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ASIA BUREAU
STATEMENT ON ENERGY

BUREAU FOR ASIA
PREPARED BY OFFICE OF TECHNICAL
RESOURCES, DIVISION OF SCIENTIFIC, TECHNICAL, AND
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SUMMARY

This statement, together with the Proceedings of the Asia Bureau Conference on Energy, Forestry, and Environment and the PPC Energy Policy Paper, is intended to provide a general framework for the development of energy programs and projects in the Asia Bureau.

The countries of Asia are faced with a dual energy crisis -- rising costs of imported oil and declining availability of firewood and traditional energy sources. Yet the expanded agricultural and industrial production necessary to meet the basic human needs of rapidly growing populations will require greatly increased supplies of both conventional and traditional energy. An urgent need therefore exists for the AID Asia countries, including the exporters (Indonesia and Burma) to expand their indigenous energy supplies and increase the efficiency of energy use.

The United States, at the Bonn, Tokyo and Venice Economic Summits and at the recent U. N. Special Session on Economic Development, has strongly supported increased multilateral and bilateral assistance for energy production in developing countries. The response of the World Bank to the energy crisis has been to program \$13 billion in energy lendings over FY 81-85 and to propose an expanded \$25 billion program that would be administered through a new energy affiliate.

Past AID programs in this area have focused on rural electricity distribution and renewable energy technologies. Recently, the Agency has moved toward a broader program of energy development that includes support for resource assessments and training in conventional energy, augmentation of fuelwood

SUMMARY (Continued)

supplies, and energy conservation and efficiency planning.

Consistent with this policy, the Asia Bureau is giving high priority to supporting the energy programs of Asian countries. Bureau resources are, of course, small in relationship to the problems of reducing oil imports and developing alternative sources of energy. Activities must therefore be structured to serve a catalytic role in this sector and to complement the major capital resources of the World Bank and the private sector.

Accordingly, the Asia Bureau and Missions endorse a Five-Year Energy Program (FY 82-86) aimed at the following basic objectives:

- To help overcome the energy constraints to rural development, with particular emphasis on increasing productivity in agriculture and rural industries.
- To help meet the basic energy needs of the poor for cooking and heating.

The program has five basic elements:

- (1) Technical assistance in energy planning;
- (2) Local and overseas training in energy technologies, resource and demand assessment techniques, and energy planning methodologies;
- (3) Technical and limited capital assistance in the demonstration of the technical, economic and social feasibility of solar, wind, biomass, and hydro technologies for rural or market-town use;
- (4) Technical and capital assistance in the broader application of proven renewable energy technologies (e.g., small hydro) in rural areas, recognizing funding limitations;
- (5) Technical and limited capital assistance in the development of community forestry and village woodlot projects that increase supplies of fuelwood to rural consumers and improve the efficiency of wood conversion and use.

The planning level for this program is \$50-75 million per year. To develop and

SUMMARY (Continued)

carry out this program, energy positions will be established as rapidly as possible in Asia missions with major programs. Missions should submit a statement of staffing needs in this area by the beginning of calendar year 1981.

The Asia Bureau looks to DS/EY, the Department of Energy and other public and private organizations for technical support of this program. DS/EY should continue to develop projects for responding to assistance requests in resource assessment and training in conventional energy.

Missions should begin to phase out capital-intensive rural electricity distribution programs and encourage the multilateral development banks to take these over where appropriate.

Finally, the Bureau should consider carefully the energy implications of all proposed projects. Missions should seek to include renewable energy technologies in non-energy projects where feasible. ASIA/TR/STEP will take the lead in a Bureau study of the energy implications of current and planned Asia Bureau projects in all sectors.

