

PN-ABE-820

LOM= 59933

**OPPORTUNITIES FOR U.S. PARTICIPATION IN
COAL-RELATED PROJECTS IN
INDONESIA, PHILIPPINES, AND THAILAND**

COAL AND COAL TECHNOLOGY EXPORT INITIATIVES

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Contract No.: DE-AC01-85FE60788

In Association with:

AID Conventional Energy Technical Assistance Project
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Contract No.: LAC-5724-C-00-5126-00

Submitted to:

Office of Fossil Energy
U.S. Department of Energy
Washington, D.C. 20585

Office of Energy
Bureau of Science and Technology
U.S. Agency for International Development
Washington, D.C. 20523

December 1988

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ABBREVIATIONS

ASEAN	Association of Southeast Asian Nations (Indonesia, Philippines, Thailand, Malaysia, Singapore, Brunei)
ADB	Asian Development Bank
A/E	Architecture/Engineering [service]
AFBC	Atmospheric Fluidized Bed Combustion
AID	U.S. Agency for International Development
BATAN	Batan Tenaga Atom Nasional (National Atomic Energy Agency - Indonesia)
BOT	Build, Operate and Transfer
BPPT	Badan Pengkajian Dan Penerapan Teknologi (Agency for the Assessment and Application of Technology - Indonesia)
CETA	Conventional Energy Technical Assistance
CFBC	Circulating Fluidized Bed Combustion
CWM	Coal-Water-Mix
DOC	U.S. Department of Commerce
DOE	U.S. Department of Energy
EGAT	Electricity Generating Authority of Thailand
EMB	Environmental Management Board (Philippines)
ERB	Energy Regulatory Board (Philippines)
FE	Office of Fossil Energy
IBRD	International Bank for Reconstruction and Development (World Bank)
ICB	International Competitive Bidding
IFC	International Finance Corporation
IFCI	Industrial Finance Corporation of Thailand
LSDE	Laboratorium Sumber Daya Dan Energy (Indonesian Energy Institute)
MEA	Metropolitan Electricity Authority (Thailand)
NEA	National Energy Administration (Thailand)
NEB	National Environment Board (Thailand)

ABBREVIATIONS -- Concluded

NESDB	National Economic and Social Development Board (Thailand)
NPC	National Power Corporation (Philippines)
OEA	Office of Energy Affairs (Philippines)
OECP	Overseas Economic Cooperation Fund of Japan
PLN	Perum Listrik Negara (National Electricity Enterprise - Indonesia)
PNOC-CC	Philippine National Oil Corporation - Coal Corporation
PTB	Perum Tambang Batubara (State Coal Mining Enterprise - Indonesia)
PTBA	Perum Tambang Bukit Asam (Bukit Asam Mining Enterprise - Indonesia)
S&T/EY	Bureau of Science and Technology/Office of Energy
TDP	U.S. Trade and Development Program
UNDP	United Nations Development Program

WEIGHTS & MEASURES

kWh	Kilowatt-hours (1,000 watt-hours)
MW	Megawatt (1,000 Kilowatts)
TWh	Terawatt-hours (billion kWh)
MMT	Million tons
MMT/y	Million tons/year

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EXECUTIVE SUMMARY

Opportunities for U.S. participation in international coal-related projects warrant a coordinated U.S. public sector initiative. This two month study was undertaken to learn from the experience of key lenders and U.S. industry, and identify potential opportunities for the U.S. Department of Energy (DOE) to further the objective of increasing exports of U.S. coal. The study was also seen as a vehicle for both DOE and the U.S. Agency for International Development (AID) to identify the near-term market potential for U.S. conventional and clean coal technologies in response to increasing global energy demand, particularly in developing countries.

This report examines the coal-related development plans of Indonesia, Philippines, and Thailand since 1982 and identifies near-term (1995) opportunities for U.S. private and public sector involvement. Estimates of these near-term coal-related investments total \$4.2-4.6 billion. Potential exports associated with these investments exceed \$2.3 billion.

Information was gathered from meetings with the World Bank (IBRD) and U.S. Trade and Development Program (TDP) officials and discussions with representatives from multilateral and bilateral foreign assistance agencies, U.S. equipment vendors, U.S. architect/engineer firms, research institutes and trade associations. On-line literature and project file searches at DOE, AID and TDP were also conducted. Key observations are highlighted below:

- A total of 83 technical assistance, loans, and grants since 1982 by the IBRD, Asian Development Bank (ADB), AID, TDP and DOE relating to the mining and power sectors of these countries have been identified.
- The total funding level of this assistance is approximately \$2,356 million (preliminary estimate).
- Coal development loans are generally not used by IBRD as lending vehicles in these countries. Instead, mine development and environmental impact studies are considered within power sector loans.

- The \$982 million in assistance to Indonesia has been concentrated in the power sector, with seven new coal plants to be commissioned before 1995, along with coal transportation infrastructure and (R&D) institution building.
- The bulk of the \$735 million in loans and grants to the Philippines predate the Aquino government, although a new \$2.5 billion energy sector loan, with a substantial coal component, is under preparation. IBRD's portion of the loan is \$350 million.
- Assistance to Thailand totaling \$619 million has resulted in major lignite discoveries, construction of mine-mouth power plants, and preliminary assessments of coal preparation, fluidized bed combustion and environmental impacts.
- U.S. industry experience in the three countries has been neutral to negative, with lengthy project approval lead times and foreign competition supported by mixed credit financing cited as key constraints.
- U.S.-supported training, conferences and information exchanges are creating an improved climate for U.S. private sector participation in coal-related investments.

The information obtained from discussions and documents has been organized into a report of indicative findings. Twelve projects for potential U.S. participation are described because they fulfill a number of requirements, including (i) host government support, (ii) available/potential financing, (iii) inclusion in the host country's least-cost expansion plans, (iv) considerable U.S. industry interest, (v) favorable U.S. competitive position, (vi) potential for U.S. coal exports for possible blending, and (vii) potential application for U.S. clean coal technologies. A number of issues have emerged from the information presented in this report which will require further actions by DOE, AID, TDP and other U.S. agencies before any conclusions may be drawn.

I. INTRODUCTION

A. BACKGROUND

The Office of Fossil Energy in the U.S. Department of Energy (DOE/FE) has been working with other federal agencies and the U.S. industry on a range of initiatives directed at improving the U.S. trade deficit and energy security through increased export of coal and coal technologies. The U.S. industry feels that the DOE can be helpful in a number of ways, specifically, collection and timely dissemination of information on markets for coal and coal technologies. The larger U.S. firms with ongoing international operations are more interested in creative and timely assistance and financial mechanisms to advance their competitive edge, whereas the firms entering international markets need a road map including agency contacts, current status of technology, knowledge of experienced local firms as potential partners, as well as financing information. In response, DOE/FE and the Bureau for Science and Technology/Office of Energy at the U.S. Agency for International Development (AID/S&T/EY) have begun to assess the markets worldwide and encourage other countries to consider U.S. conventional and clean coal technologies to meet their energy needs in the future. These environmentally-sound technologies, supported by DOE, are highly suitable for use with lower quality indigenous coals utilized in developing countries. In addition, DOE is promoting the use of U.S. coal as a primary fuel and as a beneficiation fuel to be blended with lower quality local coals.

The initial focus of that effort had been in three countries -- Costa Rica, Dominican Republic, and Thailand. The results of that initial effort were presented in a series of reports and discussed in the public meeting cosponsored by AID on "U.S. Fossil Fuel Technologies for Developing Countries" held in July 1988 in Washington, D.C. During this meeting, the U.S. industry raised specific concerns about the processes and steps involved in gaining access to foreign

markets for U.S. coal and coal technologies. The DOE then held a second public meeting entitled "The International Market Place - Niches for U.S. Coal Technology," in October 1988 in San Francisco. The key discussion topics in this meeting included (i) market opportunities for small combustors, (ii) Pacific Basin coal trade issues, and (iii) competitiveness of U.S. clean coal technologies.

Simultaneously, DOE officials have initiated discussions with officials from the U.S. Trade and Development Program (TDP), U.S. Department of Commerce (DOC), and U.S. Department of State to explore options for collaborative efforts to boost the potential for exports of U.S. coal technologies.

A review of project feasibility study funding, project financing, and lessons learned from the past was defined as the first step by DOE/FE and officials of the AID/S&T/EY. AID/S&T/EY offered the services of its Conventional Energy Technical Assistance (CETA) contractor, Bechtel National, Inc. (Bechtel) to Engineering and Economics Research, Inc. (EER) in carrying out this assignment. In this report, the term "Consultant" is used to identify the EER and Bechtel study team.

B. OBJECTIVE AND APPROACH

The thrust of this study was to review and analyze available information from past and present coal projects in order to gain from the experience of the international and U.S. lending community in formulating appropriate strategies beyond 1988.

This effort concentrated on three countries - Indonesia, Philippines and Thailand - because of the following reasons:

1. All three countries have substantial power sector programs, including coal as a significant component.
2. Power sector agencies in these countries are well developed and are considered attractive candidates for multilateral lending.

3. All three countries have abundant indigenous resources of low rank coal that may not be economic to produce, thereby opening opportunities for exports of U.S. coal and/or clean coal technologies.
4. U.S. industry has shown a strong interest in these countries, given the size of the power and coal sector markets which are continuing to increase in these countries.
5. Multilateral lending institutions and U.S. bilateral agencies (AID and TDP) have ongoing programs and a wealth of experience in these countries.

This report is a result of a two month effort by EER and Bechtel, beginning October 1, 1988. All information and data were collected in Washington, D.C. No overseas trips were made and no discussions were held with government officials in Indonesia, Philippines, or Thailand.

Direct discussions were undertaken with officials of lending institutions, U.S. government agencies, architecture/engineering (A/E) firms, and equipment vendors. A total of ten meetings were held with officials of the World Bank and TDP to review their history of lending to the mining, power and industry sectors in Indonesia, Philippines and Thailand. Annex 1 provides a list of individuals contacted.

Telephone discussions were held with the ADB Energy Planning Unit, Overseas Economic Cooperation Fund (OECE) representative office in D.C., International Finance Corporation (IFC), and industry specialists at the World Bank. Within the U.S. Government, the FE and International Affairs and Energy Emergencies offices at DOE, and AID/S&T/EY were consulted to obtain information on their assistance to, or involvement with, the three countries since 1982. Both agencies permitted the Consultant to review all necessary files, perform on-line literature searches, and obtain out-of-print reports. The literature searches uncovered a large number of publications and articles discussing coal resources, combustion and technology in Indonesia, Philippines, and Thailand. A list of documents acquired and reviewed throughout this study is presented in Annex 2.

The information gathered from one source would occasionally contradict data obtained from other sources. To corroborate the findings as well as obtain a better understanding of the position of U.S. industry in this international arena, the Consultant discussed specific projects in the three countries with a selected number of U.S. A/E firms and vendors. These discussions, while not conclusive, were used to augment the published information on projects in these three countries.

A total of 17 U.S. entities were contacted, representing three trade associations, two research institutes, six equipment vendors and six A/E firms. All individuals contacted by telephone (Annex 1) indicated a willingness to respond to further questions and appeared encouraged by the solicitation of their views in this important exercise.

The information obtained from discussions and documents has been organized into a report of indicative findings, not conclusions, which at this stage would be premature. A number of issues have emerged from the information presented in this report which will require further action by DOE, AID, TDP, and others before any conclusions may be drawn.

II. RECENT INVESTMENT PATTERNS

A. IN-COUNTRY PUBLIC SECTOR AGENCIES

The production, consumption, and import of coal and lignite, their use in power and industry sectors, and the enforcement of environmentally-sound practices are administered by a host of ministries, government departments, and state agencies. Administration of these sectors is quite decentralized in Indonesia, Philippines, and Thailand, with the frequent establishment of special committees or councils to address urgent matters. As the life span of these committees or councils is typically brief, they are not included in this introduction which is limited to the key administrative agencies dealing with coal, power, and environment. These entities and their roles relative to coal, power, and environmental issues are identified by country on Table 1. The ordering of the entities is indicative of the bureaucratic hierarchy, not the importance or predominance of the entity in the coal, power, and environmental sectors.

Each country has established its own institutional framework in line with the national economic priorities and the skills of the staff within each entity. The reports reviewed for this study indicate considerable overlap in jurisdiction, duplicity of regulation, constant state of evolution, and a need for coordination among the entities in all three countries. The authorities and functions of these agencies vary from country to country.

