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Summary Report

ENERGY SITUATION
AND
AID PROGRAMS IN ASIA

Bureau for Asia
Office of Technical Resources
Scientific, Technical, and Environmental Problems Division (STEP)

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Asia Regional

Background

Regional energy cooperation in Asia is still in its nascent stages. ESCAP's Committee for the Coordination of Offshore Prospecting has been active since the 1960's in developing data on offshore petroleum resources. ASEAN has established a Committee on Petroleum (ASCOPE) which is collecting information on the petroleum sector and attempting to develop uniform approaches to trade and investment issues. An ASEAN non-conventional energy sub-committee has also been established under the Science and Technology Committee. This sub-committee, which is chaired by Dr. Sanga of the National Research Council in Thailand, will have its first meeting in September. The plans are to develop a proposal for submission to the United States, possibly asking for support of an ASEAN Solar Energy Center. The Resource Systems Institute of The East-West Center has taken the lead role in establishing an Asia-Pacific Energy Studies Consortium, which is examining a wide variety of social and technical issues related to both large-scale and small-scale energy technologies.

AID Program

At the August 1978 ASEAN-U.S. Ministerial Meeting in Washington, it was agreed that consultations would be held in energy areas of mutual interest. As a first step in this process, the U.S. has proposed the visit of ASEAN energy officials to the United States. AID would fund the trip of two energy experts or officials from each of the ASEAN countries to view U.S. research and applications projects and to hold a round of consultations in Washington on specific areas for long-term cooperation. This proposal is expected to be approved by the ASEAN S&T Committee on September 1.

AID is providing \$500,000 million over two years to the Resource Systems Institute in support of their project on Energy and Rural Development. A planning workshop was held in May 1979 at which preliminary research proposals were developed in the following areas:

- (1) Development of Rural Energy Demand-Supply Data Base
- (2) Introduction of Appropriate Rural Energy Mixes with Emphasis on Renewable Resources
- (3) Viability Assessment of Rural Energy Strategies
- (4) Factors Affecting Energy and Rural Development Policy Formulation and Responses.

Countries that participated in the workshop were Bangladesh, India, Indonesia, Philippines, Sri Lanka, and Thailand.

<u>Renewable and General Energy (cont'd.)</u>		<u>FY 78</u>	<u>FY 79</u>	<u>FY 80</u>	<u>FY 81</u> (Current)
Sri Lanka:	Reforestation	---	---	1,000	750
Regional:	Rural Energy Flows-EWC	---	500	700	2,000
	ASEAN Consultations	---	---	50	---
Sub-Total		13,502	10,975	11,008	6,760
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2. <u>Conventional Rural Electrification</u> (Obligations)		<u>FY 78</u>	<u>FY 79</u>	<u>FY 80</u>	<u>FY 81 & Future</u>
Indonesia:	I	(G) 3,000 (L) 30,000	3,000 ---	--- ---	--- ---
	II	(G) --- (L) ---	--- ---	3,500 7,500	3,500 22,500
Philippines:	V	(L) 8,400	---	---	---
Bangladesh:	Rural Electrification	(G) 21,000	13,000	---	16,000
India:		(L) ---	58,000	---	---
Pakistan:		(G) --- (L) ---	[1,000* 14,000*]	[--- 10,000*]	--- ---
Regional:	Training	(G) 250	---	---	---
Sub-Total		62,650	74,000	11,000	42,000
Total Energy		\$76,152	84,975	22,008	48,760

*Planned but not authorized

Bangladesh

Background

Petroleum consumption in Bangladesh is extremely low -- between 26-28,000 barrels per day. Most of Bangladesh's 85 million people depend on traditional energy sources. There is no domestic crude oil production; and despite their small volume, crude oil and product imports of over \$150 million in 1977/78 represented a third of Bangladesh's export revenues. With the OPEC price increases of 30-40% in 1979, the additional costs will worsen the large trade deficit of \$800 million in 1977/78.

Bangladesh, however, has significant proven gas reserves -- about 9.36 trillion cubic feet, which can help reduce dependence on imported oil and provide a cheap feedstock for the fertilizer industry. West Germany, India, Indonesia, and the Netherlands have all concluded hydrocarbon cooperation deals. Petrobangla, the state oil corporation, plans to drill 35 exploration wells over the next seven years, largely with West German technical assistance. Union Oil discovered gas in offshore drilling during 1978; but relinquished the area in September. No foreign companies are currently operating in Bangladesh.

