would be 2.2 months.

With power factor improvement, the utility company can provide improved service to its customers and reduce the need for foreign-source generating capacity and associated power conditioning, transmission and distribution equipment. Thus, it can serve existing loads more efficiently and reliably. No estimate was made of the foreign exchange value of the utilities' improved service, as it would require a detailed evaluation of each utility that was beyond the resources of this study.

Replicability of Application

Power factor corrections can be made in any large industrial facility that has significant inductive loads such as motors and fluorescent light ballasts. In addition, the local utility must have a power factor adjustment in its rate schedule if the facility is to realize savings. Because it was not possible to collect aggregate data on actual power factors of industrial facilities, no estimates were made of the number of facilities able to use power factor correction. Vendors, utility personnel, and users, however, estimate that less than one-quarter of the facilities that could benefit from power factor correction systems currently use them.

Demonstration Requirements

The demonstration program will illustrate the benefits of power factor correction for the customer.

The first step is to select two to six industrial facilities for the demonstration program. Each plant should be subject to a power factor penalty by its electric utility. Next, conduct a comprehensive electric service audit of the plant to develop an inventory of electricity consuming equipment and its respective rated and actual power consumption and power factor. As a result of the audit, a low power factor may be traced not to the inherent power factor characteristics of equipment, but rather to poor operating practice (such as grossly oversized induction motors or unloaded distribution transformers). In such a case, the plant may not be a good candidate for this demonstration unless replacement or modification of these types of equipment is intended. The audit will also serve to identify locations at which the power factor correction capacitors should be applied (e.g., at the main service entrance, at plant distribution circuits, at individual pieces of equipment, or at a combination of these locations). Next, conduct an analysis to determine optimum power factor correction and select, procure and install the capacitors.

Finally, provide training to plant operators in the proper use and maintenance of the capacitor systems.

The remainder of the demonstration entails monitoring and reporting the results of the project. To monitor the results, use fixed amperage and power factor metering and recording instruments at the incoming service point (just downstream of utility meter) and portable current and power factor test equipment to test individual pieces of equipment and circuits.

The cost of the demonstration at four sites (exclusive of the capacitor systems) is estimated as follows:

Monitoring equipment (₱42,000 per site; 2/3 fixed, 1/3 portable)	₱168,000
Skilled TTEM staff engineer (2 man-months plus 1 man-month per site)	₱ 60,000
Report reproduction and dissemination	₱ 10,000
Total	₱238,000
	($12,865)

5. Steam Distribution System Maintenance Procedures

Application Sector: Industrial

Description

Regular inspection and maintenance of steam distribution systems can result in immediate and significant savings in energy with little or no capital investment. These savings are achieved primarily through proper maintenance of steam traps and repair of steam leaks.

The main function of a steam trap is to remove steam condensate from the steam distribution system while preventing the escape of live steam to the atmosphere. There are a number of different types of steam traps, each with its own operating principles and maintenance requirements. The major types are open bucket traps, inverted bucket traps, float and thermostatic traps, disk traps and thermostatic traps.

While the steam trap's primary purpose is not to save energy, improper maintenance can result in significant energy waste. For example, if a steam trap fails in the open position, live steam will flow directly through the trap, which can cause a pressure buildup in the condensate system and lead other steam traps to fail. If the trap exits to the atmosphere, steam will be released directly to the air, resulting in wasted energy, just as a steam leak would. If the trap fails in the shut position, it stops the flow of steam in the system. Condensate and gases build up, causing corrosion and/or a loss of heat to the process. Severe damage can occur if "water hammer" results from the shut trap.

A proper steam trap maintenance program will reduce or eliminate the incidence of failure and thus save energy as well as prevent damage to the steam system. Such a program should include visual inspections of valves, joints, seals, etc. for steam leaks on a weekly or monthly basis. In addition, more detailed inspections involving partial disassembly of traps should be made to remove dirt and foreign material deposited in strainers, steam traps and in the bottom of steam heated equipment. For new installations, these inspections should be performed frequently, at least every 3 months. For older systems, semi-annual or annual inspections are sufficient, depending on the operation of the system.

Energy Savings (Single Application)

The following table indicates the extent of steam loss for various size orifices at four steam pressures:

Steam pressure (psig)	Steam loss (lb/hr) at orifice site			
	1/8"	1/4"	3/8"	1/2"
15	18.7	75	168	300
50	40.8	163	368	653
100	72.4	290	652	1158
150	104	416	936	1663

Source: ITT Fluid Handling Division

The energy savings that could be achieved through maintenance of the steam distribution system are illustrated in the following example. Assume that a steam trap with a 1/4 inch orifice has failed to open. Steam is generated at 100 psig from feedwater at 100°F. The boiler operates for 6,000 hours per year, at 82% efficiency.

The table indicates a loss of 290 pounds of steam per hour. The annual fuel used to generate the steam is:

(1040 Btu/lb) x (290 lb/hr) x (6,000 hr/yr)/(0.82) x (10^6)
= 2206 mmBtu/yr (60 KLOE/yr)

The 2,206 mmBtu/year is valued ₱202,952.

If the plant identifies five such leaks per year, the annual savings would be 11,030mmBtu/year and valued ₱1,014,760.

The cost of the steam system maintenance program is estimated as follows:

Skilled labor for survey (1 man-month per year)	₱10,000
Trap replacement cost (5 traps) trap cost = $200 each shipping = $40 each duties, taxes = $100 each Total = $1,700	₱31,450
Trap installation cost (5 traps at 2 man-hours per trap)	₱ 600
Total	₱42,050

The simple payback is estimated as follows:

Annual cost of survey equipment and installation	₱42,050
Annual savings	₱1,014,760

The simple payback period is thus 15 days.

The example above assumes complete replacement of malfunctioning steam traps. Replacement parts for steam traps and rebuilt steam traps are available, reducing investment costs and hence the payback period.

Foreign Exchange Payback

The foreign exchange cost for imported steam traps is approximately $1,200/year per installation (5 traps at $240/trap for materials and shipping). The foreign exchange savings are $10,964 for imported oil (2,206 mmBtu/year x $4.97/mmBtu). The foreign exchange payback period is thus 1.3 months.

Replicability of Application

It is difficult to extend the analysis to encompass all industrial plants, because of the differences in plant operating conditions. However, a rough estimate can be made of the potential savings from a nationwide steam trap maintenance program.

The ADB/BEU report cited a total of 964 active oil-fired boilers and 100 active boilers fired by fuel other than oil in the Philippines. If one-third of the boilers are in multi-boiler installations, there are a total of 700 installations. If one-third of these installations already have inspection programs, savings can be achieved in 470 of the installations. If the savings in each installation are comparable to the facility in the example, the annual savings could be 140,000 KLOE/yr, or approximately ₱473 million annually. Discussions with steam trap vendors indicate these cost estimates are probably conservative, and that the potential savings are probably much greater.

Demonstration Requirements

The first step is to select two to six facilities that do not now have a steam system maintenance program in place. Next, conduct a comprehensive steam system survey (including boiler, steam distribution, and condensate return system) of the facility. At this time, identify steam and condensate leaks and malfunctioning steam traps. Also, institute a training program for plant personnel in the techniques and instruments needed to identify malfunctioning traps. Steam trap vendors have indicated a willingness to assist the TTEM Project develop such a program.

Then, identify the magnitude of steam losses and estimate savings. Next, select, procure and install the replacement steam traps, steam trap components, valve seals, pipework and other replacement parts.

The final step is to monitor, report and disseminate the program results. This step will require the installation of monitoring equipment (as appropriate) to include fuel, steam flow, feedwater and makeup water meters.

The additional cost of the demonstration at four sites is estimated as follows:

Skilled engineers (2 man-months plus 1 man-month per site)	₱ 60,000
Monitoring and metering equipment	₱840,000
Report reproduction and dissemination	₱ 20,000
Total	₱920,000 ($49,730)

6. Training, Technical Assistance and Study Programs

Application Sector: Industrial

Description

One of the major reasons for energy inefficiency is a lack of trained industrial personnel in the energy-related areas. While BEU and ENMAP have provided energy audit training to ENMAP members in response to GOP legislation, their training appears to be mostly of the classroom type, with little hands-on training. The current ENMAP/BEU courses appear to be targeted at the plant engineer level; there are no identified training programs geared to plant operating personnel.

In addition, there is a need for technical assistance on an "on-site" basis provided by foreign experts who can share their experience with Philippine industry. Finally, the project will need to conduct specific studies to develop a data base on energy use in Philippine industry which can be used to identify high potential opportunities for energy conservation. Discussions with energy users and vendors indicate a need for the following types of technical assistance and training programs.

a. Training Program

Boiler Operations. The purpose of this program is to instruct boiler operators in the energy efficient operation of boilers, steam distribution and condensate return systems. This program is very practical, with a minimum of class room instruction and a maximum of hands-on instruction with actual boilers. The course should cover, at a minimum:

- Principles of combustion
- Boiler combustion efficiency testing and adjustment
- Maintenance of boiler burners
- Survey and maintenance of steam distribution system
- Proper operation and maintenance of steam traps.

The course presentation will require 1 to 2 weeks each time it is given, depending on the background and experience of the participants. The participants or their corporation will be expected to provide for their own expenses. In addition, they may be required to pay a nominal fee to cover the course costs (from ₱500 to ₱1,500 per student). The costs of this training program are estimated as:

Course Development Costs

Consultants, engineers and academics	₱100,000
Typing, editing and graphics	20,000
Materials	10,000
Total	₱130,000

Course Presentation Costs (1 week course)

Instructors (including expenses)	₱10,000
Materials and facilities (30 students)	20,000
Total	₱30,000

Energy Auditing. The purpose of this program is to transfer the classroom training provided by BEU/ENMAP to practical applications. This transfer involves the instrumented energy audit of a participating industrial plant under the supervision of experienced auditors/instructors. The course would be geared to plant energy managers, and would cover details of the following plant systems:

- Boiler and steam distribution systems
- Refrigeration and distribution systems
- Lighting and HVAC systems
- Building envelope
- Process systems
- Electrical systems.

The course would also cover the identification and economic analysis of energy conservation projects in each of these areas. A similar program is currently being implemented under USAID auspices in Sri Lanka.

An opportunity exists here to develop a joint effort with the UNIDO energy audit training program that is currently helping to train BEU personnel in energy auditing techniques. Initially, the course will require approximately 3 weeks to cover the necessary material. If possible, it should include one or two plant visits to illustrate the techniques being taught. The course would be followed by an audit by participants of their plants and a 1- to 2-week follow-up course during which the participants' audits are discussed and advanced techniques are introduced.

The costs for this program are estimated as:

Course Development Costs

Consultants, engineers and academics	₱120,000
Typing, editing and graphics	25,000
Materials	15,000
Total	₱160,000

Course Presentation Costs (1 week course)

Instructors (including expenses)	₱30,000
Materials and facilities (30 students)	50,000
Total	₱80,000

b. Technical Assistance Programs

Technical assistance programs can provide industry-specific expertise to the Philippines. These programs involve the use of primarily U.S. technical personnel to provide on-site expertise in the following areas:

- o Energy audits, especially process-oriented audits
- o Analysis of industrial plant operating practices
- o Establishment of plant maintenance programs
- o Detailed analysis of complex energy conservation investments (including process modifications)
- o Analysis of cogeneration or on-site generation projects.

Generally, the technical personnel will be recognized experts in their particular industry sector. Normally, they require 2 to 6 weeks in-country for each assignment, plus 1 to 3 weeks additional for preparation. Because of the wide variety of assignments which will be performed and the resulting wide variety of requirements, no estimate is made of the costs of this. Normally, this assistance will be provided by the U.S. contractor, and will be funded from the grant portion of the project.

c. Study Program

The TTEM Project will also fund specific studies to identify and evaluate energy conservation opportunites. The information developed will be used for TTEM program planning purposes, and the data will be made available to users, vendors, and service organizations to help

them identify applicable technologies and procedures. In addition, these studies will serve to train TTEM staff, and provide a "baseload" of work to cushion the "peaks and valley" workload of demonstration subproject development. At this time, the specific studies to be undertaken have not been identified.

One example of the type of study which would be undertaken is comparative analysis of industrial energy use in specific industrial processes in various industrialized and industrializing countries. This will allow Philippine industrial energy users to determine what their energy consumption is relative to other plants around the world and thus indicate specific areas for improvement and the amount of improvement which is possible. Such data is currently being developed by the World Bank and similar organizations. In addition, many multinatiional corporations provide their Philippine subsidiaries with periodic comparisons of the energy consumption of the corporation's plants around the world. Some may be willing to share this information. The study itself will be a continuous effort to develop and update this data base, and will require approximately 1/4 to 1/2 man-years each year.

B. Building System Maintenance Procedures

1. Outside Air Temperature Compensation for Chiller Systems

Application Sector: Commercial Buildings

Description

Chiller systems filled with basic controls produce water chilled to a single temperature, typically 45°F. In milder weather, these systems use too much energy, as building cooling load requirements could be satisfied with water chilled to a temperature above 45°F. However, automatic controls can be used to reset the chilled water temperature based on the outside air temperature. These controls are relatively inexpensive and operate in conjunction with existing chiller controls.

Automatic reset controls operate by sensing outside air temperature and loading or unloading the chiller(s) in stages. The chilled water temperature is generally determined by an algorithm that computes the difference between the "hottest day" outside air temperature and the current outside air temperature, and then adjusts the chilled water temperature on some predefined basis, using the "hottest day" chilled water temperature as the minimum.

Energy Savings (Single Application)

The energy savings that could be achieved by implementing this measure are illustrated by the following example. Assume that a chiller is adjusted to produce chilled water at 44°F when the outdoor temperature is 95°F, at an input power of 117 kW. If the outdoor temperature is 85°F, the building cooling load could be met by raising the chilled water temperature to 48°F, which will reduce the input power to 106 kW.

If the chiller plant operates 10 hours a day, 5 days a week, 50 weeks a year, and consists of three units, and if the chilled water temperature can be raised to 48°F for 40% of the operating hours, the savings will be:

(3) x (117-106kW) x (10hr/day) x (5 day/wk) x (50 wk/yr) x (0.4) = 33,000 kWh/year.

Using a marginal cost of electric energy of ₱1.20 per kWh (the November 1984 MERALCO commercial rate, including purchased power adjustment and exchange rate adjustment), the annual cost savings will be ₱37,950.

The cost of the control package is estimated at $12,000, including 70% of the purchase price for shipping, taxes, and duties.

Design and installation charges are estimated at ₱60,000, based on the use of 1,000 man-hours of skilled labor.

The annual labor cost of system maintenance is estimated at ₱3,000, based on the use of 50 man-hours of skilled labor.

The simple payback period is estimated as follows:

Cost of equipment and installation	₱282,000
Annual savings	₱ 37,950
Annual operating cost	₱ 3,000
Net savings	₱ 34,950

The simple payback period is thus 8.1 years.

Foreign Exchange Payback

The foreign exchange cost (controls plus charges of 20% for shipping) is approximately $8,470. The electricity savings are 33,000 kWh/year. At a marginal utility heat rate of 11,000 Btu/kWh, the annual fuel savings are 363 mmBtu. At $4.97/mmBtu, the annual foreign exchange savings are approximately $1,804. Thus, the foreign exchange payback period is 4.7 years.

Replicability of Application

Reset chiller controls can be applied to any reciprocating, centrifugal, or screw compressor type electric chiller. These controls can also be fitted to steam absorption refrigeration systems, although discussions with vendors and architects did not indicate the use of these systems in any commercial buildings in the Philippines. There may be an opportunity to extend this technology to the industrial area, for use in controlling process cooling equipment. No information is available on the extent of potential application in this area. However, industrial refrigeration requirements are generally "steady-state" in nature, which may limit the application.

Demonstration Requirements

The demonstration should be structured to include the following activities. First, select two to six facilities of various sizes and types (e.g., hospitals, hotels, office buildings). Each facility chosen should have at least a 200-ton chilled water plant, with multiple compressors capable of being sequenced. The chillers shoud operate to supply the same chilled water system.

Subject the chilled water system and air conditioning system of each building to a comprehensive energy audit. The purpose of the audit is two-fold.

First, it serves to identify other potential HVAC* system problem areas. Any facility that suffers from improperly functioning controls on air handling units should not be part of the demonstration, since any savings achieved by chiller control may be masked by the malfunctioning controls. The second purpose of the audit is to develop an estimate of baseline energy consumption from which savings may be identified.

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* HVAC - Heating, Ventilation, Air Conditioning

The next step of the demonstration program is to select, procure, and install the controls. In addition, building engineers must be trained in the proper use of the equipment. Monitoring and data recording equipment will also be required for the demonstration, including watt-hour meters for electric chillers, and temperature sensors and recorders for all chilled water and outside air.

The final step of the demonstration program is to report and disseminate the results. This step will be carried out in conjunction with existing professional and trade organizations such as the United Architects of the Philippines, the Philippine Institute of Architects, the Philippine Association of Mechanical Engineers, PCCI, ENMAP, and BEU. The cost of the demonstration at four sites (exclusive of reset chiller controls) is estimated as follows:

Monitoring and metering equipment ($10,000 per site)	₱740,000
Skilled engineers (3 man-months plus 1 man-month per site)	₱ 60,000
Report reproduction and dissemination	₱ 20,000
Total	₱820,000 ($44,324)

2. Building Energy Management Systems

Application Sector: Commercial Buildings

Description

An energy management system (EMS) is composed of microprocessor-based devices that control and optimize energy use in a building or facility. An EMS is capable of on-site programming by building operating personnel, and can provide some or all of the following control strategies:

- o Time of day on/off control
- o Time of day duty cycling
- o Time of day duty cycling with temperature compensation
- o Peak electric demand control by load shedding or cycling
- o Optimum start/stop

- Chilled water reset
- Temperature control/night setback/night set/onward
- Energy usage reporting.

In general, the cost of an EMS, and the energy savings achievable with its use, increase with the capability of the system. Some specific uses for EMSs during project design are:

- Time-of-day on/off control. Such control is manual at present, and may thus result in an unnecessary use of equipment. This application should be coupled with optimum start/stop.
- Optimum start/stop. By monitoring indoor and outdoor conditions, an EMS will start equipment as late as possible and shut down equipment as early as possible while still allowing comfort conditions to be maintained in the spaces served by building HVAC equipment.
- Time-of-day duty cycling with temperature compensation. This function, which may be possible in some buildings, will help to reduce building peak demand and electric energy use. However, this strategy may not be effective where air conditioning is needed for humidity control.
- Peak electric demand control by load shedding or cycling. This option, while not necessarily cost effective under present utility rate schedules (which tend to have low demand charges), may become more attractive as utility rates increase and/or rates are restructured to include higher demand charges.

Other EMS functions such as chilled water reset or temperature control are not included because they can be accomplished by other, less expensive means. For example, reset controls can be used to compensate for outside air temperature. Temperature can best be controlled by recalibrating and refurbishing existing HVAC controls and instruments.

By eliminating the need for some control functions in an EMS, its first cost, installation cost, and maintenance cost can be kept to an acceptable level.

Energy Savings (Single Application)

Experience with energy management systems in the United States and other countries indicates that they can save between 5 and 50% of the energy used in buildings. For example, assume that a 15-story office building has a total of 18 air handling units, 400 tons of refrigeration, and an area of about 110,000 square feet (10,800 square meters). A typical Philippine office building of this size consumes about 1,893,000 kilowatt-hours annually, at a cost of ₱1,833,000. If energy usage can be cut by 10% by using the EMS to reduce HVAC unit operating hours, the annual savings would be 189,300 kWh. At a marginal cost of ₱1.15 per kWh, the annual cost savings would be ₱217,695.

The cost of the EMS is estimated at $10,000 inclusive of all sensors and electrical hardward, plus $7,000 for shipping, taxes, and duties. Design and installation would require 600 man-hours of skilled labor, for a cost of ₱36,000.

The annual system maintenance cost (80 man-hours per year) is estimated at ₱4,800.

The simple payback period is estimated as follows:

Cost of equipment ($17,000)	₱314,500
Design and installation cost	₱ 36,000
Annual savings	₱217,695
Annual operating cost	₱ 4,800
Net annual savings	₱212,895

The simple payback period is thus 1.6 years.

Foreign Exchange Payback

The foreign exchange cost (materials plus 20% for shipping and handling) of a typical EMS is $12,000. With annual foreign exchange savings (189,300 kWh times $0.062/kWh) of 11,737, the foreign exchange payback period would be 1.02 years.

Replicability of Application

Energy management systems can be used in office buildings, hotels, hospitals, apartment buildings, and large retail stores of shopping centers. The selection of EMS capabilities is very site-specific. For instance, similar office buildings may use significantly different

control strategies, depending on the equipment in the facility. In addition, a single building may require different control strategies for different areas. For example, because of health codes and regulatiions, certain areas in hospitals may not be shut down even when they are unoccupied (e.g., operating rooms). Thus, the use of duty cycling depends on the degree of air handling unit oversizing and the number of air changes per hour required. Similarly, the use of duty cycling in the public areas of hotels depends on the nature of the area. For instance, cycling would probably be possible in lobbies and vestibules, but not in occupied banquet halls where an optimum start/stop strategy would be more suitable. In guest rooms, individual detectors that control the air conditioning unit (which is usually a fan coil unit) are generally more cost-effective than central control.

Demonstration Requirements

Because of the wide variety of building types and possible performance, select six to ten facilities for demonstration. Each facility should have about 30 units or groups of units to be controlled and should require no more than 6 analog sensing points. The facility should operate on a regular schedule, with only occasional departures from that schedule, and have no operable automatic controls in place that correspond to an EMS.

Conduct a detailed energy audit of the facility to determine the actual units to be controlled and the control strategy to be employed. The audit will also determine the baseline energy consumption with which to measure savings and will indicate the savings possible by use of an EMS.

Next, select the EMS on the basis of the building control requirements, and procure and install it. Then, train building operating personnel to program the EMS. A "break-in" period of about 1 month will be required to fine-tune the EMS programming and verify that controlled equipment is operating according to the program.