B. IN-COUNTRY POWER AND COAL SECTORS

The power sectors in Indonesia, Philippines, and Thailand are dominated by the national electric utilities, Perum Listrik Negara (PLN), National Power Corp. (NPC), and Electricity Generating Authority of Thailand (EGAT), respectively. The national utilities have a monopoly on power generation and transmission, choice of fuel-mix, capacity expansion planning, siting of new plants, and procurement. While the private sector is currently being encouraged by the

TABLE 1: INTRODUCTION TO THE GOVERNMENT ENTITIES INVOLVED WITH COAL, POWER AND ENVIRONMENT IN INDONESIA, PHILIPPINES AND THAILAND

COUNTRY	ENTITY	RESPONSIBILITIES
INDONESIA	DEPARTMENT OF MINES AND ENERGY	<ul style="list-style-type: none"> ● All energy policy matters; oversees four Directorates General - Oil and Natural Gas, Electricity and New Energy Sources, Mining, and Geological and Natural Resources.
	<u>Directorate General of Electricity and New Sources and New Energy Sources</u>	<ul style="list-style-type: none"> ● Planning and policy making; oversees PLN and small cooperatively-owned electricity producers.
	- Perum Listrik Negara (PLN)	<ul style="list-style-type: none"> ● Largest electricity producer and distributor, serving entire nation.
	- Batan Tenaga Atom Nasional (BATAN)	<ul style="list-style-type: none"> ● National atomic energy agency sponsored a coal-nuclear comparison study.
	<u>Directorate General of Mining</u>	<ul style="list-style-type: none"> ● Planning and policy making; oversees state-owned agencies and concessionaires on Kalimantan Island.
	- Perum Tambang Batubara (PTB)	<ul style="list-style-type: none"> ● State coal mining enterprises; oversees production in central Sumatra (Ombilin) and Kalimantan (PTB and eight concessionaires, of which only one is part U.S., P.T. Berau).
	- Perum Tambang Bukit Asam (PTBA)	<ul style="list-style-type: none"> ● Bukit Asam Mining Company established separately; oversees South Sumatra production and supplies Suralaya power plants.
DEPARTMENT OF SCIENCE AND TECHNOLOGY	<ul style="list-style-type: none"> ● Oversees all agencies involved in science and technology. 	
<u>Badan Pengkajian Dan Penerapan Teknologi (BPPT)</u>	<ul style="list-style-type: none"> ● Agency for Assessment and Application of Technology; actively pursues new technologies, training, information exchanges and Build-Operate-Transfer (BOT) projects. 	
- Laboratorium Sumber Daya Dan Energy (LSDE)	<ul style="list-style-type: none"> ● Indonesia Energy Institute established at Serpong to manage the Puspitek energy laboratory. 	

TABLE 1: INTRODUCTION TO THE GOVERNMENT ENTITIES INVOLVED WITH COAL, POWER AND ENVIRONMENT IN INDONESIA, PHILIPPINES AND THAILAND

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	<u>Directorate General of Electricity and New Sources and New Energy Sources</u>	<ul style="list-style-type: none"> ● Planning and policy making; oversees PLN and small cooperatively-owned electricity producers.
	- Perum Listrik Negara (PLN)	<ul style="list-style-type: none"> ● Largest electricity producer and distributor, serving entire nation.
	- Batan Tenaga Atom Nasional (BATAN)	<ul style="list-style-type: none"> ● National atomic energy agency sponsored a coal-nuclear comparison study.
	<u>Directorate General of Mining</u>	<ul style="list-style-type: none"> ● Planning and policy making; oversees state-owned agencies and concessionaires on Kalimantan Island.
	- Perum Tambang Batubara (PTB)	<ul style="list-style-type: none"> ● State coal mining enterprises; oversees production in central Sumatra (Ombilin) and Kalimantan (PTB and eight concessionaires, of which only one is part U.S., P.T. Berau).
	- Perum Tambang Bukit Asam (PTBA)	<ul style="list-style-type: none"> ● Bukit Asam Mining Company established separately; oversees South Sumatra production and supplies Suralaya power plants.
	DEPARTMENT OF SCIENCE AND TECHNOLOGY	<ul style="list-style-type: none"> ● Oversees all agencies involved in Science and Technology.
	<u>Badan Pengkajian Dan Penerapan Teknologi (BPPT)</u>	<ul style="list-style-type: none"> ● Agency for Assessment and Application of Technology; actively pursues new technologies, training, information exchanges and Build-Operate-Transfer (BOT) projects.
	- Laboratorium Sumber Daya Dan Energy (LSDE)	<ul style="list-style-type: none"> ● Indonesia Energy Institute established at Serpong to manage the Pusptek energy laboratory.

TABLE 1: INTRODUCTION TO THE GOVERNMENT ENTITIES INVOLVED WITH COAL, POWER AND ENVIRONMENT IN INDONESIA, PHILIPPINES AND THAILAND -- Continued

COUNTRY	ENTITY	RESPONSIBILITIES
PHILIPPINES	OFFICE OF THE PRESIDENT	<ul style="list-style-type: none"> ● In addition to normal functions, oversees all energy and environment agencies.
	<u>Deputy Executive Secretary for Energy</u>	<ul style="list-style-type: none"> ● Established to oversee BED and BEU, formerly within the now-abolished Ministry of Energy (MOE).
	- Bureau of Energy Development (BED)	<ul style="list-style-type: none"> ● Planning and policymaking regarding energy resource development; weak links to key producer PNOC.
	- Bureau of Energy Utilization (BEU)	<ul style="list-style-type: none"> ● Planning and policymaking for energy consumption and conservation by all sectors; weak links to key distributor NPC.
	<u>Office of Energy Affairs (OEA)</u>	<ul style="list-style-type: none"> ● Established in July 1987 to take over the bulk of the former MOE functions without control over PNOC or MPC.
	<u>Energy Regulatory Board (ERB)</u>	<ul style="list-style-type: none"> ● Established in July 1987 to regulate tariffs of energy producers and distributors and enforce the use of domestic coal by industry.
	<u>Department of Environment and Natural Resources</u>	<ul style="list-style-type: none"> ● Established in July 1987 to oversee the environment and watershed management functions formerly under MOE.
	<u>Philippine National Oil Company - Coal Company (PNOC-CC)</u>	<ul style="list-style-type: none"> ● Operation of Malangas (Mindanao), and Uling (Cebu) mines since selling the Bislig mine; intends to divest other mines to private sector which already dominates Cebu mining.
	<u>Semirara Coal Corporation (SCC)</u>	<ul style="list-style-type: none"> ● Production of all coal in Semirara Island; agency is currently undergoing financial and management restructuring.
	<u>National Power Corporation (NPC)</u>	<ul style="list-style-type: none"> ● Largest electricity producer, planning and operating seven separate grids, distinct from Metro Manila served by the private Manila Electric Company (MERALCO) and from the rural electric zones served by the National Electrification Administration (NEA).

TABLE 1: INTRODUCTION TO THE GOVERNMENT ENTITIES INVOLVED WITH COAL, POWER AND ENVIRONMENT IN INDONESIA, PHILIPPINES AND THAILAND -- Concluded

COUNTRY	ENTITY	RESPONSIBILITIES
THAILAND	OFFICE OF THE PRIME MINISTER	<ul style="list-style-type: none"> ● Oversight of key state agencies.
	<u>Electricity Generating Authority of Thailand (EGAT)</u>	<ul style="list-style-type: none"> ● Largest electricity producer, planning and operating generation and transmission facilities nationwide, distinct from the distribution services provided by the Metropolitan Electricity Authority (MEA) and Provincial Electricity Authority (PEA). EGAT is also the largest lignite producer, operating mines at Mae Moh, Krabi, Sin Pun and Saba Yoi for large thermal power plants.
	<u>National Economic and Social Development Board (NESDB)</u>	<ul style="list-style-type: none"> ● National planning organization with energy sector planning group and interest in energy technology transfer.
	MINISTRY OF INDUSTRY	<ul style="list-style-type: none"> ● Planning and policymaking for Petroleum Authority of Thailand, DMR and all industrial programs.
	<u>Department of Mineral Resources (DMR)</u>	<ul style="list-style-type: none"> ● Regulation of oil, gas, and lignite exploration and production.
	MINISTRY OF SCIENCE, TECHNOLOGY AND ENERGY	<ul style="list-style-type: none"> ● Planning and policymaking for NEA as well as research in basic sciences and technology R&D.
	<u>National Energy Administration (NEA)</u>	<ul style="list-style-type: none"> ● Active agency regulating energy utilization by all sectors, promoting private sector power generation and new technologies. Operates two lignite mines to supply small industrial consumers.

SOURCES: I-6, I-8, I-22, P-14, P-16, P-32, T-1, T-10, T-13, T-17, T-18, R-10, In ANNEX 2.

international financing community to become more active in large-scale power generation, few inroads have been made in the three countries. The data presented in Table 2 are limited to the current status of the three central utilities-- PLN, NPC and EGAT -- and their least-cost expansion plans. The electricity distributors, cooperatives, and small-power producers (mini-hydroelectric plants, for example) are not included due to their very small share in the total generating capacity.

The latest data available indicate that the three utilities have installed comparable generating capacity, 5,402 - 6,155 megawatts (MW). The generation picture is slightly different with EGAT, which is producing almost 2-1/2 times the terawatt-hours (TWh) supplied by PLN with only 29 percent more installed capacity. This is indicative of the relatively high generating efficiency of EGAT, which may be attributed to the large share of thermal power in the generation mix. PLN is the most dependent on coal-fired generation with a 30% share, versus the 10% and 12% shares of coal in the generation mix of NPC and EGAT, respectively. PLN and NPC are similar in that their generation mix is approximately 46% oil and 25% hydroelectric, with some geothermal but no natural gas component. EGAT, on the other hand, has no geothermal-based power plants, and has made a substantial (46%) addition/conversion of gas-fired capacity. The share of oil-fired capacity has decreased to 26%.

The current generation mix will inevitably change. Each utility has revised its capacity expansion plan to reflect the long-term effects of low petroleum prices since 1985-86. Lower oil prices have made seemingly economic projects based on indigenous coal resources uneconomical in some cases. For instance, geothermal or imported coal are the preferred fuels in the least-cost expansion path for the Philippine power sector instead of the extensive reserves of the Semirara Coal Corporation now undergoing restructuring. Utilities, however, are

TABLE 2: CURRENT AND FUTURE POWER SECTOR SITUATION IN INDONESIA, PHILIPPINES AND THAILAND

CURRENT CAPACITY AND GENERATION

COUNTRY	UTILITY	YEAR	CAPACITY (MW)	GENERATION MIX (TWh) ¹					
				COAL	OIL	GAS	GEOT	HYDRO	TOTAL
Indonesia	PLN	1985	5403	3.9	5.8	---	0.2	3.1	13.0
Philippines	NPC	1987	5788	2.0	9.2	---	4.5	5.2	20.9
Thailand	EGAT	1985 ²	6155	3.7	8.2	14.2	----	5.0	31.1

FUTURE CAPACITY ADDITIONS

COUNTRY	UTILITY	NEW ELECTRIC CAPACITY (MW)		1988-1995		1995-2005		
		1988-1995	1995-2005	COAL PLANTS	UNITS X MW	COAL PLANTS	UNITS X MW	
Indonesia	PLN	1400-2000	7800-9600	Suralaya 3 & 4	2 x 400 MW	Banjaramasin 1 & 2	2 x 50 MW	
				Palton 1 & 2	2 x 400 MW		Palton 3 & 4	2 x 400 MW
				Bukit Asam	2 x 65 MW		Suralaya 5 & 6	2 x 600 MW
				Ombilin 1 & 2	2 x 110 MW		Central Java	5 x 800 MW
Philippines	NPC	2959	3896	Calaca 2	1 x 300 MW	Calaca 3	1 x 300 MW	
					Isabela ³		1 x 300 MW	Hopewell ⁴
				Mindanao	6 x 300 MW	Visayas	3 x 55 MW	
					Luzon		8 x 300 MW	
Thailand	EGAT	3431	9250	Mae Moh 10 - 14	5 x 300 MW	Mae Moh 15 - 19	5 x 300 MW	
				Krabi	1 x 75 MW		Ao Phal 1 - 4	4 x 600 MW
				Sin Pun R3	1 x 75 MW	Coal-Fired	4 x 600 MW	
				Bang Pakong 3	1 x 600 MW		Krabi 2	3 x 150 MW

- NOTES:
- 1 Terawatt-hours (10⁹ kWh).
 - 2 The generation mix numbers for EGAT are end-1984; EGAT sold only 21 TWh.
 - 3 World Bank does not consider this plant in its expansion program for NPC.
 - 4 Private sector plant proposed instead of NPC's Calaca 3.

SOURCES: I-14, I-22, P-3, P-18, P-32, T-5, T-18, R-10, In ANNEX 2.

more reluctant to drop planned coal-fired power plants from their plans for a host of economic and political reasons too complex to discuss in this brief report.