ASIA BUREAU STATEMENT ON ENERGY

I. Purpose

This statement, together with the Proceedings of the Asia Bureau Conference on Energy, Forestry, and Environment and the PPC Energy Policy Paper, is intended to provide a general framework for the development of energy programs and projects in the Asia Bureau. It attempts to reflect the comments of the missions on the Draft Asia Bureau Policy Statement on Energy of January, 1980, and the Draft PPC Policy Paper. In the future, the Office of Technical Resources, working with the missions, will prepare background papers that address in greater detail some of the issues raised by this statement and provide more specific guidance on project design.

This statement summarizes the global context of energy policy in Asia and the general nature and impact of the dual crisis in oil and traditional fuels on the AID-assistance countries of the region. The current energy assistance activities of AID and other donors are discussed and guidelines are presented for future Asia Bureau energy activities.

II. The Present and Future World Oil Market

Great uncertainty exists over the future of the world oil market. The current war between Iran and Iraq and the threat to world oil supplies from the Persian Gulf has once again highlighted the vulnerability of the international oil system to political and military disruptions. The future security of world oil supplies is clouded by the growing military capabilities of the Soviet Union in the region; the concentration of proven oil reserves in the Middle East (56.6% in 1979)¹; the unwillingness of major producers to expand production; and the extreme polarization over the Palestinian issue. In addition, a recent OPEC Secretariat report suggests the prospect that six

non-Middle East producers, i.e., Nigeria, Venezuela, Indonesia, Algeria, Gabon, and Ecuador, may need all their oil production for domestic consumption within the next twenty years.

Trends seem to suggest continued upward pressure on world oil prices. Of course, the decade of the 1970's saw dramatic jumps in the price of oil from under \$2 per barrel to around \$30 per barrel. (See appendix A.) Oil revenues of the OPEC countries in 1979 were estimated at \$200 billion.² The World Bank conservatively projects a 3 per cent per annum increase in the real price of oil between now and 1990. For the oil-importing developing countries, such an increase would mean at least a doubling of their oil bill from the current \$44 billion, assuming an increase in their oil import demand from 4.5 million barrels per day in 1980 to 6.4-7.6 million barrels per day in 1990.³ The ability of many developing countries to finance increased oil imports is questionable.

Significant structural changes are occurring in the world oil market as a result of the growing 'politicization' of the international oil trade. Whereas 90% of world oil exports in 1973 went to the major western oil companies under long-term contracts, one analyst estimates that only 42% of current exports go via this channel. The proliferation of government-to-government sales has led to a randomization of world oil trade and has reduced the flexibility of the system to meet temporary shortfalls. Jachen Mohnfeld also points out that the growing involvement of national oil companies has made downstream planning more difficult than the vertically integrated system since crude oil availability is more uncertain.⁴ The key question in a government-dominated world oil market is what political conditions will governments of the exporting countries place on their sales?

III. Oil Supply and Demand in Asia

With the exception of Burma, all the countries of South and Southeast Asia import

oil from the Middle East. Even the exporters, Malaysia and Indonesia, import high-sulphur, asphaltic crude from the Middle East and export low-sulphur paraffinic crude at premium prices to Japan and the United States. During 1979, the net oil importing AID Asia countries imported nearly 1 million barrels per day of oil at a cost of roughly \$7.7 billion.⁵ India, the Philippines, and Thailand accounted for about four-fifths of the total oil imports of the group. These three countries are among the top 10 oil-importing developing countries, together accounting for about 20% of total oil imports of the group of oil-importing developing countries.

The AID Asia countries produced approximately 1.83 million barrels per day of crude oil during the first half of 1980.⁶ Indonesia and Burma were net exporters of about 1.3 million barrels per day. While India, the Philippines, and Pakistan met about 40%, 15%, and 12% respectively of their oil needs from local production.