No additional monitoring equipment is required, as all savings will be reflected in the utility billing. If desired, portable watt-hour meters can be used to verify the operation of selected equipment.

The final step in the program is to report and disseminate the results. This step will be carried out through trade associations, BEU, and ENMAP.

The cost of the demonstration at eight sites (exclusive of energy management systems) is estimated as follows:

Monitoring equipment (optional) (4 portable sets at $2,000 per set)	₱148,000
Skilled TTEM staff engineer (2 man-months plus 1 man-month per site)	₱100,000
Report reproduction and dissemination (accomplished through sponsoring company, BEU, and ENMAP)	₱ 20,000
Total	₱268,000 ($14,486)

3. Increasing Roof Insulation in Existing Buildings

Application Sector: Commercial Buildings

Description

The use of roof insulation in Philippine commercial buildings was not a wide- spread construction practice prior to the mid-1970s. Most buildings used simple single concrete slab roofs, which offer little resistance to solar heat gain and heat transfer through the surface. This measure would demonstrate the benefits of retrofitting roof insulation.

Energy Savings (Single Application)

The energy savings that could be achieved by implementing this measure are illustrated by the example of an office building with a 7,500-square-foot uninsulated slab roof. The heat transfer coefficient of the uninsulated roof is about 0.25 Btu/hr/sq ft/^{o}F. The use of 50 mm (2 inches) of roof insu- lation under the deck will decrease the heat transfer coefficient to 0.08 Btu/hrsq ft^{o}F. Assuming an average cooling load temperature difference of 45^{o}F (including insulation) over the year, and operation of the cooling system for 10 hours/day, the reduction in heat transfer is computed as

$$Q = U \times A \times dT = (0.25-0.08) \times (7,500) \times (45) = 57,375 \text{ Btu/hour}$$

where

U = heat transfer coefficient (Btu/hr/sq. ft./^{o}F)

A = roof area (sq. ft.)

dT = temperature difference (^{o}F).

Over the course of the year, this reduction amounts to

(57,375) x (10 hour/day) x (5 day/week) x (52 week/yr) x (10^{-6})

= 149 mmBtu/year.

With an air conditioning system coefficient of performance (COP) of 3, the savings are about 14,500 kWh per year. At a marginal rate of ₱1.15 per kWh, the cost savings are ₱16,675 per year.

Fiberglass vendors estimate the cost of fiberglass insulation at ₱140.65 per square meter (₱13.32 per square foot), and installation costs at ₱30 per square meter (₱2.04 per square foot). The installed cost of insulation would thus be ₱120,200. Annual maintenance is negligible.

The simple payback period is estimated as follows:

Cost of insulation and installation	₱120,200
Annual savings	₱ 16,675

The simple payback period is thus 7.2 years.

These savings estimates are based on the reduction of heat transfer into the conditioned space only when air conditioning systems are operating. The application of insulation will also reduce the rate at which the space heats up overnight and on weekends, which may reduce the amount of time needed by the air conditioning system to cool down the building prior to normal occupancy, and may also permit shutdown of the cooling system before occupancy of the building ends for the day. These additional savings will further reduce the payback period.

Foreign Exchange Payback

The foreign exchange cost of this measure is very small, as fiberglass insulation is manufactured in the Philippines and thus little is imported. If the average foreign exchange component is 10% of the Fiberglass cost (₱14.1 per square meter), the foreign exchange cost in the example above is about $540. At foreign exchange savings of about $899 (14,500 kWh times $0.062/kWh), the foreign exchange payback period is about 7.3 months.

Replicability of Application

Thermal insulation can be used in commercial buildings as a retrofit project or part of the original building design. In addition, to increase the thermal integrity of the building, it may be economically advantageous either to replace existing insulation or add to it.

Underslab insulation--which was discussed in the example--is generally not economically justified in retrofit applications. However, its application to walls in new construction can be very attractive. Insulation can also be applied to air conditioning ductwork (either internal or external), parti- cularly when the ductwork passes through unconditioned spaces (e.g., mechanical rooms), and it can also be applied to chilled water pipework.

Demonstration Requirements

First, select the buildings to demonstrate roof insulation. The buildings selected should be multi-story, air conditioned, with no existing underslab roof insulation, and with reasonable access to the underslab for the retrofit. Each roof area should be 6,000 to 15,000 square feet (550 to 1,450 square meters). Two or four buildings should be selected.

Next, conduct a comprehensive energy audit of the buildings to determine baseline energy use and identify structural problems that may mask the savings achieved by insulation.

Prior to the installation of insulating materials, estimate heat transfer through the slab roof by using temperature sensors to record four variables.

- Outside air temperature
- External roof surface temperature
- Internal roof surface temperature
- Conditioned space temperature.

In addition, estimate average solar insolation if cloud cover statistics are known; these statistics should be available from a local meteorological station.

Then, determine the type of insulation required and specify, procure, and install it. Add another temperature sensor at the internal surface of the insulation, and continue the monitoring program for heat transfer estimation. The net savings achieved by the insulation should be reflected in electric uitility billings.

Finally, report and disseminate the project results, using trade associations, BEU, ENMAP, and PCCI.

The cost of the demonstration at four sites (exclusive of insulation) is estimated as follows:

Skilled TTEM staff engineers (2 man-months plus 1 man-month per site)	₱ 60,000
Multi-channel temperature recorder and sensors ($10,000 per building)	₱740,000
Report production and dissemination	₱ 20,000
Total	₱820,000 ($844,324)

4. Training, Technical Assistance and Study Programs

Application Sector: Commercial Buildings

Description

Training programs and technical assistance in this area must be geared to hands-on training, particularly for operating personnel. In addition to the training programs, a need exists for on-site technical assistance provided by foreign experts and for specific studies in commercial building energy use.

a. Training Programs

Housekeeping for Energy Efficiency. The purpose of this program is to instruct building operating personnel in the principles and practices of maintaining equipment to achieve maximum energy efficiency. The program will cover:

- Proper operation and maintenance of chillers and air handling units
- Selection and maintenance of high-efficiency lighting systems
- Proper maintenance of HVAC controls and temperature maintenance
- Improved performance of building envelope (e.g., through weatherstripping, sealing, keeping doors closed)

This course will typically require 1 week. It will include hands-on operation of equipment in a typical building, perhaps the one in which the course is held.

Controls. This program covers building HVAC controls in depth to provide a working knowledge of the implications of control adjustments. The program is a sequel to the previous course, with emphasis on advanced systems and hands-on operation. It will require 1 week.

Building Energy Auditing. The purpose of this program is to translate the theory presented in the BEU/ENMAP classroom sessions into practical applications. This translation involves an instrumented audit of participating commercial buildings (office buildings, hotels, hospitals, large retails stores) under the supervision of experienced auditors/instructors. The program will cover detailed examinations of such building systems as chiller and chilled water distribution systems, the HVAC system, lighting systems, the building envelope, domestic hot water systems, and electrical systems. It will include the identification and cost benefit analysis of energy conservation projects. This course will require 1 to 2 weeks, depending on the background and experience of the participants.

The costs for each of these training programs are estimated at:

Course Development Costs

Consultants, Engineers, Academics	₱ 80,000
Typing, Editing, and Graphics	20,000
Materials	10,000
Total	₱110,000

Course Presentation Costs

Instructors	₱ 10,000
Materials and Facilities (30 students)	₱ 20,000
Total	₱ 30,000

b. Technical Assistance Programs

These programs are designed to provide specific expertise in areas of interest to the Philippines, using experts in specific technologies and applications. Among the areas where expertise may be required are:

- o Design and analysis of building energy management systems
- o Analysis of complex energy conservation projects (including commercial building cogeneration projects)
- o Principles of energy-efficient building design for architects and mechanical engineering contractors.

As in the industrial technical assistance programs, each assignment will typically require 2 to 6 man-weeks in the Philippines and 1 to 3 man-weeks additional for preparation.

c. Study Programs

The TTEM Project will also fund study programs which will be used for program planning purposes and to help identify attractive technologies for users, vendors, and service organizations. These studies will also be used to train TTEM staff and to help balance the workload. While the specific studies to be performed have not yet been identified, an example in the commercial energy sector would be a study to evaluate microcomputer-based building energy analysis programs.

The use of these models in the Philippines has been limited by the lack of knowledge of the computer programs available and a lack of experience among the architectural/engineering sector in running them. The purpose of this study is to make these computer programs more available for use in the Philippines, demonstrating their utility and giving building design personnel experience in their use.

The use of computer models to simulate building energy performance has been a common practice in the United States for about 10 years. These models generally allow "side-by-side" analysis of unmodified buildings and those modified in structure, orientation, or building energy-using systems and schedules to determine the effects of the changes on building energy use. The models accept actual weather data for the location being examined and perform calculations on a monthly or hourly basis (or even a finer increment) to provide a comparative simulation of the performance of the building and building energy systems. While the models initially were developed for use with mainframe computers, more recent versions have been developed for use with microcomputers.

These models provide a means of determining the most energy-efficient building configurations and allow an economic analysis of the various options. Among the options that can be examined with these programs are:

- The effect of different levels of insulation on building construction and operating costs
- The costs and benefits of higher-efficiency building systems (e.g., pumps, lighting, air conditioning, motors)
- The effect of building orientation, different glazing systems, and other building envelope variations on energy consumption.

Studies in the United States made for the Building Energy Performance Standards (BEPS) program have indicated that 20 to 40% of estimated building energy consumption can theoretically be saved, with little or no additional costs, when building energy performance is analyzed using simulation models.

The demonstration program for building energy analysis programs consists of a combination of evaluations, training, and building simulation studies.

The evaluations and training involve selection of building energy analysis programs and training of Philippine users in required data collection and set-up procedures. The programs will be selected from among a number of programs developed primarily in the United States for use on microcomputers. Large programs designed for mainframe computers will not be chosen because of their complexity and the lack of access to large computers by Philippine architects.

The successful use of these microcomputer programs depends to a great extent on the skill of the building analyst responsible for collecting and formatting the input data; therefore, intensive training in the use of the program will be made available, preferably by having the program developers conduct seminars in the Philippines in program use. Each analyzer will model actual buildings with each of the selected programs and compare the results with the actual building consumption. Programs will be rated on the basis of their ease of use and accuracy, and the results made available to the architectural design community. If desired, the programs can be slightly modified to make them more appropriate for Philippine climatic conditions, construction practices, and regulatory requirements. The Philippine architectural and engineering participants will be expected to contribute their time and expenses. Computers can be rented for the duration, although participants will be strongly urged to buy their own.

The cost of the demonstration program is estimated as follows:

Program acquisition costs (4 programs at $1,500 each)	₱111,000
Skilled TTEM staff engineers (8 man-months)	₱ 80,000
Program developer seminars (4 seminars at $5,000 each)	₱370,000
Computer rental (10 computers for 2 months at $400 each)	₱ 74,000
Information dissemination	₱ 20,000
Total	₱575,000 ($31,081)

The simulation study phase of the demonstration program will focus on research into the effects of building design modifications on building energy consumption, using the program or programs that were judged best in the first phase.

Among the types of studies that may be undertaken are:

- Effects of alternative glazing types and glass areas on building energy consumption
- The use of natural ventilation rather than forced ventilation air conditioning systems
- The effect of building envelope materials and site orientation on building energy consumption
- A life-cycle cost benefit analysis of higher-efficiency building systems, different construction materials, and different building designs.

The results of these studies will be used to educate building owners, architects, and engineers about the types of energy savings that can be realized through careful building design and construction.

The cost of each of these studies is estimated as follows:

Skilled manpower (e.g., engineer, architect, professor) (8 man-months per study)	₱ 80,000
Semi-skilled manpower (e.g., junior engineer, student) (12 man-months per study)	₱ 60,000
Measuring and monitoring equipment (if necessary) ($10,000 per study)	₱185,000
Information dissemination	₱ 20,000
Total	₱345,000 ($18,649)

C. Economic Internal Rate of Return

The Economic Internal Rate of Return (EIRR) of the proposed demonstration projects is estimated in Table H3. To calculate these values, the following assumptions were developed with the assistance of AID economists:

- The economic value of foreign exchange purchases (equipment and energy) is 100% of the equipment market value, plus an additional 20% for shipping and handling
- The ratio of the economic exchange rate to the market exchange rate is 14.0/16.8, or 0.83
- The ratio of economic value to market value of domestic labor for installation and O&M is 0.66. This is equal to the economic cost of semi-skilled labor (80% of its market value) times the exchange rate ratio (0.83)
- The ratio of economic value to market value of local materials is 0.83, the exchange rate ratio
- Annual savings escalate at 2% per year for both oil and electricity
- The economic value of oil savings is equal to its foreign exchange cost of $4.57/mmBtu (based on an average 1982 crude oil acquisition cost of $32.30/bbl) plus 20% for local processing and handling, for a net value of $5.48/mmBtu
- The economic value of electricity savings is 90% of its market value, or $0.077/KWh
- The system operating life is 15 years.

With these assumptions, the EIRRS of the projects vary from 8% to over 5,300% (see Table H3). The projects having the extremely high returns are primarily "housekeeping" projects having little capital investment but with high savings. Two projects, Outside Air Temperature Compensation for Chillers and Building Roof Insulation, have relatively low returns of 8 and 9% respectively. This is below the opportunity cost of capital in the Philippines which AID economists estimate to be 20%, and thus would probably not be undertaken without more detailed study to determine if the actual EIRR is in fact much higher than that estimated in these preliminary analyses. The other projects have EIRR estimates of 30% or greater, and thus appear very attractive.

Table H3
Economic Internal Rate of Return for Proposed Energy Conservation Technologies

	Market Value ($)						Economic Value ($)				
	Foreign Purchases	Domestic Purchases	Domestic Installation Costs	Foreign O&M Costs	Domestic O&M Costs	Annual Energy Savings	Installation Costs 1/	Annual O&M Costs 2/	First Year Fuel Savings	First Year Net Savings 3/	Economic Internal Rate of Return (%)
Combustion monitoring systems:											
Small	240	-	-	100	1,600	2,500 mmBtu	240	1,156	15,700	12,544	5,350
Large	3,600	-	960	1,000	1,600	12,500 mmBtu	4,234	2,056	68,500	66,444	1,600
Flue gas heat recovery systems	36,000	-	6,300	-	200	2,484 mmBtu	38,838	132	13,612	13,480	37
Industrial Insulation	50	240	70	-	-	460 mmBtu	295	-	2,520	2,520	870
Power Factor Control Equipment	51,000	-	715	-	200	192,600 Kwh	51,472	132	14,830	14,698	30
Steam System Maintenance	1,200	-	45	-	700	11,030 mmBtu	1,230	462	60,444	59,982	4,970
Outside Air Temperature Compensation for Chillers	8,400	-	4,300	-	2,100	33,00 Kwh	11,238	1,386	2,541	1,155	8
Building Energy Management Systems	12,000	-	2,600	-	350	189,300 KWh	13,716	231	14,576	14,345	109
Building Roof Insulation	700	7,150	1,100	-	-	149 mmBtu	7,361	-	817	817	9

1/ Equals (1.0) (Foreign Purchases) + (0.83) (Domestic Purchases) + (0.66) Domestic Installation Costs.
2/ Equals (1.0) (Foreign O&M Costs) + (0.66) (Domestic O&M Costs).
3/ Oil economic value = $5.48/mmBtu; electricity economic value = $0.077/KWh.

ANNEX I

TECHNOLOGY TRANSFER FOR ENERGY MANAGEMENT FUND

DRAFT POLICY MANUAL

Annex I

TTEM STEERING COMMITTEE MEMBERS

1. Orlando Galang
   Director
   Bureau of Energy Utilization, Ministry of Energy
   Chairman of the Steeering Committee

2. Name and Position
   Bankers Association of the Philippines

3. Name and Position
   Board of Investment
   Ministry of Trade and Industry

4. Name and Position
   Department of Loans and Credit
   Central Bank of the Philippines

5. Greg Gonzales
   President
   Energy Management Association of the Philippines

6. Name and Position
   Ministry of Finance

7. Name and Position
   National Economic and Development Authority

8. Name and Position
   Philippine Chamber of Commerce and Industry

Ex-officio Members:

1. Name
   Project Director
   TTEM Project

2. Richard Stevenson
   Energy Advisor
   USAID/Philippines

FOREWORD

This manual sets forth the policies of the Technology Transfer for Energy Management Fund established under the TTEM Project Agreement between the Government of the Philippines and the United States Agency for International Development. The TTEM Project is new and thus it is likely that over its five year life the policies set forth in this manual will be revised to reflect the experience gained in administering the loan fund and the changing needs of the market place.

We have reason to believe that this program will stimulate investments in energy conservation on a large scale basis. We are thus optimistic that this project will reduce commercial energy consumption, reduce oil imports (thus improving the balance of payments situation), increase productivity and improve economic growth prospects for all Filipinos.

Orlando Galang
Chairman
TTEM Steering Committee

TABLE OF CONTENTS

I. INTRODUCTION

Objectives and Legal Framework

1.01 The Technology Transfer for Energy Management (TTEM) fund has been established to promote and accelerate the adoption of cost-effective energy conservation measures in industry, buildings and transportation. The adoption of these measures -- i.e., equipment, processes and improved management systems, will reduce commercial energy consumption, reduce oil imports and thus the balance of payments situation and improve productivity and economic growth prospects.

The central piece of the TTEM project is a demonstration program aimed at supporting actual commercial scale applications of energy conservation technologies that are not widely used in the Philippines. Eligible projects may receive financial assistance from TTEM. A number of financial intermediaries serve as conduits in channelling TTEM financial assistance to the various project sponsor.

1.02 The operation of the TTEM loan fund is guided by the following legal documents:

(a) Project Agreement, dated _____

This agreement between the Government of the Philippines and the United States Agency for International Development (USAID) defines the operation of the TTEM project and loan fund.

(b) List other legal documents, if any.

Management

1.03 The Fund is owned by the Bureau of Energy Utilization (BEU) of the Ministry of Energy and is administered by the Central Bank (CB) under a Master Agreement concluded between the two government agencies.

A Steering Committee created under the terms of the Project Agreement provides overall policy guidance and administrative oversight to the project. The Steering Committee is composed of a representative each from the BEU, the Central Bank, the Board of Investments of the Ministry of Trade and Industry, the Ministry of Finance and the National Economic and Development Authority. The private sector is represented by the Philippine Chamber of Commerce and Industry, the Energy Management Association of the Philippines (ENMAP) and the Bankers Association of the Philippines. The BEU representative serves as chairman of the Steering Committee.

1.04 A Subproject Selection Committee composed of the Project Director and selected technical personnel from the BEU, ENMAP and USAID provides day-to-day management of the Project. This committee has primary responsibility for the selection of demonstration projects, subject to final approval by BEU.

II. GENERAL POLICIES

Lending Policies

2.01 The TTEM financial assistance is provided in the form of a grant, a straight loan or as a loan with repayment tied to energy savings. The loan may be extended with or without guarantee coverage. A combination of these financing investments may be used on a single project. The TTEM Steering Committee may from time-to-time change the type of financial assistance provided and the terms and conditions of the assistance.

(a) Grants and Straight Loans

These financing instruments are the simplest form of assistance available. Straight loans must be repaid regardless of the level of energy savings achieved.

(b) Loans with Repayments Tied to Energy Savings

This financing system ties the loan repayment to the actual energy savings which accrue from the project. The savings are split between the project sponsor and the TTEM in a proportion equal to their respective capital contribution. For example, if the project contributes 40% of the capital, it will also receive 40% of the value of energy savings. The TTEM loan carries a fixed interest rate but the repayment will vary with the size of the energy savings. One hundred percent of the TTEM share of the energy savings will be applied to the amortization of the accrued interest and outstanding principal until the loan is fully paid off.

2.02 TTEM assistance is available to existing and new industrial and commercial enterprises without any restrictions on the scale of their operations. Priority is however given to those establishments which consume imported fuels, particularly oil.

2.03 TTEM loans are exempt from the following Central Bank Circulars/ Government Regulations: (List applicable regulations, if any)

2.04 In order to ensure maximum accessibility to the TTEM fund and at the same time develop private sector banking capabilities in energy conservation financing, TTEM uses financial institutions as intermediaries. Participating financial institutions such as commercial banks, savings and mortgage banks, non-bank financial intermediaries and leasing companies are required to be accredited by the Central Bank before being eligible to apply for TTEM financial assistance. During the first 2 or 3 years of the project, only a limited number of private financial institutions (no more than 4) will be accredited. As experience is gained with the project, particularly with demonstration financing, the number of accredited banks will be increased.

2.05 Loan Purposes

(a) Eligible Projects

TTEM provides financial assistance to demonstrate the applicability on a commercial scale basis of energy conservation technologies and management practices that are not widely used in the Philippines. TTEM provides project sponsors with an indicative but not all inclusive list of demonstration projects eligible for financing assistance. Sponsors of projects included in the list may or may not qualify depending on the project's ability to meet TTEM requirements.

(b) Application of TTEM Funds

Proceeds from TTEM financial assistance are to be utilized for the acquisition of fixed assets and/or installation and related construction and engineering expenditures. Eligible expenditures may include the following:

(to be completed by BEU/CB)

Project Evaluation Criteria

2.06 Only projects which are likely to stimulate other similar energy conserving investments by the private sector and where the project sponsor is willing to freely share information resulting from the demonstration are eligible for TTEM assistance. In determining the validity of projects the following types of criteria among others are used:

(a) Project Costs and Benefits

- What is the technology's technical and economic attractiveness to potential users?
- What are the foreign exchange implications of use of the technology?

(b) Risk

- Will the technology work reliably and demonstrate energy savings?
- Can it be shown to be cost-effective?
- Will regulatory or social factors adversely affect it?