Nonetheless, all three countries are enjoying impressive economic growth and accompanying growth in the power sector. Thailand, for instance, cannot fully meet its demand with its installed capacity and must import electricity from both Laos and Malaysia.

The utilities are planning for extensive growth in the near and far term. Indonesia plans to limit new electric capacity commissioned before 1995 to 1400-2000 MW, but after 1995, 7800-9600 MW of new capacity is due on-line. Much of this is coal-fired, as can be seen from the identification of new coal plants to be commissioned in the 1988-1995 and 1995-2005 timeframes (Table 2).

The Philippines will require almost 3000 MW new capacity by 1995. The immediate need for power is so great that gas turbine units and barge-mounted diesel generators are being enlisted to satisfy Luzon's electric demand. Coal-fired power plants represent a small share in NPC's expansion plans until the year 2000.

EGAT is moving forward with an ambitious program to develop Mae Moh mine to produce 28 million tons/year of lignite to supply 19 power plants (4725 MW total) at two sites in northern Thailand. Other lignite-fired power plants are planned for Krabi, Ao Phai, and near the new Saba Yoi discovery in southern Thailand. These lignite-fired plants represent the bulk of new capacity to be commissioned by EGAT after 1988.

In all three countries, ample coal resources exist to support the capacity expansion plans. As shown in Table 3, mineable reserves are substantial, although the coal rank, typically lignite and sub-bituminous, is low. Current production from these reserves is far below the production potential and less than the domestic demand for coal. Mining costs at Indonesian and Thai mines are competi-

TABLE 3: COAL RESERVES AND UTILIZATION IN INDONESIA, PHILIPPINES AND THAILAND

COAL RESERVES, PRODUCTION AND POTENTIAL

COUNTRY	REGION	MINEABLE RESERVES (MMT) ¹	RANK	CURRENT PRODUCTION (MMT/y) ²	PRODUCTION POTENTIAL (MMT/y)
Indonesia	South Sumatra	1,700	lignite-subbituminous	0.7	11.1
	West Sumatra	150	bituminous	0.8	1.8
	Kalimantan	2,200	lignite-subbituminous	0.5	25.0
		4,050		2.0	37.9
Philippines	Semirara	530	lignite-subbituminous	0.6	
	Cagayan	330	lignite	0.1	
	Cebu	NA	subbituminous	0.3	
	Mindanao	NA	subbituminous	0.2	
		1,500		1.2	NA ³
Thailand	Mae Moh	820	lignite	5.5	28.0
	Krabi	10	lignite	0.2	--
	Others	TBD ⁴	lignite-subbituminous	---	TBD
		TBD		5.7	TBD

COAL SUPPLY AND DEMAND (THOUSAND TONS/YEAR)

COUNTRY	PRODUCTION	CONSUMPTION			NET IMPORTS	YEAR
		ELECTRICITY	CEMENT	OTHER		
Indonesia	1,370	2,040	405	175	1,250	1985
Philippines	1,169	1,338	738	62	615	1987
Thailand	4,150	3,700	405	215	170	1985

- NOTES:
- 1 Million tons.
 - 2 Data for current production (Million tons/year) are vintage 1987 for Philippines and Thailand, 1985 for Indonesia.
 - 3 Not available due to current reevaluation of Philippine mineable reserves.
 - 4 To Be Determined.

SOURCES: I-22, P-17, P-26, P-32, T-2, T-5, R-10, R-15, R-33, in ANNEX 2.

tive internationally, and production can be expected to increase in line with demand in the near term. In the long term, Indonesia may become a net exporter of coal provided that oil prices are buoyed sufficiently.

All three countries are net importers, primarily of higher quality coal which is blended with the lower quality domestic coal for cement and industrial use. Electric utilities, by necessity, can use the lowest value and quality lignite or coal in appropriately adapted, heavy-duty equipment. Sophisticated, highly-engineered equipment, to this date, cannot handle the coal in these countries, which typically enter the plant without prior cleaning, rock removal, or preparation of any type.

The power sector is the largest consumer of coal in all three countries, and this situation is expected to continue. The public sector coal producers, Perum Tambang Jatubara (PTB), Perum Tambang Bukit Asam (PTBA), Semirara Coal Corp., and EGAT supply the electric utilities with coal resources. The cement industry, supplied by the private sector mining companies in great measure, has converted a number of its boilers to coal, in accordance with government-mandated policies and fiscal incentives. This coal conversion process has been so extensive in all three countries that the market for U.S. exports of clean coal technology to industry may be limited. State-run industries may be better targets for U.S. industry exports, given the federal financial support and multilateral lending possibilities available to them.

C. IN-COUNTRY PRIVATE SECTOR

Large projects in the areas of coal mining, coal-based industries, and coal-fired power generation require significant commitment of upfront investments. The magnitude of these investments is beyond the capacity of private investors and the projects are not viewed as attractive investment choices. In all three countries, the in-country capital base is low by developed country standards and possibly highly concentrated. The financial institutions lack both breadth,

i.e., type of lending institutions, and depth, i.e., types of services and financial mechanisms. Furthermore, the lending criteria of financial institutions and some government policies act as impediments to private sector investments.

However, despite the lack of a private sector investment climate, these countries are recognizing the need for private sector involvement in major projects. For example, the governments in these countries are implementing policies aimed at fostering greater private sector investment in projects traditionally in the public sector domain. Some of these policies include special fiscal and financial incentives. Through these incentives, there are indications that interesting investment partnerships among foreign banks, local investors, and suppliers of goods and services are beginning to emerge.

The governments of these countries have also sought assistance from bilateral and multilateral financial organizations in developing and encouraging private sector investments in Build-Operate-Transfer (BOT)-type projects. BOT involves the construction of a power generation facility, and its operation for a predetermined period of time prior to its transfer back to the utility. Since 1981, AID has supported programs to increase private sector participation in the economic growth of developing countries.

AID/S&T/EY recently initiated an effort which resulted in a series of country reports on the potential of private power generation in several developing countries. These reports include a Private Power Data Base which lists potential applications for private power generation in developing countries, and a quarterly news letter entitled "Private Power Reporter" featuring new developments in LDC private power markets. Studies have been completed for Indonesia, Philippines and Thailand, and while interest in the concept exists, progress on potential BOT projects has been gradual for a number of reasons:

1. The governments of these countries have only recently promulgated new laws and orders to permit private sector power generation, without altering necessary regulatory procedures, guidelines, incentives, investment regulations, tariffs and other policies.
2. The introduction of market forces into the power sector is resisted by the monopolist utility in each country, confident in its efficient management and electric generation.
3. Low sovereign credit ratings and high existing debt burden, such as in the case of the Philippines, dissuade international lenders from undertaking project risks.
4. The BOT contractual structure is tremendously complex, requiring agreements with the host governments for project implementation, shareholders for return on investment, lenders for export/suppliers credits and commercial/institutional loans, construction and A/E firms, fuel suppliers and utilities for power sales.

Coal-based projects have limited representation among the BOT proposals for the three countries under study, with only two identified in the Philippines--Hopewell Phase II and Cogentrix. Smaller-scale natural gas combined-cycle, diesel engines, mini-hydroelectric and renewable energy are more common private sector power installations than large-scale dedicated power plants burning indigenous or imported coal.

In March 1988, AID/S&T/EY presented a report, Power Shortages in Developing Countries: Magnitude, Impacts, Solutions, and the Role of the Private Sector, to the U.S. Congress. The report describes the impediments to private sector investments in the power sector, outlines potential strategies to enhance private sector participation, and defines packages of incentives needed to achieve this.

In addition, AID/S&T/EY recently sponsored a BOT seminar in Bangkok and a seminar on Private Power Generation in Manila where issues related to the investment by in-country private sector in power projects in Indonesia, Philippines and Thailand were discussed. The Manila seminar, cosponsored by the Philippine Office of Energy Affairs (OEA); coincided with the Philippine Government's final consideration of Private Power Guidelines and Regulations, enabling timely U.S. input into the deliberations.

Both the World Bank and ADB have initiated planning studies to assess the financial implications of private power generation in a series of Asian countries. The IFC Department of Investments at the World Bank sent its first mission to examine private sector BOT proposals in November 1988. IFC handles all IBRD private sector loans with a minimum of \$20 million on sector loans. The bank has no prior experience with BOT and the mission is expected to negotiate BOT contracts with project sponsors in Hong Kong, Korea and Philippines (Cogentrix and Hopewell are scheduled for meetings). At this juncture, it is unlikely that the bank will prepare a mission document except for specific negotiated BOT loan reports for internal use only. Additional missions to examine BOT proposals in other countries are expected.

ADB financed a review of private sector participation in the region's electric power sector in October-November 1988. The objective of the review and missions to six countries, including Indonesia, Philippines and Thailand, was to identify and analyze major issues in private sector participation and public sector privatization. ADB promotes private sector participation and expects this study, currently in draft form, to help accelerate private sector participation. A portion of the study is devoted to the economic, technical, and institutional implications of private sector BOT projects.

Although recent trends indicate some openings for private sector investments in power projects, the progress may be slow given (i) the absence of appropriate legislation and policies, and (ii) the status, authority, and monopoly of the national power utilities in the three countries.

D. PATTERN OF EXTERNAL DEVELOPMENT ASSISTANCE

The external development assistance to the three countries is provided by two multilateral financial institutions, IBRD and ADB, and by a host of bilateral agencies such as AID, TDP, Canadian International Development Agency (CIDA), Japan International Cooperation Agency (JICA), Caisse Centrale of France (CCCE),

Australian Development Assistance Bureau (ADAB), Overseas Development Fund (ODF), etc. This review focused only on assistance from two major multilaterals, IBRD and ADB, and three U.S. bilateral agencies, DOE, AID and TDP.

Table 4 presents selected examples of the type of assistance provided by the IBRD, ADB, and U.S. agencies to the three countries reviewed in this study. The three U.S. agencies, unlike the multilateral banks, do not routinely provide loans for major project implementation. Currently, U.S. involvement emphasizes either the initial stage of project development consisting of project definition, technical feasibility, R&D assistance, etc., or training at any stage of a project. The multilateral banks, however, finance the foreign component, wholly or in a co-financed mode, of the total project.

While the technical assistance provided by DOE, AID, and TDP is in the form of a grant, similar assistance associated with the projects provided by the banks is rolled into the project loan which must be paid back under the usual terms for bank-financed projects. On numerous occasions, the banks carry out sectoral or advisory studies in specific countries which are funded by the bank's own resources. In such cases, consultants, if required, are selected through an international competitive bidding (ICB) process and their services are made available to the country concerned.

Since most of the U.S. bilateral development assistance is in the form of a grant, and since IBRD and ADB do not provide grants for feasibility studies, there are clear opportunities for U.S. bilateral agencies. They should closely work with the banks in providing grants for the feasibility study and training components of those loan projects which are of direct interest to U.S. industry. The Overseas Economic Cooperation Fund (OECF) has formalized such arrangements with IBRD in key borrower countries. However, funds provided by U.S. agencies to developing countries are restricted for the procurement of goods and services from U.S. sources only (commonly referred as "tied" funds) whereas the banks

TABLE 4: SELECTED MULTILATERAL AND U.S. ASSISTANCE TO MINING AND POWER SECTORS IN INDONESIA, PHILIPPINES AND THAILAND

AGENCY	TYPE OF ASSISTANCE	EXAMPLES OF ASSISTANCE PROVIDED		
		INDONESIA	PHILIPPINES	THAILAND
IBRD	<ul style="list-style-type: none"> • Sector/project loans • Feasibility study loans • Regional technical assistance • Institution-building and policy studies 	Energy mission of 13 specialists to review energy options, 1986-1987	Energy sector loan preparation for \$2.5 billion, with OECF cofinancing, 1988	Mae Moh Lignite II loan of \$59.1 million to EGAT for mine expansion, 1984
ADB	<ul style="list-style-type: none"> • Sector/project loans • Project preparation assistance grants • Advisory and operational assistance grants • Regional technical assistance • Technology transfer 	Project preparation assistance of \$350,000 for study of institutional and manpower development in coal sector, 1988	Advisory and operational assistance of \$260,000 for NPC's Luzon power system study, 1987-1988	Mae Moh (Unit 9) power loan of \$38.4 million to EGAT, 1986
AID	<ul style="list-style-type: none"> • Sector/regional technical assistance • Feasibility study grants • Demonstrations/R&D project grants • Technology transfer 	Puspitek LSDE lab, fluidized bed pilots, staff training, and information exchange, \$12.5 million, 1985-1991	Five-part coal-water-mix fuels assessment funded by \$140,000 grant and \$900,000 in contractor services	Study of opportunities and impediments to private power generation, 1986
TDP	<ul style="list-style-type: none"> • Definitional missions • Feasibility study grants • Reimbursable grants • Technology transfer • Special financial aid 	Grant of \$500,000 for an electric energy assessment for BPPT and BATAN, 1985-1986	Definitional mission to evaluate potential for U.S. supplies and services in NPC rehabilitation and maintenance plan, 1988	Wiang Haeng coal exploration and prefeasibility study grant of \$200,000 for EGAT, 1986-1988
DOE	<ul style="list-style-type: none"> • R&D cooperation • Country studies • Data evaluations • Technology transfer 	Hosting office and field visit by BPPT Minister, 1988	No recent examples	U.S. fossil fuel technologies for LDCs study and country profile, 1987-1988

SOURCES: I-3, I-19, P-4, P-20, P-23, P-32, T-1, T-9, T-11, T-16, R-3, R-10, R-13, R-23, R-26, R-29, R-31, in ANNEX 2.

operate on the ICB basis. This poses some problems which can be resolved through parallel financing of those project components of specific interest to the U.S. Both TDP and AID have developed such linkages with IBRD and ADB in recent years.