The role of oil imports in meeting commercial energy demand varies from country to country. In the Philippines, Thailand, Sri Lanka, and Nepal, they accounted for over 75%. Bangladesh and Pakistan, with their domestic gas production, were dependent on oil imports for between 25-50% of total commercial energy consumption. India was least dependent on oil imports (although it was the largest absolute oil importer), with only 8% of commercial energy supply coming from oil imports.⁷

Large uncertainties exist about the geological potential of the oil importing countries of Asia and this factor complicates policy debates. Geological data assessment studies conducted for the World Bank conclude that India, Thailand and the Philippines have 'very high' potential petroleum resources. Bangladesh has 'high' potential, Pakistan and Burma have 'fair' potential and Nepal and Sri Lanka have 'low' potential.⁸

Current projections from the CIA, Congressional Budget Office and others suggest that increases in crude oil production from this region will occur; but these additional supplies will barely offset increases in consumption, if we assume a growth of demand in the range of 5-6% per annum.⁹

IV. Traditional Energy Supply/Demand

The vast majority of the people of Asia continue to depend on wood, dung, and residues for the energy they need in cooking and heating. Understanding of the characteristics of traditional energy use in different parts of Asia is poor, as are aggregate statistics on non-commercial energy consumption. Existing studies indicate that a wide diversity of traditional sources are used in rural areas.¹⁰ Considerable variation exists, according to season and availability of crop residues. While household consumption tends to dominate overall use, rural industries also depend on firewood, charcoal and other traditional energy supplies. A recent survey of rural industries in Bangladesh revealed the widespread use of firewood in such industries as gur making, lungi, baking, pottery, bricks, and tiles.¹¹ Demand for firewood is not limited to rural areas. As much as 40% of India's estimated urban energy consumption, for instance, comes from fuelwood. Prices for wood and charcoal are rising rapidly alongside of those for kerosene and petroleum fuels. In Thailand, the price of charcoal recently doubled.

Although there may be a gradual decline in the relative importance of non-commercial energy in the future, population growth, especially among the lower income groups, will result in increasing pressures on rural biomass resources. The implications are noted by USAID/India: "Firewood consumption is contributing to deforestation and land degradation, and the use of dung and agricultural wastes as fuel is diverting large quantities of materials from such higher-value uses as fertilizer and compost."¹²

The inability of the poor in Asian countries to acquire needed traditional fuels is acute in some parts of India, Nepal, Pakistan, Bangladesh, and Indonesia, and is likely to become an even more widespread problem in the future.¹³ The World Bank's energy report includes all AID Asia countries as having current or potential fuelwood problems.¹⁴

V. Political and Economic Impact and Policy Response

The developing countries of Asia are therefore faced with a dual dilemma -- the convergence of the crises in oil cost/supply and in traditional fuels depletion. Valuable time and resources have been diverted in recent years to pay for more expensive oil and firewood as well as to collect firewood. Table D-I in the Appendix indicates the sharp increase in the share of both imports and exports accounted for by petroleum imports.

The result has been reduced capital imports and development expenditures, and increased foreign debt and inflation. Because of the heavy foreign borrowing and subsidized domestic pricing of key commodities, the impact on growth and productivity has, perhaps, not been as great as it might have been. The inflation in the prices of food and other basic commodities has, however, had a serious negative effect on the lower income groups. This impact is compounded by poor export performance in traditional rural products due to the recessionary impact of rising world oil prices on industrial countries. Spot shortages of oil products have seriously affected production in specific industries. For instance, a large part of the fishing fleet in Thailand was grounded due to shortages of diesel oil and irrigation pumps in India and the Philippines were also halted in 1979 due to unavailability of supplies.

Governments in the region have responded in various ways to the dual energy crisis. The following are central policy areas affecting energy supply and demand in which Asia countries are faced with important decisions.

Energy Price Regulation and Demand Management

Asian countries have in varying degrees passed on the increases in world oil prices to consumers. However, 'socialized' pricing policies have been pursued for fuels used by the poor (i.e., kerosene) and for rural electricity tariffs. In Indonesia, the oil subsidy has grown to an estimated \$1.4 billion in fiscal 1980/81.¹⁵ Subsidies

for kerosene and diesel oil have led to strong demand for these middle distillates. In Indonesia, Thailand, Sri Lanka, demand has outstripped refinery yields of middle distillates. Excess supplies of expensive products have had to be imported, further burdening foreign exchange. Refinery expansions are planned to deal with this situation.