(c) Economy Wide Costs and Benefits

- How many replications of the technology will the demonstration stimulate, and what are the resulting overall national savings?
- What indirect costs and benefits to the nation will result, such as potential for local manufacturing, exports, and rural development?
- Are replications financially sustainable at unsubsidized commercial lending rates?
- Is the proposed investment economically viable using shadow pricing of all inputs and outputs?

(d) TTEM Costs and Benefits

- What are users or vendors willing to contribute?
- What are the expected energy savings per TTEM investment?

(e) In addition to the above criteria, the project must also comply with any applicable government regulation, such as pollution control and zoning.

Lending/Guarantee Terms

2.07 (a) Most loans/grants will have a foreign exchange component as well as a peso component, at least during the initial years of the fund. The full amount of all loans will be repayable in a fixed amount of pesos regardless whether or not a portion of the loan includes commodities purchased with foreign exchange. In the event the loan includes a foreign exchange component, the borrower will repay pesos equivalent to actual foreign exchange costs converted to pesos at the official rate of exchange (as determined by the Central Bank (CB)) on the date of the foreign exchange payments. For example, a loan approved in January 198x may include the purchase of offshore equipment which would be ordered in February 198x, but not shipped and paid for with foreign exchange until May 198x. The borrower would repay the peso equivalent of the foreign exchange payment converted at the official rate of exchange on the date of payment in May 198x, plus any pesos borrowed under the peso component.

(b) Limits of Grants

A maximum peso equivalent of ₱1 million is available as grant per eligible project. The grant will not exceed 50% of the total project cost.

(c) Limit of Loans

A maximum of ₱3 million is available as loan per eligible project. Straight loans will not exceed 75% of the total project costs.

(d) Interest Rates

The financial institution shall charge its average prime rate over the preceding four weeks less six (6) percentage points (this includes a bank service charge[1/]) on straight loans and the prime rate less one percentage point on loans with repayments tied to energy savings. The financial institution is allowed a one time loan application filing fee (including loan origination fee) of 1% of the principal amount of the loan and 1/2% of the amount of the grant. No repayment of service charge or escalation of interest during the life of the loan is allowed.

1/ Service charges refer to commissions, premiums and other service charges, not including application filing and loan origination fees.

(e) Financial Institution Spread

If the financial institution assumes 100% of the business and credit risks associated with this project it will be allowed an increased spread of 4 percentage points on straight loans and 5 percentage points on loans with repayments tied to savings over the no-risk situation. Thus, the institution would earn one half of the loan rate less one (1) percentage point respectively for the CB and the Ministry of Finance (LR/2-2). In the event the participating financial institution assumes none of the risks the spread will be reduced 4 and 5 percentage points respectively (i.e., LR/2-6 and LR/2-7). A financing institution may choose, however, to share the risk with TTEM. In this case the spread is adjusted accordingly.1/

(f) Maturity Period

(i) Maturities of straight loans may not exceed five (5) years, inclusive of a grace period for principal repayments up to a maximum of one (1) year.

(ii) Loans with repayment tied to savings will have variable maturities depending on the size of the annual savings and thus how quickly the principal and accrued interest are paid off. However, the maturities of these types of loans will never exceed seven (7) years.

(g) Penalty Charge

Participating financial institutions shall be levied a penalty charge of 5% p.a. on straight loan amortizations in default which may be passed on to the borrower if the borrower is also in default.

(h) Mode of Repayment

Repayments to the Fund will follow the same schedule as repayments by the borrower to the financial institution, in equal monthly or quarterly amortizations. When a project gets in financial difficulty, the participating financial institution may recommend restructuring the loan. If justifiable on project grounds, it may be granted by TTEM. In cases of rescheduling, graduated repayments with variable

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1/ Refer to Attachment 1 for a table of the spread allowed at various levels of risks when the prime rate is assumed to be 24%.

amortizations may be considered. The participating financial institution is required to repay TTEM in accordance with the original approved or restructured amortization schedule. If the financial institution has not received the corresponding repayments from the subborrower, the Central Bank may allow deferment of payment of borrowers in default or experiencing difficulties, provided the financial institution submits a realistic repayment plan.

III. ACCREDITATION PROCEDURES

3.01. Eligible financial institutions have to be first accredited by the Central Bank before they can apply for TTEM financing under the USAID TTEM Project.

Accreditation Criteria

3.02 (a) Commercial Banks/Savings and Mortgage Banks/Stock Savings and Loan Associations (to be determined by CB)

(b) Non-Bank Financial Intermediaries (to be determined by CB).

3.03 (a) Application - Where to file

Applications for accreditation shall be filed at the Department of Loans and Credit, Central Bank Head Office, A. Mabini, Ermita, Metro Manila.

(b) Papers required

(To be determined by CB)

IV. APPROVAL OF LOAN APPLICATIONS AND TTEM RELEASES

4.01 (a) Approval of Loans

The accredited financial institution is responsible for the proper financial appraisal of the proposed demonstration project and the organization sponsoring it. (To be determined by CB).

(b) Release of Funds

At the time of submitting applications for loans, the financial institution will submit a reasonable schedule of release it desires from TTEM. TTEM will commit to the release of funds according to such schedule, except in case of a resource gap, in which case, TTEM will advise the financial institution of an alternative schedule of release at the time of approval. However, funds will not be released until the financial institution has complied with the pre-disbursement documentation requirement.

V. PROJECT SUPERVISION RESPONSIBILITY

5.01 TTEM financing follows the concepts of the supervised credit scheme.

(a) The accredited institutions are responsible for the close supervision of the financed projects. They will undertake the initial and subsequent periodic inspections of these projects to ensure that loan proceeds are utilized properly for the purposes(s) for which the financing had been extended and that the projects are attaining their objectives as stipulated in the project appraisal report. During performance reviews of the financial institutions, TTEM staff will conduct supervision/end-use verification surveys of TTEM financed projects.

5.02 The financial institution is responsible for ensuring that:

(a) the corresponding subloan is used exclusively for the project for which the loan was granted and appropriate documentation exists to certify that the proceeds of the TTEM loans have been utilized for the purposes intended;

(b) the borrower firm complies with all conditions of the TTEM loan;

(c) the borrower firm, in case of medium industries, submits audited financial statements not later than four (4) months after the end of each calendar year.

(d) the borrower has obtained at least three quotations for the procurement of machinery and equipment, except in special cases where equipment to be supplied is available from a single source only. Appropriate documentation will be maintained in this regard by the financial institution.

VI. PERFORMANCE REVIEW

6.01 An accredited financial institution must at all times meet the foregoing criteria to maintain its accreditation in good standing. After initial accreditation, the Central Bank will undertake a review of the performance of each accredited institution at least once within a 12-month period to ensure that the criteria are met. Using the same standards and procedures as used for initial accreditation as set forth in paragraph 3.02, TTEM will send the performance reports to USAID on a quarterly basis. Institutions which are not quite active will be advised to improve their activity under the TTEM program within a certain period. If they are still not active after a given period, their accreditation status will be suspended. When these institutions have renewed their interest in the TTEM Program, a full accreditation evaluation is required.

6.02 During such performance review TTEM will conduct a supervision/end-use verification survey on a sample basis (the size of the sample to be based on the size of TTEM portfolio in the financial institution).

6.03 When notified by the appropriate supervisory departments, external auditor of the financial institution, or there is a reason to believe that the financing institution is in serious financial problems, or there is a diversion of funds on TTEM approved projects, a special performance review will be conducted by TTEM including an appropriate end-use verification survey of some projects.

VII. DEFAULT IN AMORTIZATION PAYMENTS

7.01 In case of default, the demand deposit account of the financial institution concerned with the Central Bank and/or that of its duly designated depository bank is debited for an amount equivalent to the amortization in default, plus the corresponding interest due thereon, provided that such debit does not result in overdrawings. Sufficient deposit according to the scheduled amortization is required.

7.02 A financial institution is considered to be in default upon failure to pay the amortization on its TTEM loan and subsequent failure to submit to the Central Bank within 45 days from the due date thereof, a specific proposal for deferment/restructuring/plan of payment, or to indicate legal action being taken, if any. If any of the above actions have been taken by the sponsoring institution, it continues to be eligible for TTEM financing.

VIII. VIOLATIONS BY THE FINANCIAL INSTITUTION/TTEM BORROWER

8.01 Any violation or infraction of TTEM regulations, including loan diversion and misrepresentation in the application, is sufficient basis for recall of the TTEM loan or cancellation of the guarantee within thirty (30) days from receipt of notice, and/or the imposition of administrative sanctions provided for under existing laws, rules and regulations insofar as these are applicable.

IX. REPORTING REQUIREMENTS

9.01 The Central Bank, as administrator of the TTEM fund, closely monitors the progress of the program and its impact on the economy. To this end the participating accredited financial institutions are required to periodically provide certain relevant information. The financing institutions should submit quarterly reports to TTEM on the progress and current status of each project financed, as well as a general report on the overall operation of the institution as TTEM may reasonably request. Failure to submit the required reports on time will temporarily disqualify the financing institution from the rediscount window of the Central Bank and/or their applications for TTEM loans held in abeyance until the required reports are submitted.

9.02 The participating financial institutions will be required to have their TTEM portfolio audited by independent external auditors satisfactory to TTEM and submit the audited statements to TTEM not later than 90 days after end of each calendar year.

X. USAID APPROVAL OF THE OPERATING POLICIES

10.01 Any change in the Manual will be subject to USAID approval and the participating financial institutions will be notified in advance of such change.

Attachment 1
Illustrative Spread Schedule 1/

Interest Earnings of Financial Institutions Based on Various Allocations of Credit Risk

% of Loan Principal Guaranteed by TTEM	Maximum Allowed Spread to Financial Institutions (%)	
	Straight Loan	Loan with Repayments Tied to Savings
0	7	9.5
5	6.8	9.25
10	6.6	9.0
15	6.4	8.75
20	6.2	8.50
25	6	8.25
30	5.8	8.0
35	5.6	7.75
40	5.4	7.50
45	5.2	7.25
50	5	7.0
55	4.8	6.75
60	4.6	6.50
65	4.4	6.25
70	4.2	6.0
75	4	5.75
80	3.8	5.5
85	3.6	5.25
90	3.4	5.0
95	3.2	4.75
100	3	4.50

1/ The table assumes that the prime rate is 24% and that the automatic interest adjustment mechanism is being implemented.

Annex J

GUIDELINES FOR TECHNOLOGY TRANSFER AND DEMONSTRATIONS--CASE STUDIES

To assist in formulating guidelines for the structure and operation of the Technology Transfer for Energy Management (TTEM) program in the Philippines, the project design consultants reviewed the programs of six countries for providing financial assistance to private firms to conduct energy-related research, development, and demonstration (RD&D) projects. The six countries included the Federal Republic of Germany, France, Japan, Sweden, United Kingdom, and United States. Unfortunately there is no record of such experience in developing countries from which to draw; the TTEM project should be observed and well-documented as a pioneering effort for LDCs. Nonetheless, this review of selected industrialized countries, may provide useful lessons for the structure and operation of the TTEM program in the Philippines.

Initial surveys were performed in late 1981/early 1982. In preparing this Annex, the design team updated these surveys with information from published sources and acquired additional current information on the programs of the United Kingdom and United States. However, it must be recognized that energy conservation is a dynamic field and therefore the programs for these countries may now be different in some respects from the descriptions contained in this Annex. In France, for example, a new "superagency" has recently been formed to coordinate all energy conservation efforts. Nevertheless, the general philosophies and assumptions guiding the efforts are still in force and will provide insight on how the TTEM program might be structured most effectively.

In conducting this review, the team examined the following aspects of each program:

- How do firms or persons apply for financial assistance and how are project funding decisions made?
- What criteria are used in deciding whether or not to award financial assistance for a project?
- What form(s) of financial assistance is (are) used?
- To what extent and how do government agencies provide assistance to applicants for, or recipients of, financial support?
- How do government agencies manage and monitor the performance of funded projects?
- How are the results of RD&D projects disseminated to firms and persons that may benefit from the experience gained in a project?

After separately reviewing each country's program(s), the programs were compared to identify common characteristics that may be appropriate for inclusion in TTEM.

The level of detail in the six countries is not uniform across countries (e.g., there is less information available on the Japanese and Swedish programs than on the French, United Kingdom and United States programs).

On the basis of this review, the following observations regarding the general characteristics of the RD&D support programs sponsored by the six countries can be made (see Table J1).

Project Application

Most countries use a system in which firms or persons may submit a proposal for financial assistance at any time following initiation of the assistance program. Although not provided in the same degree by all countries, the provision of technical assistance for the preparation of proposals is a favorable characteristic of several programs. Such technical assistance promotes a broader market of potential recipients and reduces the likelihood that high-quality technological opportunities will be refused support because of the inexperience of the proposer in preparing requests for assistance. The agencies of several countries receive assistance from academic or other technical experts in evaluating proposals for assistance.

This kind of technical assistance is likely to be far more necessary and important in developing countries. In a 1980 report on energy in the developing countries, the World Bank cited the lack of well-prepared project proposals as a major barrier to energy project financing in the developing world.

Project Selection Criteria

The selection process in several countries is specifically oriented at small- and medium-sized firms, which are less likely than large firms to have the financial capability of undertaking projects on their own. Also, the programs are often aimed at promoting near-term, low- to medium-risk technological development and demonstration opportunities. The near-term, low- to medium-risk focus ensures a high practical benefit from the assistance programs. Other criteria which are used for evaluating proposals include: the ability to demonstrate a need for public sector support; the potential energy savings or alternative energy production that may result from a technology, considering both the expected performance efficiency at an individual installation and the aggregate market penetration potential of the technology; the expected economic performance of the technology (sometimes measured by such concepts as expected internal rate of return); the

Table J1
General Characteristics of Industrial
Energy Conservation RD&D Programs
In Six Selected Countries

Project Application

- Technical, economic, and administrative assistance is provided to applicants in preparing proposals
- Academic and other experts may assist proposal evaluation

Project Selection Criteria (developed with industry representatives)

- Size of firm (with small and medium-sized firms preferred)
- Technical risk (with near-term, low- to medium-risk technologies preferred)
- Demonstrated need for public-sector support to overcome market barriers
- Potential energy savings or alternative energy supplies resulting to the national economy
- Financial performance of technology (e.g., internal rate of return)
- Probability of project success
- Contribution to economic development

Forms of Financial Assistance

- Grants and cost-sharing
  - limited to 25 to 50% of project costs
  - government bears cost of monitoring, measuring, and reporting
  - made primarily in higher-risk projects
- Loans
  - limited to 70 to 80% of project cost
  - loan payments may be contingent on actual savings
  - loan may be forgiven if savings do not materialize
  - primary funding vehicle for low-risk projects
- Government has no equity interest

Table J1 (Continued)

Implementation Assistance

- Support can begin during proposal preparation
- Technical assistance may be provided by private or government laboratories or experts at government expense

Project Management and Monitoring

- Primary responsibility with award recipient
- Recipient agrees to perform specified activities to a schedule
- Government may pay for independent review
- Givernment may assist in project direction if major difficulties arise

Dissemination of Project Results

- Financial award requires free, open access by government representatives to project site
- Recipients must provide data on project design, engineering, construction, and operation
- Government is permitted to freely disseminate results
- Normally, there is a formal dissemination procedure, such as publications, conferences, and on-site inspections
- Government bears information dissemination costs

probability of project success; and the expected contribution to economic development, including increased employment, industrial production, and export opportunities. Industry representatives often participate in setting program guidelines, priority areas for technological assistance, and project selection criteria.

Forms of Financial Assistance

The programs we reviewed use a combination of financial assistance mechanisms, including low interest loans, loan guarantees, grants and cost-sharing. Grants and cost-sharing tend to be provided in limited cases for the somewhat higher risk categories of projects, while loans and loan guarantees are used for the larger number of lower risk projects. In most loan-related programs, there is a 3- to 5-year deferral of loan payments and the amount of loan payment may be contingent on the value of energy savings or alternative energy production realized in a project. In some programs, a loan may be entirely forgiven if a project is not commercially successful. The typical ceiling on grants and cost-sharing is between 25 and 50% of project costs. Loans or loan guarantees may be extended to a higher fraction (e.g., 70 to 80%) of project costs. Except for certain high-risk feasibility studies, the award recipient is required to have a substantial economic interest at risk in undertaking a project. Accordingly, the recipient is expected to finance independently his economic contribution to the project; if this involves a cash outlay that must, in part, be debt-financed, there may be a problem in obtaining credit from financial institutions that are not accustomed to evaluating the credit-worthiness of energy-related investments. Finally, the government usually bears the complete cost of any monitoring, measurement, or reporting activities that are a requirement for participation in the financial assistance program.

Implementation Assistance

Some form of technical assistance is usually provided to applicants for, or recipients of, financial assistance. The extent of assistance varies by program with the United Kingdom perhaps providing the most assistance with support beginning during preparation of a proposal. In some programs, technical assistance may be provided at the government's expense from national laboratories or independent engineering firms if an award recipient is encountering difficulties in performing the project.

Project Management and Monitoring

The responsibility for technically directing and managing a project remains with the award recipient as the government retains no equity interest in projects funded under the programs we reviewed. However, as part of the agreement for receiving assistance (particularly for grant and cost-sharing assistance), the recipient agrees to perform specified activities according to

schedule. Reports are periodically filed with program administrators indicating the award recipient's progress in performing the proposed project. In several programs, the government pays for an independent review of project progress and measurement of project results (e.g., measuring the energy savings performance of a conservation project). The administering agency may take a stronger role in project direction if technical difficulties are encountered or if an award recipient fails to perform its project obligations.

Dissemination of Project Results

All of the programs reviewed provide some method of disseminating project results to interested parties. The financial assistance agreement generally requires that an award recipient provide free, open access by agency representatives and other persons to the physical site of a project. Recipients must also provide project design and engineering information, and data on the results of a project. The government is permitted to freely disseminate this project information to interested parties. In most programs, there is a formal procedure for disseminating project information through government or private-sector publications, workshops and conferences, and inspection days, in which interested persons may visit the site of a supported project. The government bears the cost of disseminating project information and results.

The following sections present a summary review of the financial assistance programs sponsored by the six countries. For each country, the procedures for applying for and receiving assistance; the criteria used to evaluate requests for assistance; the form of financial assistance; the nature of technical assistance to applicants and award recipients; the procedures for administering funded projects; and the methods for disseminating project results are described.

FEDERAL REPUBLIC OF GERMANY

The programs of the Federal Republic of Germany (FRG) for providing assistance to energy-related RD&D projects are implemented under the direction of the Bundesministerium fur Forschung und Technologie (BMFT Ministry of Research and Technology). In addition, another ministry, the Bundesministerium fur Wirtschaft (BMWi Ministry of Economic Affairs) provides leadership in energy policy and occasionally funds RD&D activities. The RD&D support program is managed by a national research laboratory, the Kernforschungsanlage (KFA) Julich, on behalf of the sponsoring ministries. The structure and operation of the BMFT/KFA Julich program are described below.

Project Application

In accordance with the policy guidelines and program funding levels specified by BMFT and BMWi, KFA Julich manages the overall process for soliciting proposals for assistance, deciding on assistance requests, managing ongoing projects, and disseminating project results. With regard to the project application and selection process, KFA Julich publishes guidelines indicating the RD&D areas that BMFT and BMWi have expressed interest in supporting. These guidelines reflect the FRG's Energy Research Program, which is prepared from time to time in consonance with the FRG's overall energy policy agenda. Industry assists BMFT and BMWi in establishing the areas of RD&D that should receive emphasis (and which are subsequently embodied in the RD&D program guidelines); accordingly, industry participates indirectly in the decision process for granting financial assistance.

In response to the published guidelines, firms may submit proposals for financial assistance at any time. Occasionally, KFA Julich may initiate project discussions with one or more organizations on an RD&D subject that has been identified as important but on which firms have not submitted proposals. KFA Julich is responsible for making decisions on whether or not to grant financial assistance for a proposed project.

Project Selection Criteria

The RD&D projects supported under the BMFT/KFA Julich program tend to emphasize short- to medium-term development opportunities involving traditional supply technologies and conventional energy management processes. Longer-term, higher-risk RD&D efforts are more often undertaken by the national labs. Funding awards tend to be oriented to small- to medium-sized companies. The criteria that are considered by KFA Julich in making funding decisions are:

- Demonstrated need for public sector support. That is, at the same time that projects must have a relatively high expectation of success, sufficient uncertainty and risk must also be present to prevent private-sector organizations from undertaking the projects on their own.

- Extent of contribution to meeting national energy requirements in an economical manner. The evaluation with respect to this criterion may consider the cost of the energy conservation activity or alternative energy supply technology, and the extent to which the technology may contribute to reduced reliance on energy imports.

- Environmental acceptability

- Ability to promote German industrial development and competitiveness in world markets

- Potential for relieving strains in international energy markets.

Forms of Financial Assistance

Financial assistance may be provided in two forms. The primary method of assisting energy-related RD&D projects is through a cost-sharing contract in which the government will typically not bear greater than 50% of total project costs. In addition, financial assistance may be provided through low-interest loans.

Implementation Assistance

BMFT sponsors an advisory and information program on energy efficiency improvement opportunities for small- and medium-sized firms. In this program, the government will pay between 25 and 75% of the audit and engineering costs associated with identifying energy conservation opportunities. Recipients of this assistance may apply for financial assistance for undertaking energy efficiency improvement projects.

Project Management and Monitoring

As part of the cost-sharing agreement, the recipient agrees to conduct specified activities according to schedule. KFA Julich requires periodic reports from funding recipients on their progress in fulfilling the terms of the cost-sharing agreement.

Dissemination of Project Results

As part of the cost-sharing agreement, the recipient of financial support must provide KFA Julich with free access to the project and all data and technical information related to the project. KFA Julich may publish this information or conduct seminars and training programs to disseminate project results to industry.