A comprehensive energy study was conducted during 1976-77 by the Asian Development Bank - UNDP. It recommended a \$930 million energy development scheme, including \$203 million on power projects; \$73 million to develop the Bakhrabad gas fields, with a pipeline to Chittagong; \$10 million to improve the 30,000 b/d Chittagong refinery; and \$638 million for three urea plants.

AID Program

AID is presently concluding a \$50 million, three-year, rural electrification project in Bangladesh, involving the construction of 4,000 miles of 11KV distribution line and 24 substations, to be owned and operated by 12 local cooperative-type organizations. Funding for a \$9.5 million hydro unit at Karnaphuli began in FY 78.

The mission is in the early stages of developing an alternative energy project for FY 81 of \$2.2 million. The project would aim at developing an institutional framework for energy planning and coordination among the various organizations involved in energy research and development. The mechanism would have as its main functions the following: 1) energy accounting (i.e., assessing sector-wide and area-wide requirements of different forms of energy and planning ways of meeting them.); 2) ensuring efficient energy use and conservation; 3) diversifying sources and utilizing cheaper alternative energy forms when possible; 4) R & D efforts -- including alternative energy pilot projects; 5) assisting in formulation of energy policy.

India

Background

India is one of the leading oil importers among the developing countries. Oil imports account for roughly half of India's 500,000 b/d demand. India was seriously affected by the Iranian situation, since it received 40% of its crude from Iran. Before the June OPEC price increases, India's crude and products import bill was expected to reach \$2.52 billion in 1979, up from \$1.8 billion in 1977/78 when it represented 28% of total imports. Domestic oil production has increased with the development of the Bombay High Zone, which is producing about 100,000 barrels per day. Plans to increase production to 160,000 barrels per day were upset by technical reservoir problems. The Oil and Natural Gas Commission has had little apparent success in finding offshore oil deposits in areas other than the Bombay High. The government is, therefore, examining its current policy of not entering into production-sharing arrangements with foreign companies.

India's Five-Year Plan calls for the addition of 18,500MW of generating capacity by 1982-83 (13,000 thermal, 4,550 hydro, and 925 nuclear), bringing the total to 44,500MW. To fuel the thermal plants, India plans to increase annual coal production by 50% from the current 100 million tons during the sixth plan. India is the leading coal producer in the developing world, with reserves of over 100 billion tons. Much of it, however, is low-quality, non-coking coal; and India is currently seeking coking coal imports from Australia and Canada.

Both the coal development and nuclear development programs are behind schedule. Five heavy water nuclear reactor projects are planned or underway. The U.S. may be forced to stop enriched uranium shipments to India for the Tarapur reactor if the Indian Government does not accept the full-scope safeguards required by the Nuclear Non-Proliferation Act of 1978.

A sizeable effort is underway in India to develop renewable energy technologies for rural use. It is estimated that India now has 50,000 family-size biogas devices with a combined annual output of 450 million cubic ft of methane gas. Under the sixth Five-Year Plan, the central government intends to increase the number to 200,000. Research on solar thermal and solar electric technologies is also well advanced. The Government estimates that between 1982 and 1989 it will be possible to install 100-watt photovoltaic solar cell panels in one million households each year for lighting and simple domestic appliances, at a cost of \$125 each. It is estimated that the alternative cost of laying transmission-distribution lines alone for electrical connections to all the 100 million rural households in Indian villages would be \$25 billion.

AID Program

The AID Program in India involves both conventional rural electrification and applications-oriented projects in renewable energy technologies for rural use.

A five-year, \$58 million rural electrification project was recently concluded that consists of 165 sub-projects/schemes to be implemented by the Rural Electrification Corporation of the Government of India. The purpose is to stimulate agricultural and small-scale industrial development in low-income areas.

A \$2 million grant was made to India in FY 78 for projects aimed at Technology for the Rural Poor. Approximately two-thirds of that amount focuses on alternative energy sources for rural areas. Several collaborative solar technology projects have been identified and final approval is pending from the Department of Science and Technology. The projects include 1) the construction of prototype solar dryers; 2) the development and demonstration of medium-temperature, high-efficiency non-tracking solar energy collectors; 3) the study and demonstration of a range of solar technologies to supply energy needs to villages. Additional funding of \$2,400,000 is planned for similar projects in FY 80.