Domestic price increases have resulted in political demonstrations against the government in Thailand, the Philippines, and Indonesia. The Philippines raised product prices twice in 1980, once in February and again in July. These actions stimulated protests by about 50 labor groups and 30 civic, religious, professional and student organizations.¹⁶ In Thailand, urban demonstrations in the wake of oil price increases helped trigger the resignation of the former Kriensak government.

Pricing policies have been used to encourage substitution of alternate fuels for oil. India and Bangladesh have promoted the switch from oil to coal and natural gas in the power and industrial sectors. India and the Philippines have prohibited the construction of new oil-fired thermal power stations as well as supported programs for auditing energy use in industry. In general, however, the development of regulations and tax policies to improve efficiency of energy, encourage retrofits, promote energy conservation designs in new residential and commercial buildings, and stimulate the conversion to more energy efficient transportation modes is in the nascent stages.

Government Organization and Expenditures

Since 1973-74, Asian governments have increased their involvement in virtually all phases of the energy sector. All, except Thailand, have developed national oil companies. The Philippines, Indonesia, and Sri Lanka have established Ministries of Energy and Bangladesh is seriously considering such a reorganization. Government expenditures for energy and power represent significant shares of overall government budgets and generally average around 20% of the total. Governments in India,

Indonesia, Burma, the Philippines and Bangladesh are spending domestic resources for oil and gas drilling as well as seeking increased foreign aid and investment in exploration.¹⁷ About 21% of Bangladesh's planned investment in energy development during the Second Five-Year Plan is for hydrocarbon exploration. Coal and lignite development is a major focus of investment in India, Thailand, and Indonesia.¹⁸ Burma, Sri Lanka, Nepal and the Philippines are giving emphasis to hydro power. However, development of coal, hydro, and natural gas for substitution in the power and industrial sectors, while essential, only deals in part with the problems of increased demands for petroleum fuels for transportation and household cooking and lighting. These uses together generally account for over half of total petroleum consumption (two-thirds in Indonesia). Population and urbanization growth trends, as well as the demands of Asia's young populations for increased mobility, suggest the persistence and exacerbation of the liquid fuels problem in the long-term.

For this reason, the Philippines, Thailand and, most recently, Indonesia, are developing an ethanol from biomass industry to meet transport fuel needs. The Philippines, through the Development Bank of the Philippines, expects to invest \$1 billion over the decade in alcohol production.

The Philippines is also taking a lead role in the development of energy supplies from geothermal and other non-conventional energy sources. The Ten-Year Energy Program (1980-89) projects a contribution from new and renewable energy (including geothermal) of 51.9 million barrels of oil equivalent by 1989, compared with 7.4 million barrels of oil equivalent at present. This projected level would represent 28% of projected commercial energy consumption in 1989.¹⁹ The Philippines is already the second largest producer of geothermal energy. In his recent State of the Nation Address, President Marcos announced a crash \$4-billion energy program to reduce reliance on imported oil from 80% at present to 50% by 1985 through accelerated development of geothermal, coal, and hydro resources.

In most Asian countries, research and development of alternative energy technologies is fragmented and dispersed in university and government laboratories. The Philippines

and Indonesia are attempting to provide a single focal point for R & D efforts by establishing a national energy center and laboratory. Sri Lanka and Bangladesh are also discussing this idea. India and Indonesia are particularly interested in promoting indigenous R & D on coal gasification and liquefaction.