As shown in Table 4, the assistance provided by the banks and U.S. bilateral agencies specifically in the area of coal has been sporadic. The usual pattern has been to provide assistance to the coal mining sector as part of a larger power sector development loan. Even this modest development assistance has come about only after the oil price increases of 1979, when the developing countries began to look at diversifying the power generation mix away from heavy dependence on oil. In the case of Thailand, for example, the discovery and production of gas in the early eighties resulted in the selected conversion of EGAT power plants to combined-cycle gas, while continuing the expansion of lignite-fired capacity, thereby reducing the overall dependence on imported oil.

Indonesia, which is a major oil producer in the region, still promotes enhanced utilization of coal in the power sector, thereby increasing its oil exports which provide foreign currency for investments in other priority sectors. NPC in the Philippines is considering increasing coal imports for some of its new capacity. By all accounts, indications are that the role of both local and imported coal in the power and industry sectors of the three countries is expected to increase in the coming years. Such a trend will present new opportunities for U.S. bilateral agencies in coal-related development activities, such as coal mining, coal preparation, and coal-fired power plants.

III. PROJECT IDENTIFICATION

A. TECHNICAL ASSISTANCE, LOANS, AND GRANTS

As part of this study, the Consultant carried out a review of the development assistance (loans and grants) provided by the two multilateral banks (IBRD and ADB) and three U.S. agencies (AID, TDP, and DOE). In this review, activities since 1982 are included to indicate the pattern of development assistance in Indonesia, Philippines and Thailand.

Table 5 presents a list of specific technical assistance projects and loans implemented or ongoing in the three countries for the period 1982-present. This list is by no means complete, as other related projects may have been missed given the preliminary nature of this study. Also, other bilateral agencies from Western Europe, Canada, Japan, and Australia have been active in the power sectors of these countries.

Table 5 is structured to present all entries grouped by lending agency - IBRD, ADB, AID, TDP, and DOE - and by country within each agency - Indonesia, Philippines, Thailand, and regional technical assistance loans and grants that contain coal components. Technical assistance, loans, and grants are described briefly, identifying the funding level, recipient entity, the contractor performing the study or project, key findings, and the current status of each, all in reverse chronological order. This ordering was chosen to draw the readers' attention to the most recent assistance first, thereby obtaining an appreciation of the evolution of relevant mining and power sector assistance to a country by a specific agency. The column entitled "Status" is used to categorize technical assistance, loans, and grants in similar stages of development and implementation.

TABLE 5: CURRENT STATUS OF RELEVANT TECHNICAL ASSISTANCE, LOANS AND GRANTS SINCE 1982
MINING AND POWER SECTORS IN INDONESIA, PHILIPPINES AND THAILAND

<u>AGENCY</u>	<u>COUNTRY</u>	<u>YEAR</u>	<u>TECHNICAL ASSISTANCE, LOAN OR GRANT</u>	<u>STATUS</u>
IBRD	Indonesia	1988	Palton Thermal Loan of \$200 million to cover part of PLN's \$932 million cost of 2 x 400 MW coal power plants in East Java, a 500-KV transmission line and associated substations. Appraisal mission yet to be finalized.	Proposed
IBRD	Indonesia	1988	Power Sector Efficiency Loan of \$300 million to the Ministry of Mines and Energy to support a package of projects including power plant rehabilitation and technical assistance. Total package cost is estimated at \$580 million. Loan on hold pending government compliance with conditionality.	Hold
IBRD	Indonesia	1987	Energy Pricing Policy Study establishing tariff structure revisions funded by loan 2690-IND.	Completed
IBRD	Indonesia	1985-1987	Energy Options Review Sector mission of 13 specialists to review energy options set forth in the <u>Power Sector Investment Review</u> , September 1985. The 1985 Review identified Suralaya and Palton plants to accommodate 7000 MW of coal-fired power.	Completed
IBRD	Indonesia	1982	Coal Exploration Loan 2153-IND of \$25 million to assist with field exploration and funding various feasibility studies, including: 1) <u>Ombilin II Conceptual Report</u> by NorWest Resource Consultants/Swan Wooster, March 1986, 2) <u>Muara Tiga Feasibility Study</u> by Kinhill-Otto Gold, May 1986, 3) <u>Bangka Barat Feasibility Study</u> by Kinhill-Otto Gold, under preparation, and 4) <u>Banjaramasin Feasibility Study</u> by Black and Veatch, under preparation.	Ongoing
IBRD	Indonesia	1982	Bukit Asam Development Loan 2079-IND of \$185 million to develop the Bukit Asam mining area, including a 400-km rail link to a dedicated marine terminal at Tarahan, and a new receiving terminal at Suralaya, scheduled to come on-line in late 1988. Further development to accommodate Suralaya 3 and 4 would require \$80-120 million.	Ongoing
IBRD	Philippines	1989-1992	Energy Sector Loan Preappraisal mission of 12 specialists in country November 1988 to appraise a \$2.5 billion loan, of which World Bank will supply \$350 million. The loan will finance investments in all energy and environment institutions, including a coal logistic facility. The loan was developed from the January 1988 mission and report, <u>Philippines: Energy Sector Study</u> , September 1988.	Definition

TABLE 5: CURRENT STATUS OF RELEVANT TECHNICAL ASSISTANCE, LOANS AND GRANTS SINCE 1982 -- Continued

<u>AGENCY</u>	<u>COUNTRY</u>	<u>YEAR</u>	<u>TECHNICAL ASSISTANCE, LOAN OR GRANT</u>	<u>STATUS</u>
IBRD	Philippines	1982	Coal Exploration Loan of \$17 million to assist with field exploration and funding various studies, including: 1) <u>Fuel Specification and Mine Planning Study</u> for Semirara Coal Corp. (SCC) by Monenco Consultants Ltd., 1987, and 2) <u>Isabela Mining Project - Appraisal Report</u> , September 1987.	Ongoing
IBRD	Thailand	1990	Mae Moh Units 10 & 11 To negotiate a portion of the next power loan to fund mine expansions as well as siting of units 12-19, for which an environmental impact study is to be completed by December 1988. Loan under preparation.	Definition
IBRD	Thailand	1988	Power Generation Loan of \$150 million to EGAT for construction of Bang Pakong combined cycle plants (units 3 and 4) and associated transmission facilities. Appraisal mission was in field August 1988. Black and Veatch is the consultant; fuel source may change.	Proposed
IBRD	Thailand	1984	Mae Moh Lignite II Loan of \$59.1 million to assist EGAT finance mine expansion, new conveyor currently out on bid, and required studies such as the siting of units 12-19, capacity handled by existing water resources, and handling of J seam lignite.	Ongoing
ADB	Indonesia	1988	Institutional Development Project preparation assistance of \$350,000 to perform a study of options for institutional and manpower development in the coal sector, paralleling the Puspitek training efforts underway by AID and Battelle.	Ongoing
ADB	Indonesia	1987	Power XIX Loan of \$96 million to PLN at variable rates, 20 years.	Ongoing
ADB	Indonesia	1985	Kailmantan Transport Project preparation assistance of \$72,750 to perform a feasibility study of specific transport options, paralleling efforts underway by AID, BPPT and Bechtel.	Completed
ADB	Indonesia	1985	Rural and Renewable Energy Advisory and operational assistance of \$450,000 to finance a study of energy development in Kailmantan by CESEN, E/DI and others, published in November 1985.	Completed
ADB	Indonesia	1983	Power XVIII Loan of \$135 million to PLN at 10.5%, 20 years.	Ongoing

TABLE 5: CURRENT STATUS OF RELEVANT TECHNICAL ASSISTANCE, LOANS AND GRANTS SINCE 1982 -- Continued

<u>AGENCY</u>	<u>COUNTRY</u>	<u>YEAR</u>	<u>TECHNICAL ASSISTANCE, LOAN OR GRANT</u>	<u>STATUS</u>
ADB	Philippines	1988	Fourteenth Power Loan of \$120 million to NPC at variable rates, 20 years, to expand transmission facilities and upgrade overall operational efficiency. Accompanied by a \$230,000 technical assistance grant for a Power Sector Structure and Transfer Pricing Study covering the period 1983-1995.	Procurement
ADB	Philippines	1987-1988	Luzon Power System Advisory and operational assistance of \$260,000 for Bechtel National Inc. to perform the Luzon Power System Development Study to the year 2000 for NPC. The report was issued March 23, 1988.	Completed
ADB	Philippines	1986	Third Power System Development Loan of \$92 million to NPC at variable rates, 20 years.	Ongoing
ADB	Philippines	1984	Second Power System Development Loan of \$33 million to NPC at 10.25%, 20 years.	Ongoing
ADB	Philippines	1984	BRC Subprojects Project preparation assistance of \$70,000, part of the energy sector loan to PNOC.	Completed
ADB	Philippines	1984	PNOC Energy Loan Loan of \$85 million to PNOC at 10.25%, 15 years. Included in sector loan are funds for the feasibility, engineering and equipment procurement for development of the Lalat coal field in Mindanao, to satisfy the coal demand of the cement industry.	Ongoing; No U.S. Potential
ADB	Philippines	1984	Private Sector Coal Development Advisory and operational assistance of \$350,000 to finance a feasibility study.	Completed
ADB	Philippines	1982	Second Coal Development Project preparation assistance of \$330,000 to finance a study.	Completed
ADB	Philippines	1982-1984	Industrial Energy Audits Advisory and operational assistance of \$560,000 to fund a comprehensive study of industrial energy conservation by A.D. Little, International, Broken Hill Proprietary Co., and Engineering Development Corp. The report was released in April 1984.	Completed
ADB	Philippines	1982	Power System Development Loan of \$32.75 million to NPC at 11%, 20 years.	Ongoing

TABLE 5: CURRENT STATUS OF RELEVANT TECHNICAL ASSISTANCE, LOANS AND GRANTS SINCE 1982 -- Continued

<u>AGENCY</u>	<u>COUNTRY</u>	<u>YEAR</u>	<u>TECHNICAL ASSISTANCE, LOAN OR GRANT</u>	<u>STATUS</u>
ADB	Thailand	1989-1992	XIII EGAT Power Sector Loan of \$100 million (tentative) to support the 1989-1992 development plan of EGAT and upgrade the power transmission system. Mission in field.	Proposed
ADB	Thailand	1988-1992	Sixth Power Distribution Loan of \$64.75 million to MEA at variable rates, 20 years, accompanied by a \$430,000 technical assistance grant.	Procurement
ADB	Thailand	1986	Mae Moe (Unit 9) Power Loan of \$38.4 million to EGAT at variable rates, 20 years, for construction of 300-MWignite-fired unit 9.	Ongoing
ADB	Thailand	1984	Mae Moe (Unit 8) Power Loan of \$122.6 million to EGAT at 10.25%, 20 years, for construction of 300-MWignite-fired unit 8.	Ongoing
ADB	Thailand	1983-1985	Industrial Energy Audits Technical assistance grant of \$400,000 to NEA and IFCT for Gas & Fuels Corporation of Victoria, Australia, CORE International and others to perform 45 energy audits, survey management attitudes at 349 companies, identify coal conversion candidates, and make institutional recommendations. Report was released August 1984.	Completed
ADB	Thailand	1982	Second Power System Expansion Loan of \$81.6 million to EGAT at 11%, 20 years.	Ongoing
ADB	Regional	1988	Private Sector Power Technical assistance of \$100,000 to finance a study by Hagler Bailly/CORE International of private sector participation in electric power generation in India, Indonesia, Malaysia, Pakistan, Philippines and Thailand.	Ongoing; Finalizing Report
ADB	Regional	1985-1986	Regional Cooperation in Energy Technical assistance of \$300,000 to finance a conference.	Completed
ADB	Regional	1985	Symposium on Environment Technical assistance of \$125,000 to finance a conference on environmental and natural resource planning.	Completed
ADB	Regional	1983-1986	Energy Demand Management Technical assistance of \$250,000 to perform studies of energy demand management policies (by utilities) in nine countries over a two-year period, with reports issued in December 1986.	Completed