Indonesia

Background

Indonesia is a net oil exporter, with production of about 1.6 million barrels per day and exports of about 1.2 million barrels per day of crude oil. U.S. direct crude imports from Indonesia average 548 thousand barrels per day in 1978, or about 8.3% of total U.S. crude oil imports.

Oil export revenues have grown dramatically from \$204 million in 1971/72 to over \$4,200 million in 1978/79 and account for 60% of government revenues. Revenues are estimated to reach \$5280 million in 1979/80 with the recent price increases. Despite this trend, production and exports are slowly declining. Major new increases in production are considered unlikely. The recent Embassy Petroleum Report (Jakarta A-48) states "...under the best of circumstances, Indonesia has entered a period where crude production and exports are almost certain to decline, at least for a while, and increases in government earnings from oil can only be realized through higher prices."

Domestic petroleum consumption of 300,000 barrels per day, which is highly subsidized by the government, is growing at 10-13% a year. The government raised domestic retail prices in April and May in an effort to reduce the subsidy and slow the rate of consumption. Over a third of Indonesia's domestic oil needs are imported from the Middle East.

Repeleta II charts a policy to intensify oil and gas exploration and production, promote energy conservation, and to develop non-oil sources of energy for domestic use. Increased use of coal, natural gas, and hydro power are expected to reduce dependence on oil in the commercial energy sector from 84% in 1979 to 79.7% in 1984. The role of energy in promoting rural development is receiving increased attention. Some estimates place non-commercial energy consumption at 52% of total use in Indonesia. Approximately 80% of Indonesia's 136 million people live in the rural areas, and kerosene and electricity use in these areas is very limited. Geothermal, biomass, and solar energy offer significant potential for providing energy to remote rural areas, and the GOI is beginning to take a serious interest in these technologies.

AID Program

AID energy-related activities in Indonesia include:

- (1) A \$47 million rural electrification program involving the construction of ten separate rural electric distribution systems on Java and three outer islands.
- (2) A small \$125,000 pyrolytic conversion project with the Institute of Technology at Bandung under an Appropriate Technology grant.

- (3) An \$800,000 alternative energy subproject of the Science and Technology loan/grant, which is still undefined at the moment.

It is expected that a \$600,000 energy planning activity will be agreed to in FY 79 with the Indonesian Ministry of Mines and Energy. These funds will support (a) studies on energy demand and applicable technologies; (b) pilot surveys of kerosene and firewood use; (c) short-term training in energy planning; and (e) the development of an energy information system. The money for the project is being transferred from DSB's 106 account.

Nepal

Background

Nepal's consumption of petroleum is only a couple thousand barrels per day, which is imported from India. In 1977, the share of petroleum imports in total imports was only 12%. Over 20% of the total commercial energy consumption comes from hydroelectric power.- Several new hydro projects are underway--the 60 mw Kulekhani plant, the 14 mw Devighat project, and the 10 mw Seti hydroelectric plant.

Firewood is the main energy source in the mountain villages, and it is becoming more scarce and expensive. The problems of deforestation in Nepal are well-known, but the search for alternative fuel sources is still in the early stages. Government capabilities to deal with the problem are extremely limited. Mini-hydro plants of less than 100 kw are being examined. ESCAP is holding a conference on mini-hydro in Nepal in August.

AID Program

AID and the Peace Corps have worked over the past three years on training Nepalese in the construction and use of biogas plants. A \$75,000 project is planned in this area for FY 80. In addition, a renewable energy component of \$1,650,000 is planned as part of a larger FY 80 project on Resource Conservation and Utilization. A \$720,000 biomass/fuelwood component is also included for FY 80 in a Rural Energy Area Development Project. Communications applications of photovoltaic panels are being undertaken as part of a Radio Education project.

Pakistan

Background

Increasing oil import costs are having a crippling effect on Pakistan's already shaky economy. The cost of over \$450 million in 1978 was equivalent to about 31% of export receipts. Estimates for the 1978/79 financial year place the balance of payments deficit at \$1.86 billion.