The AID Asia countries are, in general, taking a cautious approach to the development of nuclear power for economic, political and technical reasons. After a long delay, the Philippines is proceeding with a 600 MW light water reactor from Westinghouse. However, the cost of this plant has escalated to a reported \$1.9 billion (\$3166 per installed KW). In India, technical and fuel supply and storage problems have been encountered at the three plants in Tarapur, Rajasthan, and Madras. The Bangladesh government is planning to go ahead with a 125 MW nuclear plant at Ruppur under an agreement with the French. Indonesia is also planning a nuclear plant during its Fourth or Fifth Five-Year Plan that would come on line around the turn of the century. Sri Lanka and Thailand have no present plans for nuclear plants.

Foreign Aid and Investment

The AID Asia countries are generally receptive to foreign aid and investment in energy sector development. India is probably the most restrictive, since they have a substantial industrial and technological base from which to pursue their own exploration, development, and manufacturing. Even India, however, recently decided to allow offshore petroleum investment by foreign oil companies. Except for Thailand, which uses a standard concession system, most Asian countries use a production-sharing or severe contract arrangement.²⁰ The international banks have played a major role in financing power sector development and are now moving to support oil, gas, and coal exploration, development, and transportation projects, e.g., Pakistan (oil development), Thailand (lignite development and gas pipeline), Indonesia (coal development), Nepal (oil survey). Asian governments are showing increased interest in assistance for development and demonstration of new and renewable energy technologies but have not, as yet, provided fiscal incentives for foreign companies to set up plants to produce for the local market in this area.

External Trade and Regional Cooperation

The past several years have witnessed the rapid growth of inter-governmental energy supply and cooperation arrangements in Asia. National oil companies have begun dealing directly with the oil-producing states to enhance security of supply, gain preferential prices, and diversify sources of imports. The Philippines has been able to reduce dependence on Middle East crude-oil imports from 96% in 1974 to 70% in 1979, through direct deals with China, Indonesia and Malaysia.

Regional cooperation in energy is expanding among the members of the Association of Southeast Asian Nations -- Philippines, Thailand, Singapore, Malaysia, and Indonesia. Three ASEAN committees meet regularly to discuss and coordinate energy policies in petroleum (ASCOPE), science and technology (COST), and industry (COIME). Indonesia is a key country because of its membership in both OPEC and ASEAN.

Reforestation and Environmental Management

Most energy consumption and production patterns eventually reach a point where they involve some environmental degradation. This impact is especially severe in the case of firewood consumption and its contribution to deforestation. While growing demand for firewood is only one of several causes of deforestation, it is certainly a major factor in most countries. Governments, however, have been slow in responding to the problem. The concern in several countries, e.g., Philippines, Indonesia, and Thailand, has, until recently, been primarily for the development and protection of commercial and export interests. Community forestry and watershed management programs are beginning to emerge in virtually all AID Asia countries. In Nepal, villages are given by law a 124-hectare area to reforest.²¹ The Indian social forestry program also seeks to work through local panchayats, although land use planning is centralized in the federal government.²² Thailand's Forest Industry Organization Program is attempting to establish "forest villages" in deforested areas, with families being given 1.6 hectares of land to plant and farm. As part of the Indonesian government's "regreening" program, wide buffer zones of Calliandra are being established around forests to provide fuelwood and protect the remaining

natural forests.²³ Sri Lanka is planning fuelwood plantations and village woodlots as part of the Mahaweli development project,²⁴ and Bangladesh has given high priority to community forestry in its new Second Five-Year Development Plan.

Growing pressures in Asian countries for opening up forest areas for agriculture, however, may cause serious land-use conflicts in the future. Disputes have already occurred in some countries, e.g., Indonesia.

VI. International Policy Context of Energy Assistance Programs

In the aftermath of the disappointing 1975-76 Conference on International Economic Cooperation in Paris, the United States and other industrial countries sought a new basis for energy dialogue and cooperation with the developing countries. The field of renewable energy offered one possibility for forging a relationship based on common interests in finding alternatives to oil.