FRANCE

The principal programs of the French government for supporting energy-related RD&D are administered by the Agence pour les Economies d'Energie (AEE--National Energy Conservation Agency) and the Agence Nationale de Valorisation de la Recherche (ANVAR--National Technology Development Agency).1/ The programs administered by these agencies are similar in the criteria used for project selection and in their focus on near-term (e.g., 3 year application) technology development and deployment opportunities. Moreover, the programs are linked in that representatives of both agencies participate jointly in the project approval process and proposals that are turned down by one agency may be recommended for acceptance to the alternate agency.

1/ Since our original survey, a new "super" energy conservation agency has been created: the Agence Francaise pour la Maitrise de l'Energie.

Project Application

Both ANVAR and AEE develop and publish guidelines on the nature of RD&D projects which the agencies wish to support. Industry representatives assist in the formulation of the policy and program directions for RD&D support activities. Following publication of program guidelines, firms may submit proposals for financial assistance at any time. The proposal review committees for each agency include at least one representative from the alternate agency, thus enhancing the coordination of the two programs.

Project Selection Criteria

Projects that receive financial support from ANVAR or AEE typically do not involve a high degree of risk and may generally be completed within a 2 to 3 year period. Both programs emphasize the development and demonstration of technologies that have the potential of being broadly disseminated within industry (or other sectors) in a short timeframe. As an illustration of the near-term, nearly demonstrated technology focus, over 75% of funding provided by these programs has been for so-called demonstration projects rather than research or development efforts.

The criteria considered by AEE and ANVAR in making project support decisions are:

- Ability of the development and demonstration activity to provide an example for French industry as a whole. That is, the project should represent the first application of a technology in France or the first use of French-manufactured equipment in the application of the technology.

- Extent to which the project will contribute to economical conservation of energy or the economical supply of alternative energy resources

- Aggregate potential for energy savings, considering the national market for use of the technology

- Extent to which the project may contribute to the development of French industry and the improvement of export opportunities.

Because of the different forms of financial assistance provided by AEE and ANVAR (discussed below), AEE tends to be more stringent in its evaluation and is more likely than ANVAR to refuse support of a project.

Forms of Financial Assistance

AEE and ANVAR provide different forms of financial assistance. AEE provides grants for project support. The extent of grant that may be provided by AEE depends on the characteristics of the project: up to 70% of the equipment

costs of a development project may be provided; up to 50% of the cost of a demonstration project may be provided; and 100% of the costs of measuring project performance and energy savings will usually be provided. In addition to providing direct grants, AEE also assists in structuring innovative arrangements for financing energy conservation projects (e.g., leasing and shared-savings financings). ANVAR provides low-interest loans for RD&D projects; loan terms typically provide a 3 to 5 year deferral of repayment requirements. Only small- to medium-sized firms are eligible for these loans.

If a project is refused by either agency, it may be recommended to the other agency for consideration. Apparently, ANVAR frequently extends low-interest loans to projects that AEE has rejected on the grounds that private industry should not need as extensive a subsidy as that provided by a grant.

Implementation Assistance

Both ANVAR and AEE offer various forms of technical assistance. ANVAR offers assistance to prospective developers or deployers of technologies in assessing the potential market for the technology. AEE has undertaken intensive efforts(by direct mail, personal contact and public forums) to advise industry of its willingness to assist in conservation activities. In addition, AEE publishes technical guidebooks on opportunities for energy conservation and provides instruction programs for plant managers on the evaluation and implementation of energy efficiency improvement programs.

Project Management and Monitoring

As a condition for receipt of financial support by AEE, the project developer must agree to permit an AEE-certified engineering firm/consultant to review project implementation activities and measure project performance and energy savings. AEE bears the full cost of such evaluation and measurement activities. In addition, the recipient of an AEE grant enters a contract to perform specified activities according to a schedule. Compliance with the terms of the contract is required for retention of the AEE grant.

JAPAN

The Japanese programs for providing financial assistance for energy-related RD&D projects are principally administered by three separate agencies. The Small and Medium Enterprise Agency (SMEA), a component of the Ministry of Industrial Trade and Industry (MITI), provides financial support for smaller firms in undertaking energy-related RD&D projects. A second agency within MITI, the Agency for Industrial Science and Technology (AIST), also supports RD&D activity; however, to a large degree, AIST support is for larger scale, higher-risk activities that are typically undertaken by government-owned

national laboratories. The third agency, the New Energy Development Organization (NEDO), is a joint public/private program that sponsors research oriented to longer-term, higher-risk technological opportunities. The following discussion focuses on the RD&D support activities provided by SMEA.

Project Application

SMEA publishes guidelines for the submission of proposals for financial assistance. Firms may submit proposals in response to their guidelines at any time.

Project Selection Criteria

As previously mentioned, the SMEA program is oriented to smaller organizations (i.e., no more than 300 employees). In addition to meeting the size requirement, proposals are evaluated with respect to the following criteria:

- Extent to which the technology is approaching the practical utilization stage
- Presence of risk and uncertainty that prevents the private sector from undertaking a project alone
- Expected contribution of the technology to economically meeting the nation's energy requirements
- Expected contribution to reducing oil imports

Forms of Financial Assistance

The SMEA program provides three forms of financial assistance. Cost-sharing grants may be provided for certain higher-risk projects. The maximum level of grant varies with the size of the organization and may not exceed 50% of project costs for smaller firms and may not exceed 25% of project costs for larger firms. In addition to providing grants, SMEA provides loans and loan guarantees for supporting lower-risk RD&D projects.

Implementation Assistance

A major source of technical assistance for firms that are contemplating energy efficiency improvements is the Energy Conservation Center (ECC), a joint project of MITI and industry. ECC provides small- and medium-size organizations with training and advice on energy management and conservation opportunities. ECC also sponsors energy audits for small firms and conducts symposia, conferences, and exhibitions on energy conservation technology and SMEA-supported energy RD&D projects.

SWEDEN

The government of Sweden provides limited financial support to the private sector for undertaking energy-related RD&D projects. The Swedish programs are administererd by the National Swedish Energy Board and the Government Energy Research Commission (GERC). Funds are provided for conservation activities out of the Oil Substitution Fund.

Project Application

The GERC publishes guidelines for the submission of requests for financial assistance. Proposals submitted to GERC are reviewed by a joint committee of GERC and industry representatives to develop support decisions.

Project Selection Criteria

To receive financial support, applicants must demonstrate that a technology will be developed and commercially deployed at a significantly greater rate with government support than if no support is received. Historically, government funding for energy projects has more often been provided for conservation and new/alternative energy supply technologies than for theenhanced or augmented develoment of conventional supply sources. The criteria applied by GERC in making funding decisions relate to the following Swedish energy policy objectives:

- Reducing consumption of oil
- Reducing reliance on nuclear energy
- Promoting the use of solid, indigenous fuels
- Promoting the use of renewable, indigenous sources of energy
- Avoiding adverse environmental impacts
- Assisting industry in technological innovation

Form of Financial Assistance

The Swedish assistance program provides loans/grants that must be repaid only if the project becomes commercially successful. Loan terms provide for interest rates at approximately 4 percentage points above commercial prime rates; loan repayment may be deferred for up to 3 years. Loans may not exceed 50% of the cost of a project.

Implementation Assistance

Sweden provides an information and counseling service for industrial and commercial energy users. The service assists firms in identifying opportunities to save energy or reduce consumption of oil and in assessing the economic attractiveness of undertaking such opportunities. A free/low-cost audit service is provided for small- and medium-sized firms.

Dissemination of Project Results

The results of supported projects may be presented as part of the government's program for providing information and counseling services to industrial and commercial users of energy.

UNITED KINGDOM

The principal programs of the United Kingdom (UK) for supporting energy-related RD&D efforts are the Energy Conservation Demonstration Projects Scheme (ECDPS) and the Support For Innovation Scheme, which are administered by the Departments of Energy (DEn) and Industry (DOI). Both programs are similar in concept and structure with the exception that the Support For Innovation Scheme applies to other categories of projects in addition to energy conservation. The following discussion focuses on the ECDPS program.

Project Application

The ECDPS program is managed for DEn and DOI by the Energy Technology Support Unit (ETSU) of the National Engineering Laboratory at Harwell. ETSU publishes guidelines for prospective applicants for financial assistance under the ECDPS program. These guidelines provide detailed information on proposal requirements and the criteria that a project will have to meet to receive funding. Applicants may propose for financial assistance at any time; proposals are not called for a one-time, competitive submission basis. ETSU reviews proposals and may work with an applicant to correct defects or weaknesses in the proposal. Following a review and preliminary approval by ETSU, proposals are submitted to the Interdepartmental Committee for Energy Conservation Research and Development (ENCORD). ENCORD includes representatives from DEn, DOI, the Department of Environment, the Ministry of Agriculture, Fisheries and Food, and industry. ENCORD makes the final decision on whether or not to support a proposed effort.

Project Selection Criteria

ETSU and ENCORD apply the following criteria in deciding whether or not to support a project:

- The national energy savings potential, which reflects the energy efficiency improvement of the technology and its aggregate market potential
- The national cost effectiveness, which is based on a cost-benefit analysis in which the government's financial contribution is used as the measure of cost
- The expected economic viability of the technology at current prices
- The degree of uncertainty about the potential success or performance efficiency of the technology; the lower the uncertainty, the more favorably ETSU and ENCORD will view the proposal
- The potential for benefit to UK industry through increasing employment, exports, and economic output
- The RD&D content of the project; that is, will the project contribute to reducing uncertainties that inhibit technology development and adoption?
- The extent to which the project may be receiving financial support from other public sources
- The experience value of the project; that is, if the project is in an area currently receiving little interest from industry but which ENCORD and ETSU believe is important, then the project may receive assistance even though it does not fully satisfy other criteria.

Forms of Financial Assistance

The ECDPS program provides three forms of financial assistance:

- Grants may be provided for up to 25% of the equipment and materials costs of a project
- Reimbursable cost-sharing support may be provided for up to 50% of the cost of a project; the government's outlay is recoverable with interest and is returned as a fraction of the value of energy savings achieved by the project
- Grants may be provided for the full cost of higher risk feasibility and engineering studies.

In addition to these support mechanisms, the ECDPS program will also bear 100% of the expenses that result from the program's requirements for proect monitoring and measurement of energy savings and technology performance.

Implementation Assistance

ETSU assigns sponsors to work with prospective applicants for financial assistance in preparing their proposals. ETSU also works closely with support recipients in devising and implementing procedures for monitoring project performance and measuring energy savings. ETSU may provide advice on technical problems confronted during the conduct of a project.

Project Management and Monitoring

As a condition for receiving financial support under the ECDPS program, ETSU requires periodic reporting on project performance and measurement of energy savings. The monitoring and measurement function is typically performed by an independent engineering firm or consultant approved by ETSU. ETSU bears the full cost of the monitoring and measurement activities.

Dissemination of Project Results

ETSU requires that recipients of financial support grant free and open access to the project facilities for inspection and review by interested parties. In addition, the government retains the right to publish, or pay for publication of, detailed information on the project and its results. ETSU regularly reports on sponsored projects in its energy management newsletter and atconferences and other public forums. Finally, ETSU encourages project applicants to submit plans for disseminating project results as part of their proposals.

UNITED STATES

The United States Department of Energy (DOE), Office of Industrial Programs (OIP), provides financial support for energy-related RD&D projects in the industrial sector.

Project Application

Proposals for financial assistance in undertaking an RD&D activity may be submitted by firms or persons on an unsolicited basis or in response to an advertised solicitation (Project Opportunity Notice PON). Proposals requested under a PON must be submitted for a specified area of RD&D, and will normally be in competition for a limited number of support awards or a limited dollar amount of support. Such proposals must be submitted in a specified format and only at the time a PON is announced. Unsolicited proposals may be submitted for any topic and at any time; however, these proposals are apparently viewed less favorably than those submitted in response to a PON. Proposals are reviewed by OIP staff to develop a

preliminary appraisal of whether DOE should consider supporting the project. Staff may request technical assistance from the National Engineering Laboratory in Idaho and occasionally from academic experts in evaluating the technical merits of a submission. After the preliminary review by OIP staff, support recommendations are submitted to a Project Review Board composed of OIP management. The Project Review Board makes the final decision on whether or not to grant support for a proposed project.

Although there is no formal procedure for soliciting industry advice or recommendations in evaluating proposals, OIP staff may hold informal discussions with industry representatives to gain further insight as to the value of a project to industry. In addition, OIP staff engage in informal discussions with industry and trade association representatives to assist in formulating program strategy and in setting support priorities.

Project Selection Criteria

Project selection criteria are not formally specified and may vary over RD&D areas or among PON solicitations. However, the evaluation of a proposal will generally involve the following criteria or considerations:

- Potential energy savings, considering both the energy efficiency effect of the technology and its potential market
- The rationale for why the private sector cannot undertake the project alone
- The potential public-sector or broad social benefits of the project
- The extent to which the basis for financial assistance is well-defined; the adequacy of financial responsibility assumed by the proposer (i.e., does the proposer bear a fair and well-defined share of the project's cost?)
- The extent of overlap with other agency efforts (both within and without DOE)
- The likelihood that the project will be successful
- The market penetration potential of the technology.

For some projects, it is possible to apply quantitative evaluation criteria that are based on the potential economic return from a project and the probability of achieving specific returns.

In recent years, OIP has endeavored to ensure that its funding programs have not substituted for or duplicated outlays that would occur in the private sector independent of OIP activities. As a result, the focus of OIP funding has become oriented to longer-term, higher-risk projects. Still, the agency strives to ensure that the projects it supports have practical value to U.S. industry.

Form of Financial Support

OIP provides financial support through cost sharing on RD&D projects. Cost sharing is provided on a percentage basis for up to 60% of the budgeted cost of a project. The average level of support in recent years is about 20 to 25%. Projects range in size from $100,000 to $10,000,000 and average about $500,000. The government often pays the identifiable, out-of-pocket cash expenses associated with a project (e.g., materials and equipment) while the firm is responsible for labor and project overhead. The level of support is an element of negotiations and involves such considerations as the identifiability and certainty of the firm's cost responsibility.

Implementation Assistance

OIP may provide technical assistance to a project applicant or recipient of support through the expertise of its own personnel, through consultation provided by the Idaho National Engineering Laboratory, and occasionally through independent consultants retained by OIP. Assistance from externalsources is more likely to be provided if difficulties are being encountered in the completion of a project.

Project Management and Monitoring

The Idaho National Engineering Laboratory manages ongoing projects. As a condition of receiving financial assistance, a project applicant must prepare a schedule of activities to be undertaken in the project. The Idaho lab monitors the performance of the project with respect to the activity schedule. If a firm experiences technical difficulties, cannot maintain its schedule, or fails to meet its budget, OIP and the Idaho lab may redirect the project to ensure that some value is received from the RD&D efforts.

Dissemination of Project Results

A recipient of OIP support must prepare a report documenting the RD&D project and its results. These reports are made available to interested persons through the National Technical Information Service, a government publications agency. In addition to disseminating project results through these formal reporting procedures, OIP also participates in workshops, conferences, and other public fora in which it presents the results of RD&D projects.

Annex K

ASSESSMENT OF INSTITUTIONAL CAPABILITIES AND PROJECT ROLES

As part of the design efforts for the Technology Transfer for Energy Management (TTEM) Project, interviews were conducted with over 150 representatives of 70 Philippine private- and public-sector organizations (see Annex L). The results of these interviews were used to evaluate the ability of Philippine organizations to implement an effective energy conservation program, to obtain their views on the proposed TTEM Project, and to identify organizations that could help with the project.

In the following sections, the results of the interviews are summarized and then the organizations that can assist the TTEM Project are described.

Results of Interviews

The organizations interviewed included energy users, equipment and service suppliers, financial institutions, trade associations, government institutions, and international aid organizations. These organizations and their expected responsibilities in the TTEM Project are summarized in Table K1.

1. Energy Users

Constraints on Consumer Activities in Energy Conservation

Industrial and commercial energy users are the primary target of the TTEM Project. Interviews with representative users and a review of Philippine industry sector energy conservation studies indicate several factors that adversely affect the energy conservation efforts of this group. First, there is a large disparity in the ability of Philippine energy users to evaluate, design, finance, and implement energy conservation measures, which has resulted in a two-tier marketplace for energy conservation technologies. One small group of companies is technically sophisticated and in general can evaluate and implement conservation measures without significant assistance. Many of these companies are part of large multinational enterprises that monitor energy consumption in all their plants worldwide, provide plant energy managers with up-to-date information on their energy use compared with that of plants in other countries, and offer technical assistance in analyzing and reducing this use. Not all multinational corporations, however, provide these services.

A second, far larger group appears to have major problems in analyzing and implementing energy conservation measures. The reasons for their difficulties are complex, and are the result of interacting financial, technical, and institutional factors. The most important factors appear to be very short

Table K1
Key TTEM Organizations and Responsibilities

Organization	Key personnel	Subproject identification	Technical evaluation	Economic evaluation	Institutional regulatory evaluation	Subproject financing	Subproject implementation	Subproject monitoring	Information dissemination
PCCI	o	o		o	o	o	o	o	o
EMMAP	o	o	o				o	o	o
Financial institutions				o		o	o		o
Energy users	•	o		o		o	o	o	o
Equipment and service suppliers		o	o			o	o	o	o
BEU	o	o	o	o	o				o
NEDA					o				
BOI				o		o			
CB				o		o			
MOF					o				

payback requirements, a lack of top management support, financing difficulties, and a lack of reliable technical information and support. A major problem with implementing many energy conservation projects suggested to Philippine companies is the short payback requirement. The interviews indicate that payback requirements of 1 year or less is preferred. Until recently energy has not been a major production cost factor, and thus has received little management attention. Consequently, energy conservation investments required more attractive returns than traditional investments in, for example, capacity expansion or the development of a new product line. This attitude appears to stem from a lack of understanding among top management of the potential for savings through energy conservation measures, as well as from skepticism about the ability of their personnel to properly implement these measures. In addition, this is also the result, in part, of the unsettled political and economic situation, which affects all investment.

A related factor is a lack of top management support for energy conservation measures. Experience in both industrialized and industrializing countries indicates that significant energy savings are available through low-cost "housekeeping" measures such as proper steam trap maintenance. However, realizing these savings requires consistent, continuous pressure by top management to ensure proper maintenance on a regular schedule and employee alertness to conservation opportunities. The discussions and observations indicate that such management commitment is generally absent in the Philippines. For example, although corporations consuming over 2 million liters of oil per year are required by government regulations to have energy managers, in many cases this requirement is met by giving the duty to a plant engineer in addition to his other responsibilities. Thus, the responsible individual may have only minimal energy training, and energy efforts are given a low priority compared to his other responsibilities.

In addition to these factors, major energy conservation investments may be difficult to finance for several reasons: the inability of many financial institutions to properly evaluate the economic performances of technologies, the difficulty in financing the foreign exchange portion of the investment (since many of the technologies must be imported), the lack of alternative capital investment vehicles such as shared-savings ventures, and high effective interest rates (22-35%). Thus, what capital is available to the company is earmarked for critical investments the company absolutely must make, while energy conservation investments are deferred.

Finally, there is a widespread feeling among those interviewed that additional technical support is needed in evaluating and implementing energy conservation measures. Such support is needed both on energy housekeeping measures and on major investments such as process changes or cogeneration. Energy users are looking for an independent, objective source of reliable information on energy conservation technology performance and costs, and technical assistance in designing, installing, and operating such systems within their facilities.

A final comment of those interviewed concerned the structure of the proposed TTEM Project. Many interviewees felt it extremely important that the private sector have a major and highly visible voice in setting policy and disseminating the results. This is important if the project is to be credible to senior Philippine corporate executives. The most credible government agency for this effort, according to the energy users interviewed, is the Bureau of Energy Utilization (BEU) of the Ministry of Energy, because of its past involvement in energy auditing and conservation activities and its record of cooperation with private firms.

Role of Energy Users in TTEM Project

Energy consumers are, of course, the principal clientele of the project; they will also contribute a critical element to its success by their cooperation in replicable conservation measures.

Energy users will participate in the TTEM effort by suggesting attractive projects, assisting in their evaluation, providing financing and technical assistance, implementing and monitoring the projects, and disseminating the information. Those interviewed were favorable to the TTEM concept, and indicated their willingness to participate in specific subprojects directly by providing sites for the demonstrations, through their representatives in trade associations such as the Philippine Chamber of Commerce and Industry (PCCI) and the Energy Management Association of the Philippines (ENMAP) and through membership on the advisory panels. The exact terms of their participation, of course, will depend on the characteristics of specific subprojects.

The discussions, as well as the experience of other countries in such demonstration programs, indicate that it is important for the users to have a strong financial interest in the success of the project. Thus, for low-risk projects, TTEM should focus on financing or funding only the costs that a demonstration would incur in excess of a normal application of the technology, such as monitoring and information dissemination costs. The Philippine user could be responsible for financing all peso costs, with TTEM helping to finance the foreign exchange portion of the investment at "market" interest rates.

A final factor mentioned by users was a fear of incurring any debt denominated in foreign currencies (i.e., dollars) because of possible currency devaluation. Thus, any program that required such debt would present major obstacles to user participation.

2. Suppliers of Energy Conservation Equipment and Services

A second group interested in the TTEM Project consists of suppliers of energy equipment and services, including manufacturers, distributors, and architectural/engineering firms. Relatively few energy conservation technologies are manufactured in the Philippines; most are imported from

Europe, Japan, or the United States. Local Philippine distribution firms then provide marketing, installation, and/or maintenance services to the customer. The discussions with users indicate that these local distributors do not always have the technical capability to give the assistance needed in the proper design and operation of complex energy technologies, which slows their use. Less commonly, Philippine subsidiaries of foreign manufacturers will supply the local services needed; however, the Philippine market is usually too small to make this latter route practical except in a few isolated cases.

Discussions with representatives of supplier firms indicate that they perceive the same problems with implementing energy conservation measures as those mentioned by users. To help resolve these problems and uncertainties, they are willing to cooperate with the TTEM Project and provide contributions of personnel, equipment, or funds to assist in the demonstration, training, and dissemination efforts. Several suppliers, for example, indicated that under certain circumstances they would be willing to donate technical design services and equipment to a demonstration.