TABLE 5: CURRENT STATUS OF RELEVANT TECHNICAL ASSISTANCE, LOANS AND GRANTS SINCE 1982 -- Continued

<u>AGENCY</u>	<u>COUNTRY</u>	<u>YEAR</u>	<u>TECHNICAL ASSISTANCE, LOAN OR GRANT</u>	<u>STATUS</u>
ADB	Regional	1983	ASEAN Coal Development Technical assistance of \$450,000 (plus \$250,000 from UNDP) to finance a study by Montreal Engineering Company, published in March 1985.	Completed
AID	Indonesia	1985-1991	Puspitek LSDE Lab Grant of \$12.5 million to BPPT to engage a U.S. Institute (Battelle Columbus Laboratory) to design and implement a sister laboratory in the "Science City" at Serpong. The LSDE (Indonesian Energy Institute) lab would include circulating and bubbling fluidized beds, coal furnace pilots and coal preparation facilities. Also developed a training program for Indonesian engineers in Columbus and Jakarta.	Hold; Reevaluating bids for lab equipment
AID	Indonesia	1988	Private Sector Generation Office of Energy awarded study of opportunities and impediments to cogeneration, renewable and large-scale private power plants to Energy/Development International (E/DI). A seminar is scheduled in Jakarta for March 1989.	Completed; Follow-up activities underway
AID	Indonesia	1984-1990	General Training II As part of a \$25.5 million loan to the government, the Midwest Universities Consortium for International Activities (MUCIA) has been contracted to strengthen Indonesian universities through technology transfer.	Ongoing
AID	Indonesia	1983-1985	Kalimantan Coal Transport Conventional Energy Technical Assistance (CETA) of \$250,000 for BPPT and Puspitek Lab to contract 2-year on-site services from Bechtel National Inc. and an evaluation of sea and land transport requirements to move Kalimantan coal to Java and Sulawesi.	Completed; TDP follow-up
AID	Philippines	1988	DOT Private Power Seminar Office of Energy had its CETA contractor, Bechtel, organize a seminar on private power generation through Build-Operate-Transfer, in Manila, October 5, 1988, for approximately 300 investors, local business and government officials.	Completed; Finalizing Proceedings
AID	Philippines	1985-1986	Cogeneration Potential Office of Energy contracted Stanley Consultants to evaluate the potential for cogeneration and grid connections for the Bureau of Energy Development (BED), with training. The report was issued January 1986.	Completed

TABLE 5: CURRENT STATUS OF RELEVANT TECHNICAL ASSISTANCE, LOANS AND GRANTS SINCE 1982 -- Continued

<u>AGENCY</u>	<u>COUNTRY</u>	<u>YEAR</u>	<u>TECHNICAL ASSISTANCE, LOAN OR GRANT</u>	<u>STATUS</u>
AID	Philippines	1984-1987	Coal Development Seminars Within the CETA program, AID cosponsored the Brookhaven Workshop and presentations in Manila, and sent representatives to speak at conferences in Manila, Hong Kong, Tampa, Washington, etc. on the findings of the Coal-Water-Mix Fuels project.	Completed
AID	Philippines	1984-1985	Coal-Water-Mix Fuels Grant of \$140,000 and services of CETA contractors valued about \$900,000 to NPC for an initial investigation into introducing CWM fuels to the Philippines. A major five-volume report was published in April 1985: I. U.S. Geological Survey, "The Philippine Coal Resource," II. Brookhaven National Lab, "Formulation of CWM Fuels from Philippine Coals," III. Burns and Roe, "Power Plant Retrofit and Performance," IV. Burns and Roe, "CWM-Fuel Supply System," and V. Development Sciences, "Financial and Economic Analysis."	Completed Phase I; Reevaluating Phase II
AID	Philippines	1983-1985	Technical Assistance Program Development Sciences, Inc. was awarded two contracts worth \$130,200 and \$45,000 to identify useful technical assistance activities in Philippine coal development for AID as a result of interest sparked at the TDP symposium in Manila. Two final reports were issued in January 1984 and July 1985.	Completed
AID	Thailand	1986	Private Sector Generation Office of Energy awarded study of potential, impediments and policy issues regarding cogeneration, renewable and large-scale private power plants to Hagler Bailly.	Completed; Follow-on Anticipated
AID	Thailand	1986	Energy Conservation Services Centrally-funded AID program sent two specialists from Hagler Bailly to NEA to define national energy conservation goals and develop a mobilization plan, especially for the industrial sector. Two reports were issued in March 1986.	Completed
AID	Worldwide	1988-1994	Private Sector Energy Development Proposed program to be funded by \$7 million from Office of Energy and \$5 million from other AID Bureaus and government agencies to encourage private sector power generation in selected developing countries.	Definition
AID	Regional	1988	ASEAN-AID Seminar Asia Bureau at AID, the Asian Institute of Technology (AIT) and ASEAN cosponsored the Executive Seminar on Cogeneration and Private Power at Hua Hin, Thailand, November 9-11, 1988.	Completed; Proceedings Forthcoming

TABLE 5: CURRENT STATUS OF RELEVANT TECHNICAL ASSISTANCE, LOANS AND GRANTS SINCE 1982 -- Continued

<u>AGENCY</u>	<u>COUNTRY</u>	<u>YEAR</u>	<u>TECHNICAL ASSISTANCE, LOAN OR GRANT</u>	<u>STATUS</u>
AID	Regional	1986-1987	Asia/Near East Workshop AID's Energy Conservation Services Program contractor, Hagler Bailly, organized workshops for 75 specialists to meet, attend 36 presentations and exchange ideas.	Completed
AID	Regional	1985-1990	ASEAN Energy III Two grants: \$1.4 million to AIT for all training components in Asia and U.S. and \$3.6 million to ASEAN for energy conservation in buildings. Coal technology transfer focusing on coal use in electric power and industrial plants and an ASEAN-U.S. coal seminar have been allocated \$500,000 of AIT's grant.	Ongoing
AID	Regional	1985-1986	Coal Technology Training Within the Conventional Energy Training Project (CETP) administered by the Institute of International Education, a 16-week course was developed with internships at Utility Fuels, Inc. and Houston Lighting and Power for ASEAN country technical managers.	Completed
AID	Regional	1982-1985	ASEAN Energy II A \$1 million grant administered by the Government of Indonesia with three components: energy conservation in buildings, coal technology training and alternate water pumping systems. The coal training component was successfully completed in 1983, but ASEAN requested an extension, ASEAN Energy III.	Completed
TDP	Indonesia	1987	Palton Boiler Evaluation Grant of \$75,000 to BPPT for a U.S. consultant to assist BPPT evaluate two proposals for 2 x 350 coal-fired boilers for the Palton Station. Awaiting PLN tariff revision specified in World Bank sector loan before proceeding.	Hold
TDP	Indonesia	1986	West Java Coal Transport Grant of \$475,000 to BPPT for Bechtel National Inc. to study transporting Kalimantan coal to West Java cement plants (singled out in AID 1985 study) and identify areas for future study: coal conversion, quality, railway traffic, etc.	Completed; OECD/JICA taken lead
TDP	Indonesia	1985-1986	Electric Energy Assessment Grant of \$500,000 to BPPT and BATAN for Bechtel National Inc. to reevaluate the feasibility of nuclear versus coal power with and without flue gas desulfurization in planning for PLN's power expansion program.	Completed

TABLE 5: CURRENT STATUS OF RELEVANT TECHNICAL ASSISTANCE, LOANS AND GRANTS SINCE 1982 -- Continued

<u>AGENCY</u>	<u>COUNTRY</u>	<u>YEAR</u>	<u>TECHNICAL ASSISTANCE, LOAN OR GRANT</u>	<u>STATUS</u>
TDP	Indonesia	1983	Coal Plant Standards Grant of \$85,000 to BPPT for Burns and Roe to evaluate bids from Combustion Engineering and Babcock & Wilcox for a PLN coal-fired power plant.	Completed
TDP	Indonesia	1984	Coal Project Identification Contracted a \$61,800 definitional mission by Development Sciences to follow-up leads and projects identified by the 1983 Symposium in Jakarta.	Completed
TDP	Indonesia	1983	Coal/Lignite Symposium Grant of \$170,000 to the Ministry of Mines and Energy and BPPT for AER Enterprises and the U.S. Bureau of Mines to organize a 3-day technical seminar in Jakarta.	Completed
TDP	Philippines	1988	Power Plant Rehabilitation Definitional mission by Laramore, Douglass and Popham (LDP) to evaluate the potential for U.S. supplies and services to NPC as part of a integrated thermal plant rehabilitation and maintenance program for the 1989-1993 period. LDP found Japanese entrenchment to limit U.S. possibilities.	Completed
TDP	Philippines	1986	Lessons Learned Study Definitional mission by Engineering and Economics Research, Inc. to evaluate the economic climate for investment, the legitimacy of the complaints of mining company officials, the need for U.S. equipment and services and the lessons learned from TDP involvement in Philippine coal sector.	Completed
TDP	Philippines	1985	Semirara Coal Beneficiation Grant of \$250,000 for NorWest Resources Consultants to perform a feasibility study of a coal preparation plant proposed by Semirara Coal Corp. (SCC), since Himalian coal must be beneficiated prior to combustion.	Completed; Follow-up Suspended
TDP	Philippines	1985	Bulatacao Coal Mine Reimbursable grant not to exceed \$120,000 for F.F. Cruz (Filipinas Systems) to study the technical, commercial and financial feasibility of developing the high sulfur (3.5% plus) coal deposits of Bulatacao mine with private sector participation.	Completed study; Repayment to 1994

TABLE 5: CURRENT STATUS OF RELEVANT TECHNICAL ASSISTANCE, LOANS AND GRANTS SINCE 1982 -- Continued

<u>AGENCY</u>	<u>COUNTRY</u>	<u>YEAR</u>	<u>TECHNICAL ASSISTANCE, LOAN OR GRANT</u>	<u>STATUS</u>
TDP	Philippines	1984- 1985	Montenegrin Mining Study Grant of \$180,000 to the Montenegrin Mining Corporation for Dames and Moore to study the feasibility of establishing a mining operation in Marhatag, Surigao del Sur (provincia) to supply indigenous coal to the local market. The final report, completed September 15, 1985, was criticized by Montenegrin.	Completed
TDP	Philippines	1985- 1984	Semirara Coal Development Grant of \$400,000 to BED for Dames and Moore and three subcontractors to evaluate the feasibility of developing the Himalian deposits, and the Panian field on Semirara Island, despite the Austrian findings.	Completed; Follow-up Suspended
TDP	Philippines	1983- 1984	Cebu Island Transport Grant of \$150,000 to BED for Davy McKee Corp. to perform an engineering and economic study of three alternate means to transport coal from the Argao-Dalaguete area of Cebu. The cable car, tunnel and slurry alternatives to expensive road transport do not appear viable.	Completed
TDP	Philippines	1983	Cebu Coal Preparation Grant of \$400,000 to BED for NorWest Resources Consultants to perform a feasibility study of establishing a centralized coal washing plant at Danao City, Cebu Island. The consultant analyzed 31 samples from 15 mines visited, finding inconsistent coal quality invalidating this option.	Completed
TDP	Philippines	1982- 1983	Coal Development Symposium Grant of \$153,000 to BED for the U.S. Bureau of Mines to organize a symposium in Manila, "Accelerating Philippine Coal Development through U.S. Technology," February 20-25, 1983, which resulted in identifying and funding the above grants/missions.	Completed
TDP	Thailand	1988- 1989	Mae Moh AFBC Grant of \$450,000 to EGAT for a feasibility study of a 60-75 MW atmospheric fluidized bed combustor fed by low quality J seam lignite. Contractor yet to be selected.	Definition
TDP	Thailand	1988	Lignite Preparation/FBC Definitional mission by Harold Faulkenberry to evaluate whether TDP should fund a full feasibility study of lignite cleaning at Mae Moh, complementary use of fluidized bed combustion of J seam lignite cleaned or as-received, and an environmental impact assessment. Report issued September 1988 resulted in above grant.	Completed; Follow-on Anticipated