Pakistan imports about 90% of its domestic petroleum requirement of 1000,000 barrels per day. Efforts are being made to increase domestic petroleum production and the prospects for domestic self-sufficiency within the next decade appears good. Gulf, Amoco, Occidental and Murphy have signed exploration joint ventures with the government. The World Bank has sought to provide some stability to the investment climate by agreeing to consider financing 20% of development costs if oil is found in the Gulf Oil joint venture. The World Bank, U.K. and Canada have lent \$30 million, \$15 million respectively for on-shore oil field development.

Natural gas is a major source of commercial energy in Pakistan meeting about 37% of total demand. It is used primarily for electricity generation (33%), industry (45%), fertilizer manufacturing (17%), and domestic purposes (5%). The Five Year Plan calls for an increase of 52% in natural gas production and use.

Work is proceeding on repairing the Tarbela Dam, which if it is ever completed, would provide substantial addition to electric power capacity.

Research programs at Pakistan's universities and scientific institutes are examining the potential of solar and mini-hydro systems for use in villages but the efforts are severely under-funded.

The Pakistan nuclear program was set-back, when France, under pressure from the United States, halted work on a nuclear fuel reprocessing plant. Pakistan has, however, stated its intentions to develop an atomic bomb and the U.S. has suspended its development aid as a result.

AID Program

Before its suspension of development aid, AID was initiating a \$25,000,000 FY 78 rural electrification project. The mission has also proposed a \$500,000 non-conventional energy project for FY 80.

Philippines

Background

The Philippines began domestic petroleum production in 1979 from the NIDO offshore complex near Palawan. If the projected production of 10 million barrels is obtained, local production will represent 12% of estimated petroleum demand in 1979. Oil imports of about 200,000 barrels per day will still account for over 80% of total domestic commercial energy supply. With the OPEC price increases in 1979, the oil import bill in 1979 will rise to over \$1.4 billion compared to \$1,057 billion in 1978--when it constituted 23.3% of the Philippines total import bill. This jump will aggravate the already serious inflationary situation in the country.

The Philippine Government's new 10-year energy program seeks to reduce the share of imported oil from 80% to 44% of total commercial energy consumption by 1988. Total commercial energy demand is projected to more than double from 1979 to 1988, from 93.2 million barrels of oil equivalent. Coal will increase from 2% to 10% of total energy while hydro will supply 12%. Geothermal energy will expand its contribution to energy supplies over the next ten years from the current 305 mw to a cumulative installed generating capacity of 891 mw in 1988, or about 5% of total estimated demand.

The government is beginning to take non-conventional energy sources more seriously. President Marcos recently mandated a major gasohol program. One report suggests that the Philippines would meet 15% of the country's fuel requirements from alcohol distilleries and a Philippine team of experts recently visited Brazil. Solar, mini-hydro, biogas, and wind technologies are also being pursued as ways of supplying energy for decentralized uses in the rural areas.

AID Program

AID has for many years conducted a substantial rural electrification program in the Philippines. Project authorizations in this area totaled \$89,818 million through FY 79. The most recent was a FY 78 loan of \$8.4 million to finance imports of electrical distribution equipment and materials and the construction of over 4,000 km of primary line and secondary distribution systems.

In May 1978, a project agreement was signed with the Philippines for a \$7.1 million loan and \$1.55 million grant to the Philippines Government for a project of analysis, training, and technology demonstration in non-conventional energy. Approximately, \$4 million of this amount will be allocated to the construction of a wood-fired power plant using the ipil-ipil species and the building of a rice-husk fueled power plant. Also planned are solar drying units for grain and lumber, a solar-powered ice plant for a fishing village, several small wind-machine demonstrations, and mini-hydro installations, and an integrated village energy system. The Philippine Government has indicated a

preliminary interest in including geothermal energy as one area for funding under the security supporting assistance program.

Sri Lanka

Background

Sri Lanka produces no crude oil or natural gas. Oil imports of 30-35,000 barrels per day account for about 90% of commercial energy consumption. In 1976, this represented 25% of total import costs, but this percentage is probably higher at present due to the world price increase. Sri Lanka was, like India, seriously affected by the Iranian cut off and will reportedly shift to buying petroleum products from China.