3. Financial Institutions

Financial institutions such as commercial banks, rural banks, thrift banks, specialized, venture capital firms and government-owned banks are important to the use of energy conservation equipment and processes because their procedures and rates often determine whether capital will be available to fund the energy conservation investments. These institutions' influence on capital availability is especially pronounced in the case of high capital cost technologies such as cogeneration systems. The interviews with representatives of these organizations focused on commercial banks and venture capital firms, which together control nearly three-quarters of the capital that could be available to industrial firms for energy conservation loans. These interviews indicate that financing of energy conservation investments entails several problems. First, while many institutions would like to become more aggressive in financing energy conservation, they are unwilling to do so because they do not believe that they understand the technologies well enough to evaluate the costs, performances, and risks. Thus, they tend to apply the most conservative lending standards to such investments. In addition, lending by commercial banks tends to be overwhelmingly short-term (i.e., less than 1 year, or "demand"). A 1980 study by the World Bank indicated that over 98% of commercial loans in the Philippines were of this type. As a result, loan repayments were very high, and it was unlikely that the savings for energy conservation investments having paybacks of more than 2 years would cover these payments while the loans were being repaid.

Finally, effective interest rates are very high, typically 22-28% on short-term loans and 32-35% on long-term loans (up to 5 years), if long-term money is available at all. At one point during the visit of the study team to Manila, the interbank overnight rate exceeded 50%, an indication of a general

liquidity crisis that is forcing banks to make loans only to their best customers and credit risks. As a result, this source of capital is effectively dried up for other firms.

The TTEM Project will help to reduce these problems in two ways. First, it will provide lenders with objective, verifiable data that they can use to properly evaluate the economic performance of a particular technology. Several representatives of financing institutions indicated that the data developed by the TTEM demonstrations would show that energy conservation investments have significant beneficial side effects which make the borrower more creditworthy by reducing his costs, improving his cash flow, and making his products more competitive. Second, it will provide a vehicle for demonstrating innovative financing techniques such as shared savings (in which the financier and users share the savings from the technology) or savings-correlated loans (in which the loan repayments are a fraction of the measured savings, guaranteeing the user an investment that will cost less than his current practices).

Private financial institutions will participate in the TTEM Project through the Banker's Association of the Philippines (BAP). In addition, two to four private banks will participate in the early years of the TTEM Project as lead banks to channel TTEM funding; other banks are expected to begin participating later. The BAP will provide one member of the Steering Committee, while it or individual banks may provide members for the advisory panels. They will assist in developing financing mechanisms for the subprojects and, where a financing innovation is being demonstrated by a subproject, in designing and implementing that subproject. Finally, they will provide credible channels for disseminating the results to the financial community.

The major private banks that those interviewed suggested for inclusion in the TTEM Project are the Far East Bank and Trust Company, the Bank of the Philippine Islands, PCI Bank, and Private Development Corporation of the Philippines. These banks are the major private lenders to the industrial and commercial sectors and have reputations as leaders in developing new financing vehicles. Several private firms also expressed interest developing venture capital vehicles for financing energy conservation measures. One--Sycip, Torres, and Velayo (SGV)--is the major Philippine accounting firm, which also offers project development and venture capital services. Another firm that indicated significant interest in helping to finance TTEM efforts is Ventures in Industry and Business Enterprises, Inc. (VIBES). This is a venture capital subsidiary of the First Philippines Holdings Corporation that focuses on financing small and medium-scale businesses. It is owned by PCI Bank (a private subsidiary of First Philippines Holdings Corporation), the Land Bank of the Philippines (a government bank), the Development Academy of the Philippines (a government institution), the First Philippines Holdings Corporation (a private corporation), and the International Finance Corporation of the World Bank.

4. Trade Associations

Trade associations also have a major role to play in the TTEM Project. In general, these associations are the best avenues for communicating quickly and inexpensively with energy users, equipment vendors, financial institutions, and other firms because of their established communication networks and general credibility among their membership. A wide variety of such organizations exists in the Philippines, including general business associations such as the Philippine Chamber of Commerce and Industry (PCCI), associations focusing on specific issues such as energy management or research, and associations focusing on specific sectors such as textiles or commercial buildings.

The interviews indicate that three trade associations could make significant contributions to the TTEM effort: PCCI, the Energy Management Association of the Philippines (ENMAP), and the Bankers Association of the Philippines (BAP).

Philippine Chamber of Commerce and Industry (PCCI)

The Philippine Chamber of Commerce and Industry (PCCI) was formed 6 years ago through the merger of the two major established business associations to provide a single voice for Philippine industry. The PCCI currently has approximately 1,050 corporate and association members, with a full-time staff of 29. It recently hired a full-time Director General to give the organization a more activist orientation and to enable it to properly handle its increasing responsibilities.

PCCI offers credibility among senior industrial- and commercial-sector executives, some experience in analysis and development of energy policies, an organizational structure that might assist the TTEM staff during its initial setup, administrative expertise, and well-developed information dissemination channels.

The PCCI's work is carried out through committees staffed mainly by volunteers. Sectoral committees focus on problems of specific sectors such as food, agriculture, services, trade, and small and medium industries. Functional committees provide a "counterpart government" to review and make suggestions on government ministry policies and activities (e.g., taxation, tariffs, energy, national planning) and conduct normal PCCI activities (e.g., public relations, conferences, magazine). Regional committees include 50 affiliated local Chambers of Commerce that use the PCCI as a national spokesman and draw on its resources. The PCCI has an energy committee that has become increasingly active in the past few years. For example, it recently developed a comprehensive report on energy pricing policy for the Ministry of Industry that represented a consensus business viewpoint.

The PCCI convenes task forces to address specific problems as they arise. Recently, it sponsored a joint task force with the Ministry of Trade and Industry, which developed a package of energy conservation proposals designed to save $400 million in oil imports annually. These proposals included amending regulations to allow longer working hours and thus shortening the work week to 5 days, gasoline rationing, commercial building energy use standards, and regulations on jeepney and bus operations. It hosts an annual conference in conjunction with the other chambers (e.g., the American, Japanese, and Australian Chambers of Commerce), and in many cases acts as their spokesman also. The PCCI also publishes a monthly magazine, "Philippine Business".

The PCCI is becoming much more active in developing courses and seminars on current business topics for its members. It is planning a course next year on quality circles, cost reduction, corporate strategy development, export manpower, services and financing, productivity, institutional development, and other topics. It is strengthening its programs for small and medium-sized industries, expanding its services in the provinces, and giving more attention to international affairs through tie-ins with Chambers of Commerce in other countries.

PCCI is playing a major role in another USAID project in the Philippines, the Small and Medium Enterprise Development (SMED) Project. It is serving as an umbrella organization by providing office space and some administrative assistance. It is hiring staff for the project, assisting with workshops, seminars, and other training efforts, providing project monitoring assistance, and assisting with the organization and strengthening of regional small business associations.

The PCCI is moving its headquarters to Makati, Metro Manila, and has regional offices in major cities throughout the Philippines. It appears to be the only broad-based organization having a significant number of private-sector industrial and commercial energy users and equipment vendors among its members. Nearly all of the private-sector interviewees, when asked to indicate an organization that was credible to them and that they believed could represent their interests, mentioned the PCCI.

The PCCI will serve as the primary communication channel to senior Philippine private sector executives. It will recommend one individual to serve on the project's Steering Committee, probably the head of its Energy Committee or a member of its Technology and Productivity Committee. It will also recommend experienced individuals to serve as project staff. These staff members will be involved in all aspects of demonstrations, technical assistance, training, and special studies. Specific activities of the PCCI or its personnel will include the identification of attractive energy conservation subprojects (primarily by polling its membership), the evaluation of specific proposals (primarily economic and institutional factors), the development of financing alternatives, the implementation and monitoring of demonstrations, and

assistance in disseminating results to potential private-sector users. It will also provide important feedback on TTEM Project effectiveness from the private sector's viewpoint.

The PCCI contact is its Director General, Dr. Quintin Doromal.

Energy Management Association of the Philippines (ENMAP)

The Energy Management Association of the Philippines (ENMAP) is the major Philippine organization involved in the technical evaluation and implementation of energy conservation measures. Founded 4 years ago with the assistance of the Ministry of Energy's Bureau of Energy Utilization (BEU), it now has 368 members. ENMAP's members are primarily corporate and plant energy managers and engineers, most of whom have completed a BEU-sponsored course in energy management.

ENMAP does not yet have a high degree of visibility among senior corporate executives, probably owing to its relative youth and emphasis on technical matters. In addition, many of its organizational procedures are still evolving, and its ability to quickly and effectively disseminate information on new technologies has yet to be proven.

ENMAP's major constraint is its lack of a full-time staff. However, it has performed quite effectively over the past 5 years, using volunteers and paid consultants for specific efforts. It is confident it should have no problems meeting its responsibilities; in fact, several firms contacted by ENMAP have offered to detail energy managers to the project on a short-term basis. In addition, the project will have funds to pay short-term ENMAP consultants, where they are required for specific subprojects. Finally, both BEU and the U.S. consultant will be providing technical personnel to assist with specific projects, which can serve as a backup to ENMAP.

In short, the TTEM Project will assist ENMAP in developing a greatly enhanced capacity to provide its members and their employers with energy management advice, technical information, and access to engineerng and consulting services both during and after the project period.

ENMAP has seven regional chapters (Northern, Central, and Southern Luzon; Eastern and Western Visaya, and Eastern and Western Mindanao) and four subregional chapters (Cebu, Davao, Bataan, and Baguio). It is setting up sectoral committees focusing on specific industry sectors, including steel, cement, textiles, mining, and transportation (air, sea, and land). The organization of these committees is currently being finalized through discussions with the principal trade associations in these sectors and the chairmen and membership are being selected. In addition, ENMAP is setting up a committee on energy use in small and medium-sized industry in conjunction with the University of the Philippines' Institute for Small Scale Industry (ISSI).

At present, ENMAP is negotiating with the Philippine Licensing Board to develop professional requirements and an examination for licensing energy managers and engineers. It is also developing a series of workshops and seminars on energy use in various industry sectors and computer use in energy conservation, and it is developing energy auditing courses for regional ENMAP chapters.

ENMAP will provide the TTEM Project with a key person to serve as a member of the Steering Committee. In addition, it will recommend staff members who can provide technical subproject evaluation and assist with the other key staff functions of subproject identification, implementation, and monitoring. It has identified firms that are willing to loan key employees to the TTEM Project for a period of time and share some of their expenses. It will help identify attractive demonstrations, technical assistance, and training efforts through its membership and use its information channels to disseminate the cost and performance information resulting from the demonstrations.

The ENMAP contact is its president Mr. Greg Gonzales.

Banker's Association of the Philippines

The Banker's Association of the Philippines (BAP) was formed in 1949. Its 35 members include all the major Philippine-owned commercial banks and subsidiaries of foreign banks in the Philippine Islands. It does not, however, include the major government-owned financial institutions such as the Philippine National Bank and the Development Bank of the Philippines. The designated representative of each bank is that bank's president, executive vice president, general manager, or equivalent.

The BAP serves as the spokesman for the Philippine private banking sector. It appears before legislative and executive bodies and works with the Central Bank or other entities to consider, formulate, amend, or alter any laws, regulations, or practices related to banks or banking. In addition, it serves as a forum in which the banking community can discuss matters affecting it, and it circulates information likely to be of interest to its members.

The BAP conducts its business through 14 standing committees and 12 subcommittees composed of bank representatives. In addition, it has representatives on committees and working panels created by other government, private, or international organizations that are of interest to the Philippine banking community. The BAP sponsors a number of workshops and seminars aimed at raising the professional expertise of its member banks' employees. It also sponsors an annual meeting.

The BAP will be represented on the TTEM Steering Committee and will be an effective contributor to project success by encouraging banks' participation in financing demonstration subprojects. Through its ongoing dialogue with the GOP on laws and policies affecting banking, it can help to create a favorable climate for investment in energy conservation measures that will outlast the project peirod and reach well beyond the initial loan recipients to a large segment of the industrial and commercial sectors.

The contact person is Mr. Manuel Morales, the Association's acting president and the president of Equitable Banking Corporation.

F Government Institutions

Philippine government institutions also have a major role to play in encouraging the use of energy conservation technologies through their control of energy pricing and energy technology import policies. Government institutions are interested both in stimulating the use of the technologies through demonstrations and information dissemination and in using the technical and economic performance results to set policies and priorities on energy management, such as foreign exchange priorities and import duties for conservation equipment, pricing and tax incentives.

The primary government institutions involved in the TTEM program will be the Ministry of Energy's Bureau of Energy Utilization (BEU), the National Economic and Development Authority (NEDA), the Ministry of Trade and Industry's Board of Investment (BOI), the Central Bank (CB) and the Ministry of Finance (MOF).

Bureau of Energy Utilization of the Ministry of Energy

The Bureau of Energy Utilization (BEU) is the focus of the Philippine Government's efforts in this project. Created in 1978, BEU is one of the two major subdivisions of the Ministry of Energy and is responsible for developing and implementing a national program for energy conservation. The BEU has 142 employees and an annual budget of nearly ₱7 million. Its activities include:

- Collecting and analyzing energy consumption data from firms using more than 1 million liters of petroleum products per year;
- Offering general training courses in energy management and specialized courses such as energy conservation, energy auditing, and boiler maintenance;
- Providing energy audits to industrial plants and commercial buildings;
- Developing energy performance standards for buildings, industrial processes, vehicles, and appliances.

The first two activities are well established and are generally considered successful. In addition to its own training activities, BEU also supports similar ENMAP activities, which were discussed previously. The BEU has been providing free energy auditing services to industrial and commercial establishments since 1979, and has just completed its first full-scale independent audit for a Philippine textile firm (December 1983). These auditing services were recently assisted by the Asian Development Bank (ADB) and the United Nations Industrial Development Organization (UNIDO). The ADB recently funded an extensive program (now completed) of energy audits of 70 Philippine industrial plants conducted by outside contractors, who also trained BEU staff in energy auditing techniques. The UNIDO is currently funding a program that provides long-term consulting services for the development of energy audit and other energy conservation training programs within BEU. The energy standards activities are currently ongoing for room air conditioners. Plans to expand these activities to other appliances as well as to commercial building operations and standards are currently underway.

BEU will provide the primary GOP budgetary inputs to the TTEM Project. It will be responsible for the GOP contribution of $1.1 million, primarily by providing key staff, office facilities, and similar "in-kind" services. The staff members, who include some of BEU's most experienced personnel, will assist in identifying attractive subprojects, particularly in the early phases of the TTEM Project when they can use the results of existing BEU audits and studies. They will provide technical project evaluation and assist in economic and institutional/regulatory evaluations. BEU will also be responsible for disseminating the results of TTEM efforts through its training programs and newsletters.

The BEU will be represented on both the Steering Committee and the Project Management Committee; the BEU Director will serve on the former and be its first chairman, and the Chief of the Conservation Division on the latter. In addition, the BEU will have authority for final GOP authority for approval of demonstration subprojects, clearing the way for disbursement of funds. Since BEU will be an active participant in all earlier phases of subproject development, analysis and review, this final approval will simply formalize the results of these activities leading to implementation.

A constraint on BEU's effectiveness has been a lack of detailed technical expertise among its staff. This is rapidly being alleviated through training programs funded by BEU, AID, ADB and UNIDO. However, additional progress remains to be made. The TTEM Project will address this constraint by providing training programs for project staff in the Philippines and the United States. In addition, a significant portion of the U.S. contractor's effort will be providing consultants with specific expertise in energy technologies, financing, and program planning and implementation to buttress and provide on-the-job training to BEU staff.

The key contacts at BEU are Mr. Orlando Galang, Director, and Mr. Benjamin Lim, Chief of the Conservation Division.

The Central Bank of the Philippines

The Central Bank (CB), founded in 1939, manages the monetary, credit, banking, and foreign exchange systems of the Republic of the Philippines in a manner similar to that of other central banks around the world. It is organized into five major functional sectors, each of which is subdivided into operating departments. Three of these departments, External Debt, Current Imports and Commodity Classification, and Loans and Credit, are of importance to the TTEM Project. The Department of External Debt is responsible for coordinating with NEDA those national development programs and policies that involve foreign exchange, and for setting up foreign exchange budgets to repay foreign loans. The Current Imports and Commodity Classification Department is responsible for import commodity classification and assists in setting foreign exchange import priorities.

The Department of Loans and Credit will administer the TTEM fund, probably using one of the Industrial Guarantee and Loan Fund desks. The commercial banks contacted in the interviews have worked with this program and this Department, and they are comfortable with its procedures and requirements.

CB will not make loans directly to energy users, it will move the funds from USAID to accredited banks that will make the actual loans. To do this, the Ministry of Energy will establish an agreement with the CB to administer a TTEM loan fund, with the concurrence of the Ministry of Finance. The peso portion of the USAID contribution will be placed in this fund until the TTEM Project authorizes a disbursal to a participating bank. In addition, reflow funds from the payment of principal and interest on TTEM loans will be placed in the fund for investment and eventual relending.

The Central Bank has extensive experience managing such funds and has earned particular praise for its management of the highly successful Industrial Guarantee and Loan Fund. This fund was originally set up by USAID and later expanded significantly by the World Bank. The World Bank now uses the IGLF format (and has used CB staff as consultants) as a model for introducing similar programs in other developing countries. The CB's role in administering the TTEM loan fund will be similar to its role in managing the IGLF program, and will be administered by the same CB office.

Therefore, funds administration will present no problems because of the CB's impressive experience with the larger program. In addition, a separate loan policy manual is being developed for this project (drawing on a manual for the IGLF program) in order to assist private banks and end-users in understanding the loan fund's policies and loan and repayment procedures.

The CB will also provide other services, including accrediting the banking institutions participating in the program, disbursing funds to the banks, and auditing the loans to ensure proper handling by the banks and proper use by the borrowers. The CB levies an administrative fee of 0.5% to 1.0% of the outstanding loan balance to cover the costs of these services.

The CB will also have a representative on the Steering Committee to provide policy inputs and obtain information needed to develop rational energy technology import and financing policies. The key contact is Ms. Cecilia Arguelles, Deputy Director of the Department of Loans and Credit.

Ministry of Finance

The Ministry of Finance (MOF) is responsible for public finance administration including: administration and enforcement of customs laws; National Internal Revenue Code and other tax laws; treasury management; administration of special laws involving claims against the national government including management of public debts; and development and administration of securities market. The MOF will play an important role in formulating and recommending financial policy measures as well as providing necessary assistance to enhance economic viability and expedite implementation of various energy conservation projects. The MOF will also assume the foreign exchange risk. The key contact at MOF is Mr. Jose Javier, Planning Officer.

National Economic and Development Authority

NEDA is the primary Philippine Government planning organization. It is responsible for the formulation of both short-term and long-term development plans and for the identification and coordination of development policies and measures.

NEDA was established by Presidential Decree in 1973, shortly after martial law was declared. Its major functions include:

- o Advice to the President on day-to-day decision-making on economic matters;
- o Formulation of annual and long-term development plans and programs;
- o Coordination and implementation of national fiscal, monetary, credit, tarrif, investment, production, price, trade, population, land use, and other economic policies;
- o Analysis, coordination, and if inecessary, implementation of major development projects;

- o Coordination and integration of foreign economic and technical assistance;
- o Coordination of statistical activities of all government agencies;
- o Provision of general operational policies for those agencies under NEDA's administrative supervision.

At the helm of NEDA is a policy board headed by the President, assisted by the Prime Minister, and with Cabinet-level and other high executive officials as members. This board reviews and recommends development plans, programs, and policies, coordinates the development efforts of the various government agencies, and formulates and implements policies to carry out its goals and objectives.

Day-to-day operations are carried out by a technical staff headed by a Director-General. There are four major offices: Planning and Policy, Programs and Projects, Statistical Coordination, and Operations. In addition, there are regional offices that assist in the development and implementation of plans at the regional level.

NEDA has a number of agencies under its direct supervision, including the National Census and Statistics Office, the National Tax Research Center, the Philippine Volunteer Service Coordinating Center, and the Tariff Commission. In addition, it has a number of agencies and corporations attached to it for policy and program integration and coordination, which is accomplished primarily through NEDA representation on the organization's governing board. These agencies and corporations include ten NEDA intergovernmental committees, nine government corporations (such as the Philippine National Bank, which is the largest commercial bank in the Philippines, the Philippine Veteran's Bank, and the Development Bank of the Philippines), three regional development authorities, and the National Productivity Commission.

Technically, NEDA becomes involved in a USAID funded project when a "project paper" is submitted to it for review. In the case of the TTEM Project, this review will be performed by the Industries and Utilities Division, which will make a general recommendation. In addition, an Investment Coordinating Committee review is also necessary for all projects involving foreign exchange. Then, the approved project moves to the Ministry of Finance, which is responsible for negotiating terms and scheduling debt repayments. NEDA personnel have been involved in the TTEM Project design, and they indicate that they see no potential problems in getting the necessary project approvals.

NEDA will provide a member of the TTEM Steering Committee to ensure that it is aware of conservation opportunities identified by the project and can thus incorporate policy or regulatory changes identified as important to energy

conservation in future planning. In addition, it will provide TTEM with GOP policies and priorities in areas such as subproject selection and financing terms.

The key contact at NEDA is Ms. Remedios R. de Leon, Director of the Industry and Utilities Division.

Board of Investments of the Ministry of Trade and Industry

The Ministry of Trade and Industry's Board of Investment (BOI), together with the Central Bank, is responsible for approving any projects that make use of government incentives, require importation of foreign goods, or entail foreign investment. BOI's major responsibility is to provide "technical evaluations" of the projects submitted. To do this, it may call on other agencies, such as the Ministry of Energy, for technical assistance.