TABLE 5: CURRENT STATUS OF RELEVANT TECHNICAL ASSISTANCE, LOANS AND GRANTS SINCE 1982 -- Continued

<u>AGENCY</u>	<u>COUNTRY</u>	<u>YEAR</u>	<u>TECHNICAL ASSISTANCE, LOAN OR GRANT</u>	<u>STATUS</u>
TDP	Thailand	1988	Bang Pakong Combined Cycle Grant to EGAT for Black and Veatch to study a 600 MW combined cycle plant (unit 3) for inclusion in the utility's expansion plans. Report released in 1988 identified presence of Japanese licensees and non-competitive U.S. position.	Completed
TDP	Thailand	1987	Krabi AFBC Grant of \$350,000 to EGAT for Burns and Roe to perform a feasibility study of a 30-50 MW atmospheric fluidized bed unit to burn low-grade lignite from Krabi mine in Southern Thailand. This study followed a definitional mission by Burns and Roe in April 1984. TDP is awaiting EGAT's response on an offer of \$500,000 for additional study.	Proposed
TDP	Thailand	1987	Mae Moh Handling Grant of \$200,000 to EGAT for preparation of a preliminary study and bidding documents for a lignite handling system (conveyor) to replace and integrate existing German technology. Morrison-Knudsen International prepared the specs and three U.S. firms are bidding. This effort follows from a definitional mission (\$45,000) of Mae Moh mine expansion in 1983-1984.	Procurement
TDP	Thailand	1986-1988	Wiang Haeng Lignite Grant of \$200,000 to EGAT for Morrison-Knudsen International to perform a coal exploration and pre-feasibility study of the deposit in northern Thailand. This study followed a definitional mission in May 1984 by Stone & Webster Engineering. Report released January 1988 identified difficulties with mine development.	Completed
TDP	Thailand	1986-1987	Khlan Sa Lignite Grant of \$300,000 to EGAT for Morrison-Knudsen International to perform a coal exploration and pre-feasibility study of the Southern Lignite Development Project at Khlan Sa. This study followed an initial six-basin resource assessment by Dravo Engineering for \$28,700 in 1983, and a definitional mission in May 1984 by Stone & Webster Engineering. Report released February 1987 identified difficulties with mine development.	Completed
TDP	Thailand	1985	Asi Phaeng Coal Grant of \$280,000 to EGAT for Burns and Roe to study the sites, environmental impact and port facility requirements for an integrated 1600 MW power plant. This study followed a definitional mission in 1982. It appears that the plant will burn imported coal from Australia or China instead of lignite.	Completed

TABLE 5: CURRENT STATUS OF RELEVANT TECHNICAL ASSISTANCE, LOANS AND GRANTS SINCE 1982 -- Concluded

<u>AGENCY</u>	<u>COUNTRY</u>	<u>YEAR</u>	<u>TECHNICAL ASSISTANCE, LOAN OR GRANT</u>	<u>STATUS</u>
TDP	Thailand	1982	Oil Shale/Lignite Symposium Grant of \$120,000 to EGAT for AER Enterprises and U.S. Bureau of Mines to organize a Bangkok Symposium which served as the catalyst for the above projects and informed U.S. companies of opportunities in Thailand. Final report issued June 1982.	Completed
TDP	Regional	1987	Multi-Country Energy Sector Study Grant of \$200,000 to International Institute for Energy Conservation/EERTC to develop strategies for effective collaboration between TDP, ADB and World Bank and identify potential energy sector projects for TDP funding in Indonesia, India, Korea, Philippines and Thailand.	Completed
DOE	Indonesia	1988	BPPT Presentation Hosted a visit by the BPPT Minister to DOE, Cool Water IGCC demonstration and various laboratories involved in clean coal projects. Resulted in a request for a \$5 million fuel cell pilot plant.	Completed
DOE	Thailand	1987- 1988	U.S. Technologies for LDCs Argonne National Laboratory, as prime contractor for this project undertook a screening of 75 AID-assisted countries to identify three countries that appeared most favorable for U.S. fossil fuel technologies. The report for Thailand, released July 21, 1988, described the situation and prospects for U.S. participation.	Ongoing
DOE	Regional	1988	Clean Coal Seminars DOE/FE is organizing a number of seminars to inform the public of clean coal, DOE program and LDC opportunities, including findings of the Thailand study. Seminars have been held in DC and San Francisco.	Ongoing
DOE	Regional	1986- 1987	Research Needs Pittsburgh Energy Technology Center contracted Viking International to evaluate the data needs and acquisition for the PETC International coal database, including Indonesia, Philippines and Thailand. Annual and quarterly reports have been issued but no final report.	Ongoing

SOURCES: All documents identified in ANNEX 2.

The terms in this column are defined as follows:

Definition: The scope of the assistance is defined through preliminary meetings, definitional missions, sector review/project preparation missions, etc.

Proposed: A project proposed by either private industry soliciting funds or by the recipient public entity in the country, seeking multilateral or bilateral aid for the project, and the feasibility study.

Procurement: Bidding and acquisition of equipment and services following feasibility under a loan or grant sought by the recipient agency.

Ongoing: Site preparation, construction, installation, or other implementation of power or mining project; the continuing disbursement of loan monies; or the continuation of special project aid.

Hold: Projects held by either a reevaluation of progress to date and project relevance, a lack of funds at some stage of implementation, or the inability of the borrower to meet important covenants of the loan.

Completed: A study, training session, laboratory, power plant, or other project completed with funds fully disbursed, with follow-up status described.

These terms permit the reader to identify those assistance, loans, and grants that may be at a logical stage for U.S. bilateral involvement.

The information presented in Table 5 is rather extensive. Some key highlights of the information follow:

- A total of 83 technical assistance, loans, and grants by IBRD, ADB, AID, TDP, and DOE relating to the mining and power sectors of Indonesia, Philippines, and Thailand have been identified.
- The total funding level (preliminary estimate) of the assistance is approximately \$2,356 million.
- As expected, IBRD has been the largest lender with at least 11 loans and technical assistance projects identified at \$1,286 million, excluding the costs of numerous bank staff missions to the three countries.
- ADB is the second largest lender in this area with 26 loans and technical assistance projects, estimated at approximately \$1,006 million. ADB loans are almost exclusively to the power sector in the three countries, with technical assistance in the areas of private sector power generation, energy conservation, and training (e.g., coal manpower training in Indonesia).

- Both TDP and AID have been active in their assistance to the mining and power sectors of all three countries. TDP has provided 25 grants and technical assistance totalling at least \$5 million since 1982 in the areas of project definition, feasibility studies, technology transfer, and training. AID has been active in these areas as well as in institution-building, making at least \$57 million available to 17 public and private sector projects.
- DOE has initiated its own effort to promote U.S. coal and coal technology exports to these three countries, with country studies, seminars, and databases under development.
- The technical assistance, loans, and grants identified in Table 5 are relatively evenly divided among the recipient country for each lending agency as indicated below:

	<u>Indonesia</u>	<u>Philippines</u>	<u>Thailand</u>	<u>Regional</u>	<u>TOTAL</u>
IBRD	6	2	3	---	11
ADB	5	10	6	5	26
AID	4	5	2	6	17
TDP	6	9	9	1	25
DOE	1	---	1	2	4
TOTAL	<u>22</u>	<u>26</u>	<u>21</u>	<u>14</u>	<u>83</u>

- Thirty-four technical assistance, loans, and grants are at some active stage of planning, disbursement, or implementation. Of particular interest are the following projects in the definition, proposal, procurement, or hold stages, which may offer great opportunities for U.S. participation.

	<u>Definition</u>	<u>Proposed</u>	<u>Procurement</u>	<u>Hold</u>
IBRD	2	2	---	1
ADB	---	1	2	---
TDP	1	1	1	1
TOTAL	<u>3</u>	<u>4</u>	<u>3</u>	<u>2</u>

- Forty-nine of the technical assistance and loans identified in Table 5 have been completed. Follow-up activity is indicated where it is known. In at least a dozen cases, the potential for U.S. participation is nil, while in other cases, follow-up may be suspended by the recipient agency for political or other reasons.
- Training, conferences, and information exchange appear to be prominent forms of development assistance provided by the multilaterals and the U.S. public sector agencies, thus creating a favorable climate for involvement by the U.S. private sector.
- A few projects identified in Table 5 appear to be duplicated efforts undertaken by two or more lending agencies, thereby making a strong case for coordinated programs among U.S. bilaterals and multilaterals in all developing countries.

- In some cases, inter-agency coordination is identified, for instance, the AID-funded Kalimantan Coal Transport Study was followed up by TDP, or IBRD-funded exploration program discovered Thai lignite deposits which were studied by U.S. consultants under TDP grants.

Technical assistance, loans, and grants provide one part of the development activity. U.S. industry has also been active in seeking potential projects in these countries, especially in the power sector since new utility plant orders have been reduced in recent years in the U.S.

B. U.S. PRIVATE SECTOR INVOLVEMENT

As part of this effort, direct discussions were undertaken with three trade associations, two research institutes, six equipment vendors and six A/E firms to solicit their opinions on the current study. The U.S. industry representatives contacted (See Annex 1) were accessible and expressed a willingness to answer further questions from the Consultant or DOE directly. The topics of the interviews are discussed below.

U.S. industry representatives were asked to corroborate the information gathered by the Consultant on the technical assistance, loans, or grants in which they participated, as well as new project leads. Many of these individuals offered information of a much more current nature than the data accumulated through discussions with bank and U.S. bilateral agency officials. They provided explanations for a number of projects that appeared completed with no follow-up activities, and why certain activities had been suspended.

The Consultant requested information on the experience of the U.S. industry representatives in the three countries under study and the level of their interest in pursuing projects abroad. The response was neutral-to-negative in terms of experience to date, since numerous marketing trips had been made with no resultant commitment by the entities visited. In the case of the Philippines, one company had been discouraged by the postponement of specific power and mining projects which were viewed as candidates for its technologies. The overall feeling is

that U.S. financing packages, when compared to offers from other countries, are not attractive enough to make U.S. companies competitive. The level of interest in seeking projects in these three countries was high for all companies contacted.

The discussions with industry representatives also addressed the problems they face in attempting to market their services and equipment abroad. These problems include, but are not limited to: available financing; flow of information; lack of U.S. public-private sector cooperation; U.S. legislation limiting creative marketing abroad; and lack of a clear economic advantage for U.S. technologies abroad. There are also numerous difficulties inherent in operating abroad, such as identifying the appropriate public sector sponsor and private sector counterpart, changing political tides, local currency requirements for project implementation, receiving timely payment for services, obtaining insurance, locating local staff of appropriate skill levels, etc.

The bulk of the discussions addressed the projects identified in the review of technical assistance, loans, and grants in Section III.A. The projects identified by the private sector are presented in Table 6, grouped by country. U.S. industry representatives also assisted in identifying three private sector opportunities in Indonesia and Philippines with possible coal components.

By and large, U.S. industry felt encouraged by the current government initiative. Trade associations to date have not addressed coal and technology opportunities in the three countries and welcome the government initiative. Greater U.S. industry interest and awareness are expected to benefit all parties.

C. REVIEW OF EXPERIENCE GAINED

U.S. bilateral agencies and industry have been active participants in the development of the mining and power sectors of Indonesia, Philippines, and Thailand. Their experience since 1982 varies by country and sector as well as by the year in which their activity was initiated. A number of major political and economic events altered the course of these three countries and consequently,

TABLE 6: PRIVATE SECTOR/PRELIMINARY PROJECT IDENTIFICATION

INDONESIA

Palton 1 & 2 U.S. vendor has an outstanding tender on 2 x 400 MW gas and coal power plants to be evaluated by a U.S. A/E firm.

Suralaya 5 & 6 U.S. vendors interested in feasibility study of 2 x 600 MW coal units.

Central Java 1 & 2 U.S. vendor interested in feasibility study of 5 x 800 MW coal units once site is selected.

Puspitak AFBC Potential for other U.S. institutes to continue training and procurement of bench-scale equipment for the energy law.

Gresik International competitive bid proposals for BOT or turnkey construction of 3 x 300 MW combined cycle units sought by BPPT.

GENERAL OPINIONS

- Good market, ranked high by U.S. industry.
- Government ability to attract highly competitive proposals.
- Good quality coal production offers opportunities.
- Seven new power plants burning imported and domestic coal due on-line by 1995.

PHILIPPINES

Calaca 2 U.S. vendors watching 300 MW coal plant near prequalification stage. One vendor negotiating with OECF (\$228 million loan 1987) to supply boiler parts.

Hopewell/Calaca 3 Developer of first successful BOT (China 700 MW coal plant) offered to build NPC a 350 MW plant fired by Semirara coal within 4 years.

Cogentrix Proposed coal-fired 2 x 55 MW power plant at Caltex refinery for sale of electricity to NPC; seeking assistance.