The government has taken a low-key approach toward oil exploration. Eleven offshore exploration areas are open, but little activity or foreign interest is evident. During 1979, Norway provided exports to help process available data concerning onshore and offshore prospects. Sri Lanka has previously received technical assistance from the Soviet company Techno-exports in seismic surveys and test drilling.

The major energy emphasis of the government is on developing its hydroelectric power resources. The Maduru Oja project, the Victoria project, the Randenigala project, and the Kotmale project all involve a hydroelectric power component. A U.K. firm has recently been awarded a contract to design and supervise the construction of the 200Mw, \$400 million hydro project at Kotmale.

The Government has appointed a committee to study alternative energy sources, including the feasibility of nuclear power. The Sri Lanka National Water Resources Board already has a cooperative project with the Netherlands to produce a windmill for water-pumping. The WEDP expects to install 15 windmills in different parts of Sri Lanka. The UNEP has funded a solar village in Pattiyaapola, which includes a biogas plant, solar photovoltaics, and windmills.

AID Program

AID is in the early stages of planning a wood plantation subproject of a proposed \$2,000,000 FY 80 project for Reforestation and Watershed Management, that is connected with the large Mahaweli irrigation and rural development scheme.

Thailand

Background

Thailand is totally dependent on imported oil for its petroleum supply. Domestic petroleum consumption stands at about 190,000 barrels per day and represents about 85% of commercial energy consumption. An energy team from META Systems, Inc. recently estimated that petroleum supplied only 41% of total inanimate energy consumption in Thailand in 1977. Like the Philippines, the cost of oil imports represents a major drain on the economy. In 1978, they constituted about 25% of total imports. The National Economic and Social Development Board estimates that the oil import bill for FY 80 will increase to \$1.7 billion, compared with \$1.3 billion in FY 79.

Thailand has natural gas, lignite, and hydro resources. The gas discovered by Union Oil and Texas Pacific are being developed for use in on-shore power plants and industries beginning in 1981. An official of the National Energy Administration projects natural gas use in 1985 at 18% of total commercial energy consumption. The Asian Development Bank is assisting Thailand in the development of its lignite resources. Lignite's share of the total energy supply is expected to increase from 3.75% in 1978 to 11.8% in 1985. It is assumed that hydroelectric power will almost triple between now and 1985.

The Thai Government is pushing ahead to develop solar energy resources. Thailand has established an Alcogas Committee, and a feasibility study by a foreign private company is planned. Mini-hydro, solar, and wind technologies are being tested by the NEA in conjunction with local universities. The Electric Generating Authority of Thailand is also beginning a program in solar thermal and wind electric technologies.

AID Program

A \$5 million project in renewable and non-commercial energy is now in the final stages of approval by both governments. The project will support Thai efforts to assess geothermal, oil shale, and tar sand resources, to establish energy information and extension services, to demonstrate mini-hydro, biomass, and solar drying and process heat technologies, and to investigate the feasibility of village woodlots. The project will be the responsibility of the National Energy Administration of the new Ministry of Science, Technology, and Energy.

Asia Bureau

Summary of Program in Energy
(\$ thousands)

<u>1. Renewable and General Energy</u>		<u>FY 78</u>	<u>FY 79</u>	<u>FY 80</u>	<u>FY 81</u> (Current)
Thailand:	Renewable Non-Conventional Energy	---	2,500 (G)	2,500 (G)	---
Philippines:	Non-Conventional Energy Development	1,550 (G) 7,100 (L)	---	---	---
India:	Technology for the Rural Poor	1,330 (G)	---	2,400 (G)	---
Bangladesh:	Rural Alternative Energy	---	---	---	2,200
	Karnaphuli Hydro	2,500	7,000	---	---
	Flood & Cyclone (P/V)	---	---	500	---
Indonesia:	Science & Technology	150	60	163	---
	Appropriate Technology	125	---	---	---
	Energy Planning for Development	---	600	---	---
	Energy Manpower and Training	---	---	1,000	---
Nepal:	Rural Area Development	---	---	720	460
	Radio Education - Teacher Training	97	315	---	---
	Bio-Gas Research	---	---	75	---
	Resource Conservation and Utilization	---	---	1,650	1,350
	RAD/RCU Design	650	---	---	---