Currently, the BOI offers the following incentives for energy conservation equipment:

- "Pioneer" technologies (i.e., high risk, novel technologies which replace imported energy) may be imported tax and duty free. The current taxes and duties are about 10%.
- Non-pioneer technologies which replace imported energy have 1/2 the taxes/duties forgiven.
- Tax credits of 10% are available on net local content.

The general criteria for approval of projects and incentives include:

- Payback in 5 years or less.
- Conversion from imports to local manufacture
- External benefits to country, which are loosely defined. These can include rural development, employment opportunities, and other social benefits.

In the case of energy conservation technologies, there are no procedures for advance approval by BOI; each project application is reviewed individually in a process that takes approximately 2 months. In addition, these technologies do not now have foreign exchange priority, so it is possible that even if a user wanted to install a system, he may not be able to get the foreign exchange to purchase it. Both of these factors were mentioned as problems affecting the implementation of energy conservation technologies by potential users.

BOI will provide a representative for the Steering Committee to provide the Committee with a perspective on foreign exchange and investment priorities. In addition, participation in the TTEM Project will provide BOI with an understanding of the impacts of energy conservation technologies, which may help to speed the approval process for cases outside the project.

The key contact is Governor Hermingoldo Zayco.

Overall GOP Roles and Relationships to USAID

The GOP institutions described above are very supportive of the TTEM Project. In discussions during project design, GOP spokesmen agreed on the following points:

- The GOP desires decision-making authority on such TTEM policies as lending rates and annual budgets, as well as final approval on subprojects.
- USAID's project role, in the view of GOP spokesmen, should be primarily managerial rather than directive. In practice, this means full USAID participation on the Project Management Committee (where the major operational decisions will be made) and ex officio membership on the Steering Committee.

- Owing to the current severe GOP budget crunch, the Government's contributions will be on an in-kind basis, through the BEU, rather than a direct contribution of funds.

The first and second GOP points above reflect the Government's view that as the party responsible for repayment of the USAID project loan, it has both the right and the responsibility to determine overall policies related to use of the funds. These are viable arrangements, given the strong GOP commitment to the success of the project. Effective project performance will require ongoing consensus from all partners, both public and private, and it is in the interests of all the project actors to maintain that consensus.

6. International Assistance Organizations

Two international organizations whose efforts will complement the TTEM Project are the Asian Development Bank (ADB) and the United Nations Industrial Development Organization (UNIDO). The ADB is a major source of investment funds for Philippine development efforts. From 1967 to 1982, it invested approximately $1.6 billion in the islands. In recent years, the Bank has increased lendings in the energy sector to where these lendings now represent almost 30% of total annual lendings, second only to the Agriculture and

Agro-Industry sector's 32%. The main thrust of these lendings has been electric power development, although increased emphasis is now being placed on renewable resources and industrial-sector energy conservation.

The ADB is currently undertaking a number of studies and loan programs in the Philippine energy sector. In particular, it recently finished an energy audit study of 70 industrial plants that estimated national industrial energy conservation potential and provided energy audit training for BEU personnel. The results of this study are being used to suggest initial TTEM demonstration efforts. Other ADB energy studies in the Philippines include a recently completed study on bagasse utilization for drying, cogeneration, and small power production; a study of ASEAN coal potential; a study of refinery rationalization; and a study of geothermal potential for electric power production.

The ADB is very interested in financing energy conservation efforts if a way can be found to fund them in one large package rather than dozens of small loans. The TTEM Project provides a possible way to do this, similar to the Industrial Guarantee and Loan Fund (IGLF) effort. In the IGLF effort, USAID funded a successful program starting in 1950 to provide funds and loan guarantees to small and medium industrial firms. The World Bank then built on the structure established by USAID and vastly increased its funding. Similarly, ADB may be able to make a single large loan to the central fund of the TTEM Project that can be relent for energy conservation investments through participating banks. Discussions with ADB personnel indicate that as much as $120 million may be made available for such loans. The ADB will be kept current of TTEM efforts, and will advise the TTEM Project team on ADB's interests and information requirements.

The United Nations Industrial Development Organization (UNIDO) is headquartered in Vienna. Its 1983 budget was $145.5 million, of which $49 million was for administration and research and $95.5 million was for programs. The administrative and research costs are funded from the regular UN budget; the program costs are funded by various UN and participating government funds. Of these program costs, 70% ($65.4 million) comes from the United Nations Development Programme (UNDP); UNDP's funds are contributed by member states and allocated to particular countries up to a predetermined amount called the indicative planning figure (IPF).

UNIDO has a mandate to promote and accelerate the industrialization of developing countries by providing technical expertise and cooperation in all aspects of industry. This assistance includes consultation on developing an industry sector, establishing training centers in marketing, manufacturing, and finance, providing expert advice on new technologies, performing techno-economic studies of particular ventures, conducting personnel training, and providing international expert groups meetings and workshops.

UNIDO is currently financing an energy audit training program for BEU staff and establishing a fuel testing laboratory in a 3-year, $1.5-million effort. These training efforts complement the BEU, and ENMAP efforts directed toward private-sector energy users, and would be equally complementary to future TTEM efforts. It is quite possible that economies of scale can be realized by sharing instructional materials and possibly joint programs and seminars. Thus, UNIDO will participate through the Advisory Panels by keeping the TTEM staff cognizant of UNIDO programs and information needs, sponsoring joint training programs, and using TTEM demonstrations to identify procedures and technologies that can be transferred to and from other developing countries to promote energy conservation.

7. Private Commercial Banking Institutions

Four commercial banking organizations are expected to be the initial private banking participants in the TTEM Project. The choices were based on the recommendations of energy conservation system users and vendors and on discussions with the banks themselves. The banks are Bank of the Philippine Islands (BPI), Philippine Commercial International Bank (PCI), the Far East Bank and Trust Company, and the Private Development Corporation of the Philippines (PDCP).

BPI is the largest privately owned commercial bank in the Philippines, with total assets as of the end of 1983 of 10.6 billion pesos ($760 million at the current official exchange rate). It has 127 branch offices throughout the Philippines, and offers its customers a full range of services from commercial banking to investment banking to leasing. It is very interested in the field of energy conservation, and has installed computer-based energy conservation management systems in its headquarters. It is also very interested in developing new financing vehicles, such as loans with repayments tied to savings, to finance energy conservation. The contact person is Benito R. Araneta, Executive Vice President.

PCI Bank is the fourth largest privately-owned commercial bank, with over 6.0 billion pesos in assets at the end of 1982. It is owned by the Manila Electric Company (MERALCO), and the bank's president is also chairman of the board of MERALCO. PCI Bank is particularly interested in energy conservation because MERALCO (which does not generate power) has extremely low reserve margins and thus suffers from frequent planned and unplanned brownouts. An affiliated company, PCI Management Consultants, conducts free energy audit services for MERALCO customers with the assistance of MERALCO engineers. PCI Bank and its affiliated companies indicated that they are very interested in cooperating with the TTEM Project in a variety of ways from assistance in financing to energy audits to participation in actual demonstrations. The contact person is Antonio H. Ozaeta, President.

The Far East Bank and Trust Company is the country's seventh largest private banking institution, with 1982 combined assets of 6.2 billion pesos. It has 52 branches throughout the Philippines, and provides a full range of commercial banking services both domestically and internationally. The main contact is Mr. Wilfredo V. Vergara, Executive Vice President. In 1981, Far East acquired PDCP, an organization formed by international lending organizations as a development finance institution that would provide capital for equity and for medium and long-term debt to ventures strategic to the growth of private industry and to the development of the national economy as a whole. PDCP had 1982 assets of 1.7 billion pesos (in addition to those of Far East). The contact person is Robert S. Orose. Both organizations are very interested in and enthusiastic about the TTEM Project and its goals, and are willing to assist in a variety of ways, from acting as an agent for TTEM loans to devising innovative conservation financing vehicles such as shared savings ventures.

Annex L

ORGANIZATIONS INTERVIEWED

This section summarizes the organizations and persons interviewed in designing the TTEM Project.

Industrial and Commercial Energy Users

Organization/Address	Person/Position
Benguet Corporation 225⁰ Pasong Tamo Ext. Makati, Metro Manila	Jose E. Briones, Manager Marcelino C. Reyes, Manager Power & Energy Development
Borden International Philippines, Inc. 1001 Filipinas Life Bldg. Ayala Avenue, Makati, Metro Manila	Francisco A. Manalo Production and Engineering Manager
Carnation Philippines Corner Reliance and Pine Streets Mandaluyong, Metro Manila	Manuel Lara, Plant Manager
Engineering Equipment, Inc. (EEI) 391 J. Rizal, Namayan Mandaluyong, Metro Manila	Johnny O. R. Cardenas Group Manager, Materials Movement Group
Erma Industries, Inc. 115 N. Bay Boulevard Navotas, Metro Manila	Ernesto B. Marcelo, President Salvador C. Fernandez, Marketing Manager
Firestone Tire & Rubber Co. of the Philippines Barrio Posadas, Mungtinlupa Metro Manila	Ernesto Formanes, Engineering Manager George R. Laxamara, Plant Engineering Manager Richard J. Roney, Factory Manager
International Oil Factory 19 F. Manalo Street San Juan, Metro Manila	Ramon dela Rosa, Mechanical Engineer
National Development Company 377 Buendia Avenue Extension Makati, Metro Manila	Fernando Vicente Assistant General Manager

Industrial and Commercial Energy Users (Continued)

Organization/Address	Person/Position
Pacific Activated Carbon Co., Inc. Suite 401, Cattleya Condominium 235 Salcedo St., Legaspi Village Makati, Metro Manila	Herman M. Montenegro, President
Pilipinas Kao, Inc. (PKI) 110 Legaspi Building 110 Legaspi Street Makati, Metro Manila	Hideo Anzoh, Senior Vice President Wakayoshi Higashi, Chief Chemical Engineer Tokusaburo Kubota, Plant Manager Alfredo D. Yniguez, Jr., Executive Vice President/Director
Pilipinas Nissan, Inc. 222 E. Rodriguez Sr. Boulevard Quezon City, Philippines	Antonio A. Gimenez
Philippine Refining Company (PRC) 1351 U.N. Avenue, Manila	Julio Cesar J. Locsin
Planters Products Fertilizer Plant P.O. Box 3447, Manila	Victor T. Fresnoza, Jr. Production Manager
Republic Glass Corporation (RGC) Barrio Pinagbuhatan, Pasig Metro Manila	Adolfo B. Rosel, Jr. Senior Manager, Manufacturing Services Group
Resins Incorporated E. Rodriguez Jr. Avenue Pasig, Metro Manila P.O. Box 2534, Manila	Meneleo Carlos, Jr. President
Ortigas Investment & Management Corp. Ortigas Bldg., Ortigas Avenue Pasig, Metro Manila	Jose S. Roque, Jr., Engineer AVP, Technical Department
Saniwares Manufacturing Corporation Barrio Santolan, Pasig, Metro Manila	Eduardo L. Valenzuela Manufacturing Manager
Scott Paper Philippines Bisa, Quezon City	Gerardo Izon Plant Operation Manager

Industrial and Commercial Energy Users (Continued)

Organization/Address	Person/Position
TOA Industries, Inc. Omega Industrial Inc. 117 N. Bay Boulevard Navotas, Metro Manila	Sergio R. Ortiz-Luis, Jr. President
The Regent of Manila Roxas Boulevard, Manila	Demitrius T. Advincula Chief Engineer

Financial Associations

Organization/Address	Person/Position
Bank of the Philippine Islands Ayala Avenue, 8 Paseo de Roxas Makati, Metro Manila	Benito R. Araneta Executive Vice President
Development Bank of the Philippines Green Room, Penthouse DBP Building Buendia Avenue Extension Makati, Metro Manila	Ben Hur M. Manalo Executive Office for Research
Equitable Banking Corporation Equitable Bank Building Juan Luna Street, Manila	Manuel Morales, President
Far East Bank and Trust Company 5th Floor, Beneficial Life Bldg. Intramuros, Manila 2801	Wilfredo V. Vergara Executive Vice President Edilberto V. Javier First Vice President
National Development Company 377 Buendia Avenue Extension Makati, Metro Manila	Fernando Vicente Assistant General Manager
Philippine Commercial International Bank 1 PCI Bank Towers, Makati Avenue Makati, Metro Manila	Antonio H. Ozaeta President

Financial Associations (Continued)

Organization/Address	Person/Position
Philippine National Bank Escolta, Manila	Gerardo Agulto, Jr. Senior Vice President Renato D. Sarmiento Vice President, Trust Department
Private Development Corporation of the Philippines (PDCP) PDCP Building 6758 Ayala Avenue Makati, Metro Manila	Roberto S. Orosa Executive Consultant Exequiel Villacorte, Jr. Vice President, Business Development (now President, Banco de Oro)
Ventures in Industry and Business Enterprises, Inc. Landbank Building, 5th Floor Buendia Avenue Ext., Makati	Thomas T. Paterno President

Trade Associations

Organization/Address	Person/Position
Bankers Association of the Philippines c/o Equitable Banking Corporation Equitable Bank Building Juan Luna Street, Manila	Manuel Morales, Acting President
Council of Technology and Applied Science of the Philippines (COTASP)	Adolfo Benavides, President Pedro M. Carino, Past President
Philippine Association of Mechanical Engineers (PAME) 1438 San Marcelino St. Ermita, Manila	Pedro M. Carino, President Antonio R. Herrera, Past President
Philippine Chamber of Commerce & Industry	Dr. Quintin Doromol, Director General Herman M. Montenegro, Chairman, Energy Committee (Pacific Activated Carbon) Meneleo Carlos, Jr., Member, Pro-

Trade Associations (Continued)

Organization/Address	Person/Position
	ductivity and Technology Committee (Resins Inc.) Federico S. Puig (Kimberly Clark) Jim Moorhouse (C.I.G.I.) Ricardo P. Guevara (Maria Christina Chemical Industries) Ceferino L. Follosco (Alpha Machinery) Reynaldo Adriano (Borden International Philippines) Pablo P. Gabriel (Tin Can Manufacturer's Association of the Philippines)
Philippine Institute of Architects	Carlos A. Santos-Viola
Philippine Wood Products Association 3rd Floor, LTA Building 118 Perea Street Legaspi, Philippines	Santiago P. de Guzman, President (Insular Lumber Company)
Energy Management Association of the Philippines (ENMAP) BEU Office, PNOC Complex Merritt Road, Fort Bonifacio Makati, Metro Manila	Greg Gonzales, President (Philippine National Bank) Norberto L. Villarama (Fil-Hispano Ceramics) Edgardo Villavicencio (Universal Cement) Rene Banares (San Miguel Corp.) C. F. Carlos (Ford Philippines) Gonzalo O. Catan, Jr. (MAPECON Philippines) Antonio Gimenez (Pilipinas Nissan)
Textile Mills Association of the Philippines, Inc. Legaspi Village, Makati, Metro Manila	Benedicto V. Dakanay Executive Vice President
United Architects of the Philippines	Geronimo V. Manahan, Principal (Planning Resource & Operations System)

Vendors, Service Organizations

Organization/Address	Person/Position
ACI Fiberglass Gamboa Street Legaspi Village, Makati	Steven Shedden, General Manager Jose Servanda, Marketing Manager Jesus Lopez, Sales Manager
AMC Associates 6th Floor, 8F Topman Center Building Ayala Avenue, Makati, Metro Manila	Angel de la Cruz Principal Architect
AG&P Air Conditioning & Refrigeration Div. 2306 Pasong Tamo Extension Makati, Metro Manila	Jose A. Hilario, Vice President
Avesco Marketing Corporation San Francisco Del Monte Quezon City, Metro Manila	Jimmy Y. Yang, President Jose Yu Lim, Manager, International Division Ernesto V. Payonagayong Marketing Manager Reuben Abante, Engineer
EMB Industries 15 N. Bay Boulevard Navotas, Metro Manila	Salvador C. Fernandez Marketing Manager
Economic Development Foundation 8th Floor, Bankmer Building Ayala Avenue, Makati, Metro Manila	Cesar N. Sarino, President Purita M. Festin
Konserv, Inc. Suite 2-O, Padillo Building Emerald Avenue, Pasig, Metro Manila	Sahson R. Tivkinltoy Engineer
A. Mateo Engineering & Consulting Services 44-E Rizal Avenue Extension Caloocan City, Metro Manila	Dr. Antonio F. Mateo, President
PCI Management Consultants, Inc. 15th Floor, No. 1 PCI Bank Towers Makati Ave., cor. H.V. de la Costa St. Makati, Metro Manila	Arthur N. Aguilar, President

Vendors, Service Organizations (Continued)

Organization/Address	Person/Position
Philippine Industrial Energy Co., Inc. 2242 Pasong Tamo Extension Makati, Metro Manila	Frederico T. Cortez
Philippine Insulation Company Metro Bank Building Ayala Avenue, Makati, Metro Manila	Garry L. Abaca, Sales Executive
RN Ferrer & Associates Padilla Building Ortigas Commercial Center Pasig, Metro Manila 3130	Rodolfo N. Ferrer, Principal
Tootal Textiles Limited 56 Oxford Street Manchester M60 1 HJ	Hugo McCorkell Philippine Project Manager
The SGV Group 105 De la Rosa Street Makati, Metro Manila	Washington Sycip, Chairman Rufo Colayco, Managing Director Antonio Saplala Yap, Principal Tomas F. Molina, Staff Consultant
Spirax Sarco Philippines, Inc. 8435 Mayapis Village Makati, Metro Manila	Charles G. Moody General Manager, Philippines

Philippine Government Institutions

Organization/Address	Person/Position
Board of Investments Industry & Investment Building Buendia Avenue Extension Makati, Metro Manila	Herminigildo Zayco, Governor Agapito Kalingking Ramon Rosales
Ministry of Energy Merritt Road, Fort Bonifacio Makati, Metro Manila	Benhur Salcedo, Controller Mar Tecson, Legal Counsel Ramona Ang, Budget Director

Philippine Government Institutions (Continued)

Organization/Address	Person/Position
Ministry of Energy/Bureau of Energy Development Merritt Road, Fort Bonifacio Makati, Metro Manila	Gregorio V. Kilayko Officer-in-Charge
Ministry of Energy/Bureau of Energy Utilization	Orland Galang, Director Benjamin P. Lim
Ministry of Energy Building Merritt Road, Fort Bonifacio Metro Manila	Chief, Conservation Division Marcial F. Ocampo, Section Chief Buildings & Transportation Wilfredo S. Toledo, Section Chief Industry
Central Bank of the Philippines 5th Floor, Multi-Storey Building A. Mabini, Manila	Cecilia Arguelles Deputy Director -- Department of Loans and Credit Angelina L. Tiangco Director, Management of External Debt and Investment Accounts R. M. Alvarez Dolores Faylona, IGLF Leandro A. Almendrol, IGLF Neilo T. Altre, IGLF Joan M. Carter, IGLF
Ministry of Finance	Jane V. Tambanillo
Ministry of Human Settlements Technology Resource Center Buendia Avenue Extension Makati, Metro Manila	Eligio J. Tavanlar, Sr.
Ministry of Trade & Industry 385 Buendia Avenue Extension Makati, Metro Manila	Quintin G. Tan, Director, Bureau of Small and Medium Industries Francisco G. Valenzona, Jr. Regional Manager, Small Business Assistance Center Zoile B. Pedro
Ministry of Transportation and Communication Ortigas Avenue, Pasig Metro Manila	Jose P. Dans, Jr., Minister Roger R. Vitasa, Acting Head Executive Director

Philippine Government Institutions (Continued)

Organization/Address	Person/Position
National Tax Research Center 4th Floor, Banco Filipino Condominium Aduana Street Intramuros, Manila	Angel Q. Yoingco, Director Vicente G. Quintos, Deputy Director Dante Sy, Fiscal Incentive Branch
National Economic and Development Authority NEDA Building, 2nd Floor Amber Street, Pasig Metro Manila	Remedios R. de Leon, Director Industry and Utilities Staff (IUS) Senen Recasio, Asst. Director, IUS Zita C. Gotauco, IUS Rafael B. Cinco, IUS Erlinda Ortega, External Assistance Staff (EAS) Antonio L. Ampil, Policy Coordination (Staff (PCS) Renato A. Sabado, Infrastructure Staff (IS) Lilia S. Sarmenta, Asst. Director Project Economics Staff (PES) Ms. Ester A. Cebuma, IUS Arturo Cebuma, IUS Sylvia Reyes Fiologo Pante, Jr. Vicente D. Salazar, Jr., EAS Rafael B. Carlos Zita C. Gotanco
Technology Transfer Board 4th Floor, Industry & Investments Bldg. 385 Buendia Avenue Extension Makati, 3117, Metro Manila	Rowena L. Paguio, Chief Specialist

Other Organizations

Organization/Address	Person/Position
Asian Development Bank Energy Planning 2330 Roxas Boulevard Pasay City, Metro Manila	V. V. Desai Kari J. Nyman

Other Organizations (Continued)

Organization/Address	Person/Position
Dangroup 28 Teknikerbyen DK-2830 Virum-Copenhagen Denmark	Jasper Krogh Jensen Chief Planning Engineer
Manila Electric Company Meralco Center, Ortigas Avenue Pasig, Metro Manila	Jesus P. Francisco Vice President, Engineering
PCI Bank Towers Makati Avenue, Makati, Metro Manila	Antonio H. Ozaeta Chairman of the Board
UNIDO 106 Amorsolo Street Legaspi Village Makati, Metro Manila	Ivan E. Pluhar, Senior Industrial Development Field Advisor P. R. Srinivasan Chief Technical Advisor
Polytechnic University of the Philippines Polytech Institute of Technology 79 Atis St., Sta. Mesa, Manila	Romulo M. Ricafranca Dean of Engineering

Annex M

TTEM PROJECT FUND REFLOW ANALYSIS

The first generation reflow funds from loans from the TTEM Project were estimated to determine the moneys available for additional projects and whether a sufficient cash flow could be generated to repay the U.S. dollar-denominated loan as it falls due. This analysis was conducted because the GOP wanted assurance that the TTEM loan fund could be totally self sustaining. It does not mean, however, that the reimbursement of the USAID loan by the GOP is tied to the financial viability of the TTEM loan fund. In this annex, the project characteristics that influence the cash flows are briefly reviewed.