Mindanao NPC postponed 1988 start-up to 1999, dampening U.S. vendor efforts. NPC plans for five additional coal plants on Mindanao after 2000.

Bisitig Mines PNOC has three coal mines up for sale or privatization in international competitive bid end-1988.

GENERAL OPINIONS

- Change in government caused institutional restructuring (still underway).
- Discouraging market condition; long lead times for project approval and disbursement.
- Private sector taking the initiative to meet explosive electricity demands.
- No shortage of high quality coal suppliers in region vs. domestic coal development.

THAILAND

Krabi 4 U.S. vendors interested in 75 MW coal plant replacement near tender request stage.

Krabi AFBC U.S. A/E firm considers project alive after its May 1987 feasibility study, despite Saba Yoi discovery. EGAT is also considering 75 MW AFBC for Sin Pun.

Mae Moh AFBC Three U.S. firms in close contact with EGAT; awaiting decision on bubbling or circulating bed.

Khian Sa Southern lignite mine development will not proceed with U.S. services/equipment due to lack of information exchange.

Mae Moh 10-19 U.S. vendors tracking boiler procurement opportunities for 10 x 300 MW lignite plants, anticipating environmental specifications in later bid requests.

GENERAL OPINIONS

- Good market; active, booming economy with tremendous prospects.
- Very competitive internationally.
- Strong public sector agency with excellent track record for competitive bids and negotiated short-list selection.
- Environmental specifications for coal preparation, scrubbers, etc. expected after 1990.

the success of U.S. initiatives during the past six years. The overthrow of the Marcos regime impacted virtually every project planned or underway in the Philippines. The price war within the Organization of Petroleum Exporting Countries (OPEC) following its frustration over depressed oil prices since 1985 has seriously affected Indonesia's ability to repay its loans, as evidenced by IBRD's moratorium on new loan disbursements until power sector tariffs are restructured. In contrast, Thailand's economic boom continued, with the encouraging discovery of major lignite reserves at Saba Yoi and Sin Pun and expansion of proven reserves at Mae Moh. Within this context, highlights of the U.S. experience gained follow.

- IBRD and ADB have lent the Indonesian power sector \$731 million since 1982, \$596 million since 1987. This places an obvious strain on the utility, PLN, as it prepares to construct seven new coal-fired plants and rehabilitate many oil-fired units. Opportunities for U.S. involvement exist at all levels, and TDP has funded assistance grants for U.S. A/E firms to establish coal plant standards and evaluate equipment bids received by PLN. While the recent IBRD moratorium on loan disbursement may limit further U.S. bilateral aid, it may support private sector power generation initiatives which would not be subject to the PLN covenant.
- Indonesia received \$210 million in IBRD mine development loans in 1982. There appears to be no further need for funds directed at domestic coal resources. Rather, infrastructural changes required to transport Kalimantan coal to West Java plant sites are more pressing issues. ADB, AID, and TDP were integral to the assessment of alternate transport modes, providing \$0.8 million in technical assistance funds to U.S. A/E firms. Once the project was sufficiently scoped, foreign competition offered more financially-attractive project implementation options.
- The Puspitek 11-laboratory complex includes an energy lab funded by a \$12.5 million AID grant. This project fulfills a major institution-building function with training and installation of R&D bench-scale units. Closer collaboration with DOE, already actively promoting clean coal technologies with its third demonstration round underway, may help facilitate planned equipment procurement.
- Indonesia received at least \$40.2 million in non-reimbursable funds from the five agencies to develop its coal and power sectors. U.S. industry is encouraged by the ability of the government to solicit highly competitive proposals; however, the implementation of these proposed projects is lacking. Aware of the need for further coal sector development, ADB has recently authorized \$350,000 to study institutional and manpower requirements in this sector. The implementation of selected findings from this ADB study should facilitate further U.S. involvement.

- IBRD lent the Philippines \$17 million for coal exploration in 1982. This loan was accompanied by two ADE technical assistance projects to evaluate public vs. private sector coal development options. U.S. bilateral agencies AID and TDP also supported this effort with eight grants totalling \$3.2 million between 1982-1985. However, there were no further IBRD or ADB funds for coal development to bolster the U.S. investments. In fact, PNOC-CC has initiated the privatization of its coal mine holdings.
- AID was actively supporting the coal sector with its \$140,000 grant and \$900,000 in contractor services offered to NPC under the Coal-Water-Mix (CWM) Fuels program. Philippine resources and markets were evaluated to determine the potential for CWM retrofits and new installations. The first phase was completed in 1985 amidst the simultaneous fall of the Marcos dictatorship and oil prices, two key assumptions for project economics. The CWM project has been on hold ever since.
- In 1987 IBRD reevaluated the least-cost fuels for Philippine power generation. IBRD found geothermal and imported coal less expensive than domestic coal for electricity production. This position has made it undesirable for TDP to follow-up any of the six mine development, preparation, and resource transport grants (\$1.9 million) it funded prior to 1985.
- The Philippines are experiencing a major power shortage requiring immediate solutions. ADB is responding with studies of Luzon's power demand and \$10 million in connection with IFC and supplier credits for gas turbines rated at 200 MW. AID is assisting U.S. industry to enter a market ripe for private sector power generation initiatives by funding relevant studies and seminars. This private sector initiative has identified two coal-fired projects that may go forward with creative U.S. financing assistance.
- Major Philippine coal mine investments have been delayed pending a resurgence in world coal prices. Consequently, opportunities appear concentrated in imported coal plants and isolated domestic coal utilization schemes.
- ADB has processed five power sector loans for Thailand, totalling \$407.8 million. EGAT is a financially secure and well-managed electric utility and lignite mine operator. IBRD has negotiated one power sector loan in 1988 for Bang Pakong and is currently preparing a second power sector loan for Mae Moh units 10 and 11. The second loan will include a coal development component. The opportunities for U.S. goods and services related to lignite power production are abundant in Thailand.
- Since 1982, Thailand has received only one coal sector loan. The \$59.1 million IBRD loan in 1984 specified in its covenants that EGAT had to mount an aggressive coal exploration program. Subsequently, EGAT made major lignite discoveries at Saba Yoi and Sin Pun. At present, IBRD does not use coal sector loan vehicles in Thailand, and will continue that policy for the foreseeable future.

- Bilateral agencies have filled the void in coal development, offering numerous grants and low-cost loans to identify the Thai resource base. TDP has made two grants for coal exploration studies in the south, two grants to evaluate coal infrastructure at Mae Moh and Ao Phai, and two studies of coal preparation and fluidized bed combustion opportunities. The \$2.5 million invested by TDP should reap adequate returns if U.S. equipment and services can be earmarked for these new projects. The link between prefeasibility and specifications preparation to procurement and installation is often weakened by more financially-attractive offers from foreign competitors.
- Regional technical assistance in the form of symposia, seminars, workshops, and sector studies have continued throughout this timeframe. ASEAN cooperative efforts have included AID and ADB for a number of information exchanges. Awareness of potential environmental impacts and private sector power generation options has been the key focus. These training and institution-building exercises must continue, and possibly expanded as U.S. agencies and industry become more active participants in the region. This provides an excellent forum for providing relevant information on environmental issues, clean coal technologies, and U.S. equipment and services, to developing countries.

The participation of U.S. bilateral agencies and industry in the energy development of Indonesia, Philippines, and Thailand is still evolving. The experience gained since 1982 may assist in resolving policy issues and formulating appropriate strategies and collaborative efforts beyond 1988.

D. PROJECT OPPORTUNITIES

The review of technical assistance, loans, and grants by multilateral and U.S. bilateral agencies and involvement of U.S. private sector provides a list of projects for potential U.S. participation. The Consultant assessed the potential for implementation and immediate U.S. exports for each project. This effort was not sufficiently comprehensive to ensure that the project opportunities identified do, in fact, have a 100% chance of implementation or that other potential projects not identified in this study are not equally attractive opportunities.

The projects for potential U.S. participation were identified only if they fulfilled a number of requirements, including (i) host government and public agency support, (ii) inclusion in the country's least-cost expansion plans, (iii) available/potential financing (untied foreign or tied U.S. funds), (iv)

considerable U.S. industry interest, (v) strong U.S. competitive position, (vi) involvement of coal blending, possibly with U.S. coal exports, and (vii) the potential for installation of new systems or conversion of existing units to clean coal technologies.

Twelve projects fulfilled most of the above requirements. They are described in terms of their size (installed MW or million tons/year), current status, estimated capital cost, and export sales on Table 7. Current status is a key factor; the 12 projects are primarily in the initial stages of definition and proposal. Five projects in the definition stage share strong World Bank support, and in selected cases, a willingness, in principle, by TDP to fund prefeasibility and environmental impact studies. Three projects in the proposal stage have been initiated by private industry, which has discussed its plans with industry and government representatives both through direct discussions and at seminars organized by AID. Three procurement projects offer immediate opportunities for sale of U.S. equipment. Vendors actively following these prospects may need U.S. government assistance to improve financing packages or to offer development assistance for training. One project, Puspitek LSDE lab, offers immediate opportunity for DOE involvement given the R&D nature of this project and DOE's strong emphasis and capabilities in this area. Puspitek LSDE laboratory, constructed with AID funding, will have circulating and bubbling fluidized bed pilot units in addition to its extensive institution-building and technology transfer components.

The 12 projects are distributed among country and status as follows:

	<u>Indonesia</u>	<u>Philippines</u>	<u>Thailand</u>	<u>TOTAL</u>
Definition	1	1	3	5
Proposal	---	2	1	3
Procurement	1	1	1	3
Reevaluation	1	---	---	1
TOTAL	<u>3</u>	<u>4</u>	<u>5</u>	<u>12</u>

Figure 1 provides a map of the region with the location of the 12 projects.

TABLE 7: SUMMARY OF PROJECTS WITH IMMEDIATE U.S. EXPORT PROSPECTS

COUNTRY	PROJECT	SIZE MW or Mmt/y ¹	CURRENT STATUS	ESTIMATED	ESTIMATED
				CAPITAL COST ² \$ MM	EXPORT SALES ² \$ MM
Indonesia	Suralaya 5 & 6 Domestic coal (Bukit Asam) fired units for PLN commissioning in mid-1990's; World Bank loan under preparation.	2 x 600 MW	Definition	900	495
Indonesia	Kallimantan Coal Distribution Rail-truck system for shipping coal from concessionaires on Kalimantan to cement plants in West Java; feasibility studies funded by ADB, AID and TDP; implementing in pieces.	2 Mmt/y	Procurement	150	60
Indonesia	Puspitek LSDE Lab Building in place for energy lab containing pilots and equipment for coal analysis and combustion studies including circulating and bubbling AFBC, and training.	Bench Scale	Reevaluation	7	7
Philippines	Coal Logistic Facility Half-finished PNOC-CC facility for blending imported and domestic coal for distribution to small users in Manila; World Bank evaluating completion costs (\$20 MM invested).	N/A	Definition	TBD ³	TBD
Philippines	Hopewell/Calaca 3 Imported coal fired 300 MW power plant for NPC commissioning 1998 or accept Hopewell proposal to build 750 MW plant on build-own-operate basis.	300/750 MW	Proposal	225/560	123/308
Philippines	Cogentrix BOT Private power project fired by domestic and imported coal for Caltex refinery; five partners seeking financial advice and studies.	110 MW	Proposal	150	82
Philippines	Calaca 2 Untied OECF credit for equipment for power plant fueled by Semirara and imported coal; NPC commissioning in 1992.	300 MW	Procurement	225	123
Thailand	Mae Moh 12 - 19 Siting Captive lignite-fired EGAT power plants away from units 1-11 and mines where environmental impacts are less and water is available; World Bank loan under preparation.	8 x 300 MW	Definition	2,400	1,320
Thailand	Mae Moh AFBC TDP funded definitional mission of coal cleaning and AFBC; feasibility funds set aside; possible component of a World Bank loan under preparation.	60 MW	Definition	60	33
Thailand	Mae Moh Conveyor Lignite handling system; feasibility funded by TDP; EGAT International; competitive bid to replace and integrate existing German technology.	N/A	Procurement	35	20
Thailand	Sin Pun-Krabi AFBC Replacement of 3 x 20 MW lignite units at Krabi; AFBC feasibility funded by TDP; nearby Sin Pun mine also AFBC candidate.	75 MW	Proposal	75	40
Thailand	Saba Yoi Mine Development Recent discovery due to World Bank exploration covenants; full reserves unknown; EGAT production to begin 1996.	14 Mmt/y	Definition	TBD	TBD
TOTAL				4,227 - 4,562	2,303 - 2,488

NOTES: 1 Megawatt rating or Million tons per year.

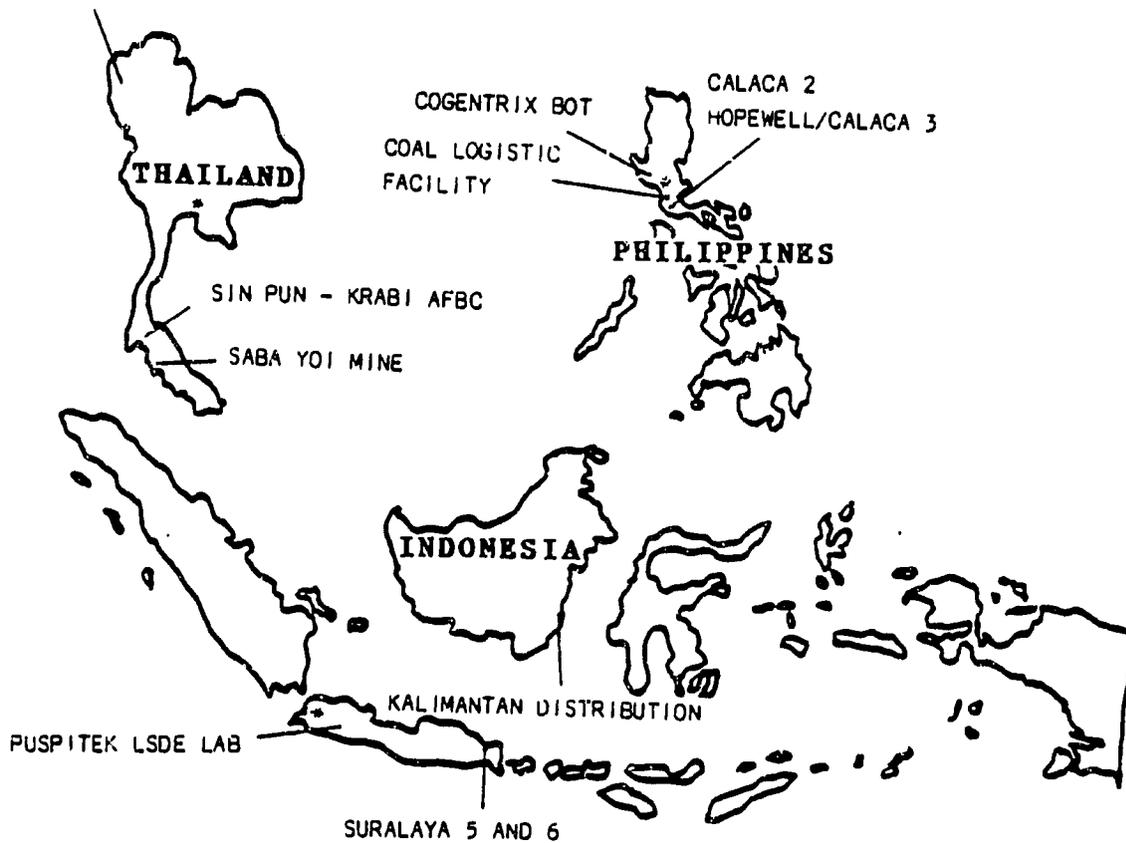
2 Order of magnitude costs based on reference plants do not reflect the actual costs of the facilities in question.

3 To Be Determined.

SOURCES: Tables 5 and 6, and Consultant's estimates.

**FIGURE 1: MAP OF INDONESIA, PHILIPPINES AND THAILAND
INDICATING LOCATION OF PROJECT OPPORTUNITIES**

MAE MOH 12-19
MAE MOH AFBC
MAE MOH CONVEYOR



* Indicates Capitals: Jakarta (Indonesia), Manila (Philippines) and Bangkok (Thailand)

There seems to be general consensus that Thailand would be the first country to consider installation of a clean coal project, given the strong IBRD and TDP support and EGAT's financial position and willingness. However, other coal-related projects could be undertaken in the Philippines or Indonesia prior to the new coal technology project in Thailand. This depends on further investigation of the 12 projects identified and their overall merits, a necessary study that could not be accomplished during this exercise.

Ten of the 12 projects are estimated to cost \$4.2 - 4.6 billion, with the potential export component estimated at \$2.3 - 2.5 billion, using standard industry reference plant costs and foreign exchange-local currency splits. These estimates are indicative and further study and direct dialogue with all concerned parties are essential to refine the capital costs and U.S. prospects for capturing potential exports. This preliminary analysis offers an estimate for the export potential of U.S. goods and services sufficiently large to warrant a coordinated U.S. public sector initiative.

IV. POTENTIAL FOR U.S. PARTICIPATION

A. OVERVIEW

The discussions in Section III concluded with a description of 12 current projects which are candidates for U.S. participation. Before discussing the possible specific options for U.S. participation in some of these projects, it is important to gain an understanding of the context within which the U.S. public and private sectors must define their initiatives.

A number of technological, financial, policy, and institutional barriers to investments in new projects continue to exist in most developing countries. The three countries selected here are by no means an exception. An understanding of these barriers to investments in coal-related projects is crucial before defining options for U.S. participation.

The technological barriers emanate from (i) the applicability of U.S. technology to the country's resources and infrastructure, (ii) cost, and (iii) related training and manpower development requirements resulting in further costs. In some cases, U.S. coal technologies are not directly suitable for utilization of locally-produced coal. This may provide opportunities for the export of U.S. coal and coal technologies as a package, or coal preparation and combustion technologies as a packaged environmental solution for use of locally-produced coal.

Because of the competing requirements of other sectoral projects for limited foreign exchange and because of ceilings on foreign borrowings, the three countries face financial constraints to invest even in attractive projects. Additionally, a lack of creative co-financing, unfavorable terms of commercial banks and supplier credits, and underdeveloped local capital markets impose further constraints on new investments. At first glance, these constraints may make privately financed BOT projects more attractive to the governments. However,

such projects must be evaluated in the context of the government's overall economic development plans where government policies may make a particular BOT project unattractive.

The policies on life-line rates, tariffs, subsidies, and incentives for export-oriented industries, quite prevalent in the three countries, pose difficulties for private sector projects where return on investment is the sole criterion. All three countries are reluctant to revise power tariffs, particularly in the case of Indonesia where both the IBRD and ADB until recently had suspended processing of new power projects unless the tariffs were restructured.

In addition to the above, a number of institutional factors continue to impact the entry of private financiers into projects traditionally in the public domain as is the case with power generation. PLN, NPC and EGAT continue their virtual monopoly and are, in general, reluctant to open the power sector to wholly private investment and control. A number of creative schemes involving leasing, ownership/operation arrangements, and joint public/private sector are being contemplated by the governments, local private industry, and foreign companies.

Furthermore, aggressive bilateral assistance, such as attractive financing terms available from the Overseas Economic Cooperation Fund (OECF) of Japan, also offers both a constraint and an opportunity for the U.S. public sector to reevaluate its focus and strategy.

B. PROJECT SPECIFIC CONSIDERATIONS

A total of 12 specific projects with a potential for an immediate U.S. role were described in Section III.D. Given the status of these projects, the potential barriers discussed in Section IV.A, the competitiveness of U.S. technology, and the strong interest of the U.S. industry, the U.S. bilateral agencies (DOE, AID, and TDP) can play a significant role in assisting U.S. industry in furthering its objective of increased coal and coal technology exports.

Table 8 summarizes immediate actions for U.S. bilateral involvement in the 12 projects identified in the three countries selected for this study. The last column of Table 8 provides a summary of specific activities that U.S. government agencies may want to consider as the next step in their coordinated public sector initiative to promote coal and coal technology exports in Indonesia, Philippines, and Thailand.

TABLE 8: OPPORTUNITIES FOR IMMEDIATE U.S. BILATERAL INVOLVEMENT IN COAL-RELATED PROJECTS IN INDONESIA, PHILIPPINES AND THAILAND

<u>COUNTRY</u>	<u>PROJECT</u>	<u>CURRENT STATUS</u>	<u>POTENTIAL ACTIONS</u>
Indonesia	Suralaya 5 & 6 (2 x 600 MW)	Definition	<ul style="list-style-type: none"> ● Meet with IBRD, ADB and PLN officials to define the timeframe, resources and technologies applicable. ● Investigate U.S.-Australia-China coal competition and pricing in the Pacific Basin and consider some creative responses. ● Conduct a quick review of the types and sources of equipment procured in the past by PLN to draw implications for sales of U.S. equipment.
Philippines	Coal Logistic Facility	Definition	<ul style="list-style-type: none"> ● Meet with IBRD officials upon their return from December '88 mission. ● Study financial records of the facility, including covenants of \$20 million loan to PNOC-CC. ● Investigate potential for U.S. equipment, service and resource exports for this facility vis a vis foreign competition.
Thailand	Mae Moh 12-19 Units (8 x 300 MW)	Definition	<ul style="list-style-type: none"> ● Obtain a copy of the environmental impact study and review it. ● Meet with EGAT and IBRD officials to scope out potential U.S. bilateral aid. ● Meet with IBRD Environmental Department to identify potential U.S. role and precedents for this type of entre.
Thailand	Mae Moh AFBC (60 MW)	Definition	<ul style="list-style-type: none"> ● Meet with EGAT officials to assess Thai government's position, study parameters, site selection, financing available, etc. ● Consider a study to identify each equipment component manufactured wholly in the U.S., and mechanisms to promote U.S. exports for this and other projects, prior to a feasibility study.
Thailand	Saba Yoi Mine Development	Definition	<ul style="list-style-type: none"> ● Meet with EGAT and IBRD officials to identify appropriate forms of U.S. involvement - drilling, feasibility, financing, mine development, production, etc. ● Consider a study of mine reclamation with special attention to rubber plantations. ● Discuss with appropriate officials the possibility that better mining economics may permit investments in newer technologies at Saba Yoi, and level of financial aid needed to guarantee this.
Thailand	Sin Pun-Krabi AFBC (75 MW)	Proposal	<ul style="list-style-type: none"> ● Review Burns and Roe feasibility study and evaluate potential for project in light of Saba Yoi development. ● Obtain data on Sin Pun mine development, local population projections, and sector development plans to evaluate future electric demand. ● Assess applicability of the Krabi project for Sin Pun.

TABLE 8: OPPORTUNITIES FOR IMMEDIATE U.S. BILATERAL INVOLVEMENT IN COAL-RELATED PROJECTS IN INDONESIA, PHILIPPINES AND THAILAND -- Concluded

<u>COUNTRY</u>	<u>PROJECT</u>	<u>CURRENT STATUS</u>	<u>POTENTIAL ACTIONS</u>
Philippines	Hopewell/Calaca 3 (300/750 MW)	Proposal	<ul style="list-style-type: none"> ● Meet with NPC and Hopewell officials to identify all the issues and barriers to a BOT project for the national utility, and possible U.S. export components. ● Discuss possible solutions with ADB, IBRD, and other interested financial backers. ● Consider study of reducing barriers to Semirara coal development after 1990 to assist in providing adequate coal supplies for new power plant.
Philippines	Cogentrix BOT (110 MW)	Proposal	<ul style="list-style-type: none"> ● Develop a coordinated strategy among U.S. bilateral agencies, IBRD, ADB and possibly other investors to assist in alleviating barriers to this project. ● Use the experience of this project and other related seminars, etc. to develop a strategy for U.S. public sector support for privately-initiated projects.
Indonesia	Kallimantan Coal Distribution (2MMt/y)	Procurement	<ul style="list-style-type: none"> ● Meet with PTB, ADB, IBRD and Australian officials to determine when which selected components will go out to bid and possible U.S. participation. ● Identify components manufactured in U.S. and meet with U.S. industry to solicit their interest.
Philippines	Calaca 2 (300 MW)	Procurement	<ul style="list-style-type: none"> ● Meet with OECF, IBRD and NPC officials to identify covenants of Japanese funding and key project procurements. ● Meet with U.S. industry to initiate a dialogue on creative U.S. aid to enhance U.S. competitiveness and collaboration with foreign bilaterals.
Thailand	Mae Moh Conveyor	Procurement	<ul style="list-style-type: none"> ● Meet with EGAT, IBRD and U.S. industry to gauge most appropriate U.S. response. ● Discuss creative financing arrangements and possible installation/training assistance with U.S. banks and bilateral lenders.
Indonesia	Puspitek LSDE Lab	Reevaluation	<ul style="list-style-type: none"> ● Arrange DOE-AID-TDP meeting with Battelle and BPPT to review progress and define new direction to revitalize this project. ● Identify U.S. lab, R&D and technology experience directly applicable to Puspitek. ● Solicit U.S. industry and banking community support to continue the project.

ANNEX 1

LIST OF CONTACTS
(10/24 - 11/23/88)

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ANNEX 2 -- Concluded

REGIONAL -- Concluded

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