TTEM Project Characteristics

To evaluate the cash flows for the TTEM Project, assumptions must be made about the total funds available, the repayment terms, the length of the project, and how the funds will be used. Of the $5 million allocated by USAID to the TTEM Project, $3 million is a loan that must be repaid (see Table M1). The terms of this loan include a 10-year grace period followed by a 30-year repayment period. During the grace period, interest accrues at 2% per year; during the repayment period, at 3% per year. Of the $3 million loan, $340,000 will be used for project expenses and will not be available for relending to users.

The TTEM Project has a targeted life of 5 years. During this time, the USAID loan will be used in three ways: straight loans, loans with repayments tied to savings, and non-revenue-generating uses such as grants. Approximately 50% of the available funds are expected to be used for straight loans at interest rates at the favorable end of the range of current commercial rates, and with longer repayment terms than are normally available to Philippine borrowers, to give borrowers an incentive to participate in the program. At present, commercial loan terms are 33 to 40% for terms less than 1 year and longer term funds are generally not available at all).

The cash flow analyses assumed the TTEM subproject straight loans will have a 1-year "grace" period to allow detailed design, ordering of parts, and construction, followed by a 4-year repayment period. These comparatively long-term loans should allow the users to realize immediate improvements in their cash flows from the energy conservation investment. An interest rate to the borrower of Manila Reference Rate (currently 24%) plus 3 percentage points has been targeted for these loans, which is more favorable than

Table M1
Sources and Uses of USAID Funds
Forthe TTEM Project
($000s)

Grant		$ 2,000
Technical Assistance	$1,289	
Studies/Training/Information	586	
Commodities	50	
Project Evaluation	75	
Loan		3,000
Technical Assistance	218	
Studies/Training/Information	72	
Commodities	50	
Project Loans and Grants	2,660	
Total		$5,000

generally available on the market yet not too concessionary.1/ Discussions with commercial banks indicate that they require a 3% spread for loans in which the TTEM fund accepts all the risk. If the commercial bank accepts the risk, their return will need to be much higher; about 7%. If the risk is split between the commercial bank and the TTEM fund, the spread will be adjusted accordingly. For example, a 50/50 split would result in a 5% spread to the commercial bank. The Central Bank receives a fee for its services, assumed here to be 1%. The TTEM fund will then realize a return of 10% to 14%, depending on the risk it accepts. The targeted borrower cost of MRR plus 3%, plus the longer repayment terms, should make the loans attractive to users while generating funds that the TTEM Project can reinvest in additional energy conservation projects. (These additional funds generated by principal and interest payments are termed reflow funds.) Finally, to ensure that users have a strong financial stake in the successful outcome of their investment, at least 25% of the total subproject cost should be borne by them.

1/ For purposes of analysis of project financial viability, the 1983 average MRR of 15% has been used as the lowest MRR likely to occur as Philippine economic conditions return to normal in coming years.

The second application of funds is loans with repayments tied to savings. In this type of loan, the actual energy savings resulting from the investment will be monitored, and the value split between the lender and the user until the loan, plus accrued interest, is paid off. Because of the higher risk (compared with a straight loan) and higher costs (because of monitoring requirements), the lender should realize a higher return of at least 5 percentage points. Thus, the net return from loans with repayments tied to savings would be at least 23%. If the TTEM fund takes the loan risk, the commercial bank's spread should be 4.5%, because the loan will have more complex administrative requirements than a straight loan and the project does want to provide them an incentive to participate in this type of loan, at least in the early years. If the bank is willing to take the loan risk, its spread should be much higher, about 9.5%. If the risk is shared, the return should be split proportionally. For example, a 50/50 sharing of risk should result in a 7% spread to the commercial bank. Again, the Central Bank receives a fee of no more than 1%, and the user will be expected to contribute at least 25% of the initial project costs. This structure results in a return to the TTEM fund of 12.5 to 17.5%, depending on the level of risk it assumes. This type of loan is expected to account for 25% of available TTEM funds.

The final application of the TTEM funds is in non-revenue-generating activities such as direct grants to subprojects, technical assistance, studies, training courses, information dissemination, project monitoring, and so forth. These grants--which are separate from the funds made available by USAID as a direct grant--will represent about 25% of the funds available.

We also assumed that the commercial banks will receive from the borrower a fee of 1% of the loan amount and 1/2% of the grant amount for credit assessments and administrative expenses. These financing terms are summarized in Table M2.

Base Case Analysis

In conducting a "base" analysis, the first step is to estimate the funds needed to repay the USAID loan. Next, assumptions on TTEM project revenues and expenditures are developed. Finally, actual cash flows are estimated and a determination is made as to whether they are sufficient to repay the loan.

The loan portion of USAID funding is denominated in dollars and has a 10-year grace period during which the loan accumulates interest at 2%, followed by a 30-year repayment period with biannual payments, during which the loan carries a 3% interest rate. For analysis purposes, the loan is expected to be drawn on according to the following schedule:

Table M2
Proposed First Year Financing Terms[1/]

Type of Financing	Who takes risk?	TTEM fund	Spread (percent) Commercial Bank	Central Bank	Loan rate to borrower	Loan origination fee (%)	Maximum amount
Grant	-	-	-	-	-	0.5	$ 75,000[2/]
Straight Loan	Bank	10	7.0	1.0	18.0	1.0	200,000[3/]
	TTEM Fund	14	3.0	1.0	18.0	1.0	200,000[3/]
	Shared (50/50)	12	5.0	1.0	18.0	1.0	200,000[3/]
Loan with repayments tied to savings	Bank	12.5	9.5	1.0	23.0	1.0	200,000[3/]
	TTEM fund	17.5	4.5	1.0	23.0	1.0	200,000[3/]
	Shared (50/50)	15.0	7.0	1.0	23.0	1.0	200,000[3/]

1/ These terms can be adjusted at any time by the TTEM Project Steering Committee
2/ This is also limited to 50% of the total subproject cost.
3/ This is also limited to 75% of the total subproject cost.

Table M3
Revenue Realized from Loans With Repayments Tied to Savings

Investment Payback (years)	Yearly Revenue (Fraction of Initial Loan Amount) 1/ 1	2	3	4	5	6
1	0.0000	0.0000	1.1000	0.0086	0.0000	0.0000
2	0.0000	0.0000	0.5500	0.6050	0.0143	0.0000
3	0.0000	0.0000	0.3667	0.4033	0.4437	0.0211
4	0.0000	0.0000	0.2750	0.3025	0.3328	0.3660
5	0.0000	0.0000	0.2200	0.2425	0.2662	0.2928
6	0.0000	0.0000	0.1833	0.2017	0.2218	0.2440
7	0.0000	0.0000	0.1571	0.1729	0.1901	0.2092
Weighted Return 2/	0.0000	0.0000	0.4200	0.3418	0.2448	0.1261

1/ Assume energy prices escalate at a 10% per year rate

2/ Using the following weights:

Investment Payback (yrs)	Weight
1	0.10
2	0.20
3	0.30
4	0.15
5	0.15
6	0.00
7	0.10

Year	Loan Amount ($000)	Percentage
1	140	5
2	1,161	38
3	1,699	57
4	-	-
5	-	-
Total	3,000	100

The future value of the loan stream compounded at 2% to year 10, is $9,393,446, which is the total amount that must be paid back in biannual payments over the next 30 years. At 3%, each semi-annual loan repayment is $238,532. To repay the loan, it is assumed that an annuity fund is established at the beginning of the repayment period. If the fund earns 7% annually, the initial amount of the annuity must be $5,950,109. An earned interest rate of 7% is conservative; currently, rates on U.S. government securities are about 9% on short-term instruments and 10 to 11% on long-term instruments.

This analysis assumes that the peso-to-dollar exchange rate will remain relatively stable from the time of loan release to the end of the subproject loan payment period.

To determine the fund cash flow, a number of assumptions must be made about the applications of the funds, the amount of bad debt, and the reinvestment strategy that the fund will follow. In this conservative "base case" scenario, approximately 50% of the funds will be allocated to regular loans and 25% each to loans with repayments tied to savings and to non-revenue-generating activities such as grants and technical assistance. The straight loans have an estimated return to the TTEM Project of 12%. These loans have a 1-year grace period and a 4-year repayment period. The revenue stream (principal and interest payments) from such a loan is:

Year	Principal and interest payment
1	0.0000
2	0.3687
3	0.3687
4	0.3687
5	0.3687

The revenue stream from loans with repayments tied to savings depends on the interest rate realized and the characteristics of the investments. This analysis assumes the risks are on average split 50/50 between the commercial bank and the TTEM fund, resulting in a net return to the TTEM fund of 12%. To simplify the calculation, no fees for intermediaries such as banks are included. The realized cash flows to the TTEM Project from a portfolio of investments with paybacks based on energy savings of 1 to 7 years are shown in Table N3. For this loan, 25% of the investment is provided by the user, and 75% by the project. There is a 1-year grace period for engineering, procurement, and construction, and the loan repayments continue for a maximum of 5 years thereafter. After 5 years of payments, any remaining loan balance is forgiven.

The composite loan revenues from the composite of 2/3 regular loan and 1/3 loan with repayment tied to savings are shown in Table M4. Also indicated are the revenues that the TTEM Project will actually receive once allowances are made for bad debts. For the base case analysis, bad debts were assumed to be equal to 10% of the outstanding loan balance per year, which is high relative to experience in other loan programs. The Industrial Guarantee and Loan Fund (IGLF), for example, claims to have a 2% bad debt experience. However, as this project is primarily a demonstration program rather than a loan program, the higher estimate provides a cushion for problems that may arise and thus a more conservative estimate of the actual cash flows.

Finally, to calculate the cash flows, the investment strategy to be followed by the TTEM Project in the base case must be defined. The principal assumptions are:

Table M4
Expected Loan Revenues

	Yearly Revenue (Fraction of Initial Loan Amount)					
	1	2	3	4	5	6
Regular Loans (12%)	0.0000	0.0000	0.3238	0.3238	0.3238	0.3238
Savings-Related Loans (15%)	0.0000	0.0000	0.4200	0.3418	0.2448	0.1261
Composite Loan Revenue 1/	0.0000	0.0000	0.3559	0.3298	0.2975	0.2579
Expected TTEM Loan Revenue 2/	0.0000	0.0000	0.2883	0.2404	0.1952	0.1523

1/ 2/3 Regular Loan; 1/3 Loans with repayment tied to savings

2/ Assuming 10% per year bad debt.

- The project will operate for a 5-year period, after which it will cease to function. It is assumed that no additional funds will be made available from USAID, the Asian Development Bank, or other sources.

- During the period of activity, all moneys received from the USAID loan and from reflow funds--user loan principal and interest payments--will be allocated as follows: 50% to regular loans, 25% to loans with payments tied to savings, and 25% to non-revenue-generating activities.

- After the TTEM Project has ended, the loan principal and interest payments will be put into a fund that invests in secure finance instruments, with a view to eventually repaying the USAID loan.

Given these assumptions, the cash flows for the TTEM Project are summarized in Table M5. During the 5-year period of the project, loan repayments will contribute approximately $1,867,000 to the funds made available from the USAID loan. Approximately $2,993,500 are made available in addition to the USAID grant and the GOP contribution for non-revenue activities such as grants, technical assistance, training courses, and test and monitoring equipment purchases.

The loan principal and interest repayments received after the project has ended will be put into a special fund to set up an annuity at the end of the 10-year grace period to pay off the USAID loan. Under the conservative base case assumptions, the annuity fund would produce a modest surplus of $840,200 that the Philippine government could use for other purposes.

Table M5
Summary of TTEM Project Cash Flows: Base Case[1/]

	1	2	3	Y 4	E 5	A 6	R 7	8	9	10
U.S. AID Loan	766.0	1,915.0	2,681.0	1,532.0	766.0	-	-	-	-	-
Principal and Interest Repayments from User[2/]		192.9	696.0	1,444.9	1,980.4	2,287.3	1,691.0	1,017.9	473.5	48.5
Total TTEM Funds	766.0	2,107.9	3,377.0	2,976.9	2,746.4	2,287.3	1,691.0	1,017.9	473.5	48.5
Non-Revenue Activities [3/]	191.5	527.0	844.2	744.2	686.6	-	-	-	-	-
Loans to Users	574.5	1,580.9	2,532.7	2,232.7	2,059.8	-	-	-	-	-
Funds Available to Repay AID Loan	-	-	-	-	-	2,287.3	1,691.0	1,017.9	473.5	48.5
Future Value of Repayment[4/]										6,790.3
Amount Needed to set up Repayment Annuity										5,950.1
Surplus (Deficit)										840.2

1/ All numbers are in $000.

2/ Includes both straight loans at 12% and loans with savings tied to repayment at 15%. Bad debt losses were 10% of outstanding loan balance per year.

3/ 25% of total TTEM Funds.

4/ Assuming Repayment Funds are invested at 7%.

FINANCIAL TABLES

Table N1
Preliminary Budget for U.S. Technical Assistance Contractor
($000s)

	YEARS 1	2	3	4	5	Total
Personnel (U.S.) [1/]						
1. Long-term consultant (1)	110	118	126	135	144	
2. Short-term consultants (.5)	94	101	106	115	123	
3. Home office support (.25)	26	28	30	32	34	
Subtotal	230	247	284	282	301	1,324
Personnel (Filipino) [1/]						
1. Project director (1)	17	18	20	-	-	
2. Senior project officers (2)	17	18	20	-	-	
3. Senior financial analysts (1)	9	9	10	-	-	
4. Short-term consultants (2)	37	40	42	-	-	
Subtotal	80	85	92	-	-	257 [2/]
Travel/Per Diem						
1. International [3/]	41	44	46	49	52	
2. Domestic	2	3	4	4	4	
Subtotal	43	47	50	53	56	249
Long-Term Consultant Expenses [4/]						
1. Living allowance	12	13	14	15	16	
2. Furniture moving/storage	10	2	3	3	13	
3. Family transportation/leave	13	-	15	-	17	
Subtotal	35	15	32	18	46	146
Grand Total	388	394	438	353	403	1,976 [2/]

Footnotes to Table N1

Note: Peso exchange rate to dollar = 14.0 to 1.
All first year costs escalated 7% annually.

1/ Number in ( ) indicates the number of full-time equivalent staff on an annual basis.

2/ See Table N2 for sources of funds.

3/ Assumes 11 round-trips (at $2250) and 20 days per diem/local transportation per trip (at $75/day).

4/ Assumes four family members.

Table N2
Estimated Project Expenditures by Type of Input
($000s)

	Total	AID Grant	AID Loan	GOP	Reflow	Allocation to Project Outputs
PERSONNEL 1/						
U.S. (Project Implementation)						
o long-term consultant (1)	633	633	-	-	-	) 75% to technical assistance: 25% to studies/training
o short-term consultants (.5)	541	541	-	-	-	
o home office support (.25)	150	150	-	-	-	
Subtotal	1,324	1,324 2/	-	-	-	
U.S. (Project Evaluation)	75	75	-	-	-	
Counterpart						
o Project director (1)	78	-	55 2/	-	23	) 75% to technical assistance; 25% to studies/training
o Senior Project Officers (3)	108	-	55 2/	31	22	
o Senior Financial Analyst (1)	39	-	28 2/	-	11	
o Junior Project Officers (6)	92	-	-	192	-	
o Technical Assistance Consultants	126	-	89 2/	-	71	100% to TA
o Studies/Training Consultants	255	78	30 2/	-	281	) 100% to studies/training
o Support staff (10)	62	-	-	99	-	) 100% to operations
o Project Management (1)	88	-	-	142	-	
Subtotal	848	78	257 2/	273	240	

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Table N2 (Continued)

	Total	AID Grant	AID Loan	GOP	Reflow	Allocation to Project Outputs
TRAVEL/PER DIEM						
Domestic						
o U.S. contractor[2/]	17	17	-	-	-	75% to technical assistance; 25% to studies/training
o Counterpart	29	-	-	29	-	
International						
o U.S. contractor[2/]	232	232	-	-	-	
o Counterpart	46	-	33	-	13	
Subtotal	324	249	33	29	13	
COMMODITIES[3/]						
o Microcomputer and accessories (3)	40	-	23 (1)	-	17 (2)	100% to commodities
o Auditing Equipment (19)	125	22 (2)	11 (1)	-	92 (16)	
o Programmable calculators & accessories (9)	4	4	-	-	-	
o Vehicles (2)	20	20	-	-	-	
o Electric typewriters (3)	3	-	3	-	-	
o Monitoring Instruments	91	-	-	-	91	
o Miscellaneous Office Equip. & Furniture	20	4	13	3	-	
Subtotal	303	50	50	3	200	

Table N2 (Continued)

	Total	AID Grant	AID Loan	GOP	Reflow	Allocation to Project Outputs
OPERATING EXPENSES						
o U.S. Long-term consultant 2/	146	146	-	-	-	) 75% to technical assistance; 25% to studies/training
o Rent & Utilities (400 sq/m)	177	-	-	177	-	) 100% to operations
o Vehicles (operations & maintenance)	21	-	-	21	-	) 75% to TA: 25% to studies/training
o Communications	99	-	-	99	-	) 100% to operations
o Printing & Information dissemination	125	78	-	26	21	) 100% to studies/information dissemination
o Office supplies; steer-committee, advisory panels & other meeting experses	104	-	-	104	-	) 100% to operations
Subtotal	672	224	-	427	21	
TOTAL 4/	3,546	2,000	340	732	474	

Note: Peso exchange rate to dollar = 18.50 to 1

1/ Number in ( ) indicates the number of full-time equivalent staff on an annual basis.

2/ See Table N1 - Preliminary Budget for U.S. Technical Assistance Contractor

3/ Number in ( ) indicates the number of commodities.

4/ Before demonstration expenditures of $2,660,000 (AID loan), $1,393,000 (reflow), $1,352,000 (private sector) and $190,000 in additional private sector contribution to studies, training and information dissemination.

Table N3
TECHNOLOGY TRANSFER FOR ENERGY MANAGEMENT
Estimated Annual Project Expenditure by Source and Type of Input
($000s)

	Year 1						Year 2					
	AID				Private		AID				Private	
	Grant	Loan	GOP	Reflow	Sector	Total	Grant	Loan	GOP	Reflow	Sector	Total
PERSONNEL												
U.S. Contractor	230	-	-	-	-	230	247	-	-	-	-	247
Counterpart (staff)	-	43	46	-	-	89	-	46	49	-	-	95
Counterpart (consultants)	18	37	-	-	15	70	36	40	-	-	15	91
Subtotal	248	80	46	-	15	389	283	86	49	-	15	433
TRAVEL/PER DIEM												
U.S. Contractor	43	-	-	-	-	43	47	-	-	-	-	47
Counterpart	-	10	5	-	-	15	-	11	5	-	-	16
Subtotal	43	10	5	-	-	58	47	11	5	-	-	63
COMMODITIES												
Microcomputers	12	-	-	-	-	12	1	-	-	-	-	1
Auditing Equipment	22	11	-	-	-	33	-	-	-	-	-	-
Monitoring Instruments	-	-	-	-	-	-	-	-	-	-	-	-
Other	12	39	3	-	-	54	-	-	-	-	-	-
Subtotal	46	50	3	-	-	99	1	-	-	-	-	1
OPERATING EXPENSES												
Long-Term U.S. Consultant	35	-	-	-	-	35	15	-	-	-	-	15
Information Dissemination	16	-	-	-	23	39	39	-	-	-	23	62
Other	-	-	36	-	-	36	-	-	88	-	-	88
Subtotal	51	-	36	-	23	110	54	-	88	-	23	165
DEMONSTRATION	-	-	-	-	-	-	-	1,064	-	-	355	1,419
EVALUATION	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL	388	140	90	-	38	656	385	1,161	142	-	393	2,081

Table N3 (Continued)
TECHNOLOGY TRANSFER FOR ENERGY MANAGEMENT
Estimated Annual Project Expenditure by Source and Type of Input
($000s)

	Year 3						Year 4					
	AID				Private		AID				Private	
	Grant	Loan	GOP	Reflow	Sector	Total	Grant	Loan	GOP	Reflow	Sector	Total
PERSONNEL												
U.S. Contractor	264	-	-	-	-	264	282	-	-	-	-	282
Counterpart (staff)	-	49	54	-	-	103	-	-	59	64	-	123
Counterpart (consultants)	24	42	-	-	15	81	-	-	-	88	15	103
Subtotal	288	91	54	-	15	448	282	-	59	152	15	508
TRAVEL/PER DIEM												
U.S. Contractor	50	-	-	-	-	50	53	-	-	-	-	53
Counterpart	-	12	6	-	-	18	-	-	6	12	-	18
Subtotal	50	12	6	-	-	68	53	-	6	12	-	71
COMMODITIES												
Microcomputers	1	-	-	16	-	17	1	-	-	-	-	1
Auditing Equipment	-	-	-	44	-	44	-	-	-	-	-	-
Monitoring Instruments	-	-	-	37	-	37	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-	-	-	-
Subtotal	1	-	-	97	-	98	1	-	-	-	-	1
OPERATING EXPENSES												
Long-Term U.S. Consultant	32	-	-	-	-	32	18	-	-	-	-	18
Information Dissemination	23	-	7	22	23	75	-	-	8	19	23	50
Other	-	-	91	-	-	91	-	-	94	-	-	94
Subtotal	55	-	98	22	23	196	18	-	102	19	23	162
DEMONSTRATION	-	1,596	-	165	587	2,348	-	-	-	563	188	751
EVALUATION	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL	394	1,699	158	284	625	3,160	354	-	167	746	226	1,493

Table N3 (Continued)
TECHNOLOGY TRANSFER FOR ENERGY MANAGEMENT
Estimated Annual Project Expenditure by Source and Type of Input
($000s)

	Year 5						Total					
	AID				Private		AID				Private	
	Grant	Loan	GOP	Reflow	Sector	Total	Grant	Loan	GOP	Reflow	Sector	Total
PERSONNEL												
U.S. Contractor	301	-	-	-	-	301	1,324	-	-	-	-	1,324
Counterpart (staff)	-	-	65	67	-	132	-	138	273	131	-	542
Counterpart (consultants)	-	-	-	92	15	107	78	119	-	180	75	452
Subtotal	301	-	65	159	15	540	1,402	257	273	311	75	2,318
TRAVEL/PER DIEM												
U.S. Contractor	56	-	-	-	-	56	249	-	-	-	-	249
Counterpart	-	-	7	13	-	20	-	33	29	25	-	87
Subtotal	56	-	7	13	-	76	249	33	29	25	-	336
COMMODITIES												
Microcomputers	1	-	-	-	-	1	16	-	-	16	-	32
Auditing Equipment	-	-	-	-	-	-	22	11	-	44	-	77
Monitoring Instruments	-	-	-	-	-	-	-	-	-	37	-	37
Other	-	-	-	-	-	-	12	39	3	-	-	54
Subtotal	1	-	-	-	-	1	50	50	3	97	-	200
OPERATING EXPENSES												
Long-Term U.S. Consultant	46	-	-	-	-	46	146	-	-	-	-	146
Information Dissemination	-	-	10	-	23	33	78	-	25	41	115	259
Other	-	-	93	-	-	93	-	-	402	-	-	402
Subtotal	46	-	103	-	23	172	224	-	427	41	115	807
DEMONSTRATION	-	-	-	665	222	887	-	2,660	-	1,393	1,352	5,405
EVALUATION	75	-	-	-	-	75	75	-	-	-	-	75
TOTAL	479	-	175	837	260	1,751	2,000	3,000	732	1,867	1,542	9,141

RESPONSE TO APAC PID REVIEW CABLE[1/]

1. Role of BEU

(a) Role of BEU Versus Private Sector Participants.

The BEU will be an active and critical participant in the project in that it is the lead government agency for the GOP, but its role will not impede the extensive private sector-participating built into the project design. It is through the BEU that the GOP's financial contribution to the project will be made. The Director of the BEU will serve as the first chairman of the Project Steering Committee; in addition the Chief of the Energy Conservation and Utilization Division will represent the BEU on the Project Management Committee. The BEU will also assign some of its most senior and capable staff to the project.

A Project Director, to be specifically hired (most likely from the private sector) for this project will have the primary responsibility for day-to-day operation of the project. He will be assisted by a Project Management Committee composed of four members, two from the private and two from public organizations, of which the latter are BEU and USAID. Thus, BEU's involvement in the operation of the project will be limited. The BEU will, however, as the agent for the GOP responsible for repayment of the USAID project loan, have the final GOP authority for approval of demonstration subprojects, and clearing the way for disbursement of funds by the Central Bank.

The project organization focuses primarily on improving private sector capabilities in energy conservation by involving systematically and directly A/E firms, technology suppliers, financing institutions and private sector trade associations (e.g., ENMAP, PCCI) in all phases of the demonstration process from project selection to project engineering, construction and financing. Philippine A/E firms will be responsible for engineering work associated with demonstrations. They will receive technical assistance from the TTEM project staff. The TTEM loan funds will be channeled from the Central Bank to the borrowers through a limited number of private commercial banks. Neither the BEU nor any other GOP agency will receive money from the project. It is quite possible that the TTEM project organization may eventually evolve into a private entity offering technical and financial services to Philippine companies; it is even more likely that, once fully trained, the project staff will move into comparable positions with Philippine companies (e.g., A/E, banks) to capitalize on the expanded demand for conservation-related services which will have been triggered by this project.

1/ A copy of the cable is attached to this Annex.

For more details on the role of the BEU and other project participants refer to Section VI, Project Organization and Management and Annex K, Assessment of Institutional capabilities.

(b) Policy Reforms Coming From the Project

The two major policy problems constraining the full-scale development of energy conservation in the Philippines are (1) tariffs for electric power and (2) lack of foreign exchange priority for conservation technologies. The National Power Corporation is in the process of developing a new wholesale and retail electric power rate structure to meet World Bank lending requirements. The new tariffs will reflect the real economic and social costs of energy. The TTEM project will thus focus its attention mostly on overcoming the barriers associated with the foreign exchange priority and existing fiscal policy for conservation investments. The participation on the Steering Committee of the Board of Investments (responsible for government incentives and foreign exchange priorities) and the Ministry of Finance (responsible for the government's tax policies) will greatly facilitate the policy dialogue with the GOP.

For more details refer to Section VI, Project Organization and Management and Annex K, Assessment of Institutional Capabilities.

(c) Specific Plans for Developing an A/E Capability in Audits

To date the BEU and ENMAP have conducted over 40 audit training sessions in which nearly 2000 engineers from energy-using establishments and A/E firms have participated. The TTEM project will supplement the classroom training provided by BEU and ENMAP with practical hands-on in-plant training leading to applications in industrial facilities and commercial buildings. This training will involve instrumented energy audits under the supervision of experienced auditors/instructors. (A similar program has been successfully implemented by AID/S&T/EY in Sri Lanka).

For more details on the energy auditing training program refer to Annex H, Potential TTEM Subprojects (Industrial Energy Auditing and Building Energy Auditing).

(d) Structure of Demonstrations to Stimulate Further Private Investments.

Careful attention has been given to structuring a demonstration program which will lead to replication of the technologies demonstrated. Among the steps taken to ensure further investments by the private sector are: (1) participation of the private sector in the management of the demonstration program including the subproject selection process; (2) use of subproject selection criteria which

take replicability clearly into account by minimizing technological risk and concomitantly required management sophistication; (3) evaluation of the economic performance of each subproject based on conservative real-life market conditions; (4) on-going technical assistance and training programs for investors and (5) on-going participation of the private sector (e.g., A/E, private banks, technology suppliers) in the implementation of each subproject thus ensuring their familiarity with the technology.

For more details, refer to Section VI(C), Subproject Management and Annex H, Potential TTEM Subprojects.

2. Role and Beneficiaries of Private Sector

(a) Project Replication Within Funding Proposed

Approximately $7.7 million of the USAID loan will be dedicated to financing demonstration projects. Assuming that on the average a demonstration project will cost $150,000 (of which the project sponsor will contribute 25%), approximately 65-70 projects will be funded--45-50 in the industrial sector and 20-25 in the building sector. This number of subprojects will allow TTEM to demonstrate on site and at commercial scale numerous technologies with wide application in the Philippines. The structure of the demonstrations as discussed above under 1(d) should ensure replication. In addition, reflow funds from loan repayments are expected to be available for additional project activities including demonstrations.

(b) Role of Private Sector Organizations.

As discussed under 1(a) above the project is being implemented primarily through private organizations: the Philippine Chamber of Commerce and Industries, the Energy Management Association of the Philippines and the Bankers Association of the Philippines are key members of the Steering Committee; the permanent project staff including the Project Director will come from the private sector; the financial assistance will be channeled to the private sector users through a number of private-sector financial institutions; and the project engineering will be carried out by private-sector A/E firms. Thus the principal actors and beneficiaries of the TTEM projet will be private sector organizations.

For more details refer to Section VI(B), Institutional Arrangements and Annex K, Assessment of Institutional Capabilities.

(c) Sectoral Focus and Criteria to Select Eligible Firms

The analysis conducted during the project design phase led to the conclusion that many opportunities for demonstrations were broadly applicable across several industrial and commercial subsectors. Combustion control systems, flue gas heat recovery systems, and power factor control equipment are examples. The project will thus focus initially on those technologies which are the most widely applicable to firms in many sectors. Once these opportunities have been demonstrated, the project will start focusing its efforts, with the assistance of industry advisory panels, on specific sectors. The transportation, electric utility and agricultural sectors are not included in the initial targets because the funding available to the TTEM project was not enough to meaningfully address their problems and/or they are the focus of studies and financing of other AID projects and programs by organizations such as the World Bank and the Asian Development Bank.

No effort is being made initially to give special emphasis to small and medium scale enterprises because the GOP wishes to encourage the maximum energy conservation as quickly as possible. However, it is probable that the small and medium scale enterprises will benefit most from the demonstrations, as they are most likely to need the information, training and financial assistance that are part of the demonstrations. The demonstration projcts will be selected strictly on their merits using the selection criteria and procedures developed and agreed upon with private and public sector participants. Refer to Section VI(C), Subproject Management for a discussion of the selection criteria and evaluation procedures.

For more details refer to Annex G - Selection of TTEM Subproject targets and Annex H - Potential TTEM Subprojects.

(d) Constraints Addressed by the Project

The project components -- technical assistance, training, studies, information dessimination, policy analyses, and demonstrations -- and the project organization and management address the main existing constraints to improving energy conservation in the Philippines, particularly:

- energy-consumers' lack of awareness of technologies for energy conservation;
- skepticism about the economic (and technical) performance of conservation technologies;
- access to capital and foreign exchange;

- lenders' reluctance to undertake what they often peceive as high-risk loans

- a shortage of demestic suppliers of both equipment and services needed to implement conservation measures.

3. Justification for Equipment Loans

(a) Justification for Loans

One of the key constraints to investments in a cost control investment is generally management's reluctance to allocate (particularly in the current economic situation) scarce capital resources (internally generated or borrowed) for non-revenue generating investments. This traditional reluctance is, in the case of energy conservation, strongly reinforced by the fact that management lacks proper understanding of the magnitude of the potential savings (and concomitantly the positive impact it might have on their firm's bottom line) and is often skeptical about the economic and technical performance of conservation technologies. The only way to overcome this reluctance is to demonstrate on site and at commercial scale the viability of such investments. This problem is compounded by lenders' reluctance to undertake what they often perceive as high-risk loans.

Many industrialized countries which have implemented demonstration programs have emphasized grants (up to 100% of the total demonstration project costs in some case) to induce participation in their programs. This emphasis was needed because of the nature of the technologies being demonstrated: first-of-a kind, unproven and technically very risky. The TTEM project, on the contrary, will demonstrate the application of proven low risk technologies which are not used or are being used in only very limited cases in the Philippines. Clearly, grants are not justified except in some exceptional cases. The only mechanism thus left to overcome the scarcity of capital is to create a loan fund.

(b) Justification for Loan Rates

Lending terms must be close to market interest rates since the projects must be financially viable under normal market conditions to insure their wide scale replication. The TTEM lending rates will therefore be at rates only slightly lower than market rates. At present effective market rates for straight loans range between 22% and 35% p.a. The TTEM loan rate will be at 18% to 23% p.a. This differential is required to encourage participation in the project and compensate borrowers for the increased risks, project monitoring and information dissemination costs they will incur. The steering committee will be in a position to adjust the TTEM loan rate from time to time to reflect changing market conditions. See Section VI(C), Subproject Management.

2.66

4. Loan Fund, Financial Arrangements

(a) Role of BEU and Lending Institutions in the Loan Fund

The fund will be administered by the Central Bank on behalf of the BEU in accordance with a Master Agreement between the BEU and the CB. The procedures will be modelled after the successful Industrial Guarantee and Loan Fund (IGLF) also managed by CB. The CB will accredit several private financial institutions to channel the funds to borrowers.

For more details, refer to Section VI(B), Institutional Arrangements, Annex K, Assessment of Institutional Capabilities and Annex I - Draft TTEM Loan Fund Manual.

(b) Financing Terms and Conditions

Various types of financing instruments will be used during the project's life. During the initial period of the project three types of financial assistance will be available: grants, straight loans and loans with repayments tied to savings. A maximum of ₱1.0 million (approximately $ 75,000) is available as grant per eligible project not to exceed 50% of the total project cost. (Only relatively higher-risk projects will be eligible for grant funding). A maximum of ₱3 million (app. $200,000) is available as loan per eligible project, up to 75% of total project costs for straight loans and 100% for loans with repayments tied to savings. Participating financial institutions will charge a maximum rate of 18% p.a. on straight loans and 23% p.a. on the other type of loans. The financial institution will be allowed a 7% p.a. spread on straight loans and 10% p.a. on loans tied to savings if it assumes all the business and credit risks. If the risk is shared with TTEM (guarantee coverage) then the spread is adjusted accordingly.

Refer to Annex I, Draft TTEM Loan Fund Manual, for more details.

(c) Reprogramming of Loan Fund Reflows

A detailed analysis was conducted of the first generation reflow funds from the TTEM project. The reflows will accrue to the TTEM fund and will thus be available for financing additional project related activities including technical assistance, studies, information dissemination and additional subproject demonstrations. Note, however, that the success of the project will not depend on the availability of the fund reflows.

For more details, refer to Annex M, TTEM Project Reflow Analysis.

5. Relationship to Agency Energy Policy and Strategy, Philippine CDSS, and Other Donors.

(a) Agency Energy Policy and Strategy

As final drafting of the paper (TTEM) nears completion, the Agency Energy Policy is undergoing revision and the Energy Strategy remains in draft. However, through S&T/EY participation in project design the Mission has kept abreast of developments in both processes and has been assured that the TTEM project's emphasis on improving energy efficiency through conservation technologies and practices is fully consistent with the Agency's priorities. Energy efficiency has been a primary energy-sector goal since 1981.

(b) CDSS

Complete review of the Mission's overall Strategy has been deffered to January 1985, and a "lines of inquiry" study of the energy sector will contribute to that process. However, energy will be a core program in the future Strategy and activities in energy will continue to follow the current two-pronged rural and modern-sector approach. In the modern sector the objective of the mission Energy strategy is to increase productivity and reduce oil imports and associated foreign exchange outlays. This is also the objective of the TTEM project.

(c) Other Donors

The TTEM project is complementary to and non-duplicative of activities funded by other donors. It will benefit directly from the results of a UNIDO program of energy audits and training and a survey of energy conservation potential in the Philippines supported by the Asian Development Bank. Extensive discussions with the ADB, UNIDO and the World Bank have contributed to project design and to prospects for excellent inter-donor coordination and communication during project implementation. Given this cooperative environment, prospects are excellent for the TTEM project to leverage significant follow-on investment in Philippine energy conservation. The ADB has, in fact, already indicated strong interest in supporting a continuing loan program built on the TTEM project model and experience.

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Attachment

AIDAC

E.O. 12356: N/A
TAGS: AFLD
SUBJECT:1) APAC PID REVIEW

1. SUMMARY:

- APAC ON OCTOBER 7, 1983, REVIEWED PID FOR TECHNOLOGY TRANSFER FOR ENERGY MANAGEMENT PROJECT WITH USAID REPRESENTATIVES M. KILGOUR AND L. ERVIN IN ATTENDANCE. APAC SUPPORTED PID CONCEPT OF PROMOTING PRIVATE ENTERPRISE SOLUTION AND ENCOURAGED PROJECT DEVELOPMENT TO ENSURE PROPER ROLE OF BUREAU OF ENERGY UTILIZATION IN ACHIEVING THIS OBJECTIVE. CONCERN, HOWEVER, WAS EXPRESSED OVER (1) FOCUS AND BENEFICIARIES OF PROJECT ACTIVITIES(BOTH PUBLIC AND PRIVATE), (2) LENDING INSTITUTIONS, AND (3) PROJECT'S CONTRIBUTION (PARTICULARLY GIVEN LIMITED RESOURCES) TO GOP ENERGY CONSERVATION STRATEGY. AA/ASIA HAS GIVEN APPROVAL TO PROCEED WITH PROJECT DESIGN. AUTHORIZED REPRESENTATIVE(S) SHOULD APPROVE, AUTHORIZE PROJECT AND SIC AGREEMENT. APAC COMMENTS AND GUIDANCE FOR PP DEVELOPMENT FOLLOWS BELOW.

- - -

2. ROLE OF BEU

- APAC ASKED THAT PP CLEARLY IDENTIFY THE ROLE OF THE BUREAU OF ENERGY UTILIZATION (BEU).

-- WE ARE CONCERNED THAT WHEN PROJECT IS IMPLEMENTED, BEU WILL VIEW THEIR ROLE AS MORE OPERATIONAL,(I.E. DOING TECHNOLOGY DEMONSTRATIONS,ENERGY AUDITS,ETC.) INSTEAD OF DEVELOPING THE CAPABILITY OF THE LENDING INSTITUTIONS OR THE A AND E COMMUNITY TO CARRY OUT THE OPERATIONAL SIDE OF THE PROJECT.
-- WE UNDERSTAND THAT BEU'S ROLE WILL BE FOCUSED ON POLICY REFORM AND INFORMATION DISSEMINATION. THEREFORE, PP SHOULD INDICATE (1) WHAT POLICY REFORMS (E.G. GOP PRICE, TAX, AND FISCAL POLICY CORRECTIONS TO ENCOURAGE ENERGY EFFICIENCY) WILL COME FROM PROJECT SUPPORT TO BEU, (2(SPECIFIC PLAN FOR DEVELOPING A AN; E CAPABILITY IN ENERGY AUDITS, AND (3) HOW DEMONSTRATIONS WILL BE STRUCTURED TO STIMULATE FURTHER PRIVATE INVESTMENT.

3. ROLE AND BENEFICIARIES OF PRIVATE SECTOR:

- APAC NOTED VARIANCE BETWEEN THE PROJECT'S SMALL AMOUNT OF FUNDING AND ITS GOAL TO PROMOTE THE ADOPTION OF ENGERY EFFICIENT TECHNOLOGIES. THEREFORE, APAC ASKING THE FOLLOWING:

-- PROJECT DEVELOPMENT SHOULD ADDRESS HOW PROJECT ACTIVITIES WILL ACTUALLY LEAD TO WIDE-SCALE INVESTMENT IN MORE EFFICIENT TECHNOLOGIES WITHIN THE FUNDING PROPOSED.
-- PP SHOULD DESCRIBE THE STRATEGY INTENDED TO ACHIEVE DESIRED RESULTS INCLUDING ROLE OF ORGANIZATIONS OTHER THAN BEU (E.G. CHAMBER OF COMMERCE AND OTHER PRIVATE ASSOCIATIONS).
-- PROJECT DEVELOPMENT SHOULD PROVIDE FOR NECESSARY FOCUS AND CRITERIA TO SELECT ELIGIBLE FIRMS IN KEY SECTORS (I.E. TRANSPORTATION, INDUSTRY BUILDING, AND COMMERCIAL SECTOR'S),
--PROJECT DEVELOPMENT SHOULD ADDRESS THE RANGE OF CONSTRAINTS TO IMPROVE ENERGY EFFICIENCY IN SPECIFIC INDUSTRIES WITHIN ONE OR MORE SECTORS.
-- PP SHOULD CLEARLY STATE WHICH INDUSTRIES WILL ,E TARGETS FOR DEMONSTRATIONS.

4. JUSTIFICATIONS FOR EQUIPMENT LOANS:

- PP SHOULD GIVE GOP'S JUSTIFICATION FOR PROVIDING LOAN FUNDS (AND AT PREFERLNTIAL RATES) TO FIRMS FOR DEMONSTRATION PURPOSES AND FOR GENERAL ACQUISITION.
-- WE SUGGEST JUSTIFICATION SHOULD BE DEVELOPED FROM REASONS GIVEN BY USAID REPRESENTATIVES DURING APAC. OUR UNDERSTANDING IS THAT LOANS ARE CATALYST TO (1) INTRODUCE BUSINESSES TO OTHER USES OF LIMITED CAPITAL TO PROMOTE GROWTH, (2) CREATE DEMAND FOR ENERGY CONSERVATION EQUIPMENT TO ENCOURAGE SUPPLIERS TO BUILD QUALITY EQUIPMENT, (3) ENCOURAGE CONSERVATIVE BANKERS TO USE EXISTING LENDING PRACTICES FOR EQUIPMENT PURCHASES, AND (4) DEVELOP A AND E CAPACITY TO PREPARE AND IMPLEMENT CONSERVATION PROJECTS.

5. LOAN FUND, FINANCIAL ARRANGEMENTS:

- APAC IS UNCLEAR ABOUT WHAT PART BEU AND LENDING INSTITUTIONS WILL PLAY IN THE PROPOSED LOAN FUND FOR ON-SITE DEMONSTRATIONS OF NEW TECHNOLOGIES AND GENERAL ACQUISITIONS BY BENEFICIARIES.
-- CONSEQUENTLY, PP SHOULD STATE (1) TERMS OF GOP FUNDS MADE AVAILABLE TO SUBLENDLRS, (2) TERMS OF SUBLENDER LOANS TO ULTIMATE USERS, AND (3) USE OF FUNDS GENERATED FROM INTEREST SPREAD. IN CONSIDERING THESE ITEMS,

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PROJECT DEVELOPMENT SHOULD ASSESS THE FOLLOWING:

(A) AVOID PLACING UNDUE BURDEN ON LENDING INSTITUTIONS,

(B) AVOID PROVIDING UNDUE BENEFITS TO LENDING INSTITUTIONS,

(C) DEFINE REPROGRAMMING OF LOAN FUND REFLOWS,AND

(D) AVOID SUBSIDIES TO BORROWER(BUT IF BELOW MARKET RATES ARE PROPOSED, PP SHOULD PROVIDE JUSTIFICATION LINKED TO THE BROADER PROJECT PURPOSES).

6. RELATIONSHIP TO CDSS AND SECTOR STRATEGY:

- APAC RECOGNIZED THAT PROJECT IS IN ADVANCE OF REVISED AID POLICY PAPER AND NEW ENERGY SECTOR STRATEGY . APAC ALSO RECOGNIZED THE AMOUNT OF INFORMATION AVAILABLE AND THE ROLE OTHER DONORS ARE PLAYING IN THE PHILIPPINES' ENERGY CONSERVATION FIELD. NEVERTHELESS, APAC AGREED TO PERMIT PROJECT DEVELOPMENT GO FORWARD TO AVOID DELAY BEFORE USAID/MANILA CDSS IS REVIEWED. SHULTZ
BT

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