At the United States' initiative, the Bonn Economic Summit in 1978 adopted a measure to increase cooperation among OECD countries in the development and use of renewable energy in developing countries. A Working Party of the OECD Council was formed under the chairmanship of Canada. This body developed recommendations for intensified activities in:

- (a) the assessment of renewable energy potential and resources;
- (b) research and development;
- (c) training, infrastructural and institutional support;
- (d) project formulation and evaluation;
- (e) information exchange.²⁵

These recommendations were endorsed by the Council and sent to member governments.

At the same time, the Third World was developing its own initiative in this area: Kenya proposed a U. N. Conference on New and Renewable Sources of Energy. This resolution was approved after tense debate over the inclusion of nuclear power, and the Conference is scheduled for August 1981 in Nairobi. In Asia, ESCAP is planning a number of meetings to help prepare for this Conference and countries are working on national papers.

Technical committees organized around resources are meeting to assess the status and potential of different technologies. The World Bank is also examining the issue of financing and coordination of international activities in renewable energy. The Bonn Summit also stimulated the adoption by the World Bank of an expanded program of lending for the development of oil, gas, and coal resources. The Bank program projected loans and credits increasing from \$155 million in 1979 to \$1500 million in 1983, of which \$1230 would be for oil and gas.²⁶ The 1980 Venice Summit also emphasized energy and asked the World Bank to consider the possibility of a new affiliate or facility for LDC energy exploration, development, and production. In August, the World Bank released a report proposing a five-year, \$25 billion energy lending program for FY 81-85. It included \$2 billion for coal and lignite, \$8 billion for oil and gas, \$1 billion for refineries, \$1.750 billion for fuelwood and alcohol, \$11 billion for electric power and \$1.250 billion for industrial retrofitting.²⁷ No decision has yet been made on this proposal and the Bank is currently considering the establishment of a new energy affiliate. The proposed program supports the conclusion of the Brandt Commission on International Development Issues that "There must be major investment in oil and natural gas exploration and development in Third World countries, as well as in known and available alternative energy sources such as coal and hydroelectric power; planning and funds are also required for research and development of new types of energy use, especially solar and other renewable forms."²⁸

VII. U. S. Energy Assistance Policy and Program

U. S. international energy policy has stressed technical and political cooperation among OECD countries in reducing oil imports, enhancing emergency preparedness, strengthening relations with key oil producers, and expanding energy assistance to the oil-importing developing countries. Secretary of State Muskie, in his August 25, 1980 address to the United Nations Special Session on Economic Development, stressed the need for oil-exporting countries to increase their aid to developing countries and pledged U.S. support for producer-consumer discussions on ways to provide

further assistance to non-oil developing countries. He also stated:

"We are committed to the stimulation of energy production worldwide, and to the increased use of renewable fuels. The United States strongly supports an expansion of World Bank energy programs, to permit Bank participation in multinational risk-sharing ventures to discover and develop new energy sources. Here, too, as we agreed at the Venice Summit, we are open to new institutional and financial arrangements. We will participate positively in the UN Conference on New and Renewable Energy Sources. We urge the Secretariat and member nations to make every effort to ensure its success."²⁹

AID's development assistance program has focused primarily on rural development and the poor. Consistent with this emphasis, past energy projects have been principally in the areas of rural electricity distribution and renewable energy technologies. Consistent with our overall foreign policy, IDCA has made energy a priority area of U.S. assistance and is seeking to develop an expanded program that balances concerns for conventional and traditional/renewable energy.

The proposed AID energy budget for FY 81 is a little over \$100 million, including \$25 million for power generation and distribution, \$53 million for new and renewable energy, \$18 million for fuelwood activities, and \$11 million for resource identification and training in conventional energy.

The current Asia Bureau program in energy falls into four main categories:

(1) Rural electricity distribution:

Major projects are underway in India, Bangladesh and Indonesia. The Philippines program is virtually completed.

(2) Demonstration and application of renewable and non-conventional energy technologies:

Major projects are underway in the Philippines, Thailand, and India and smaller-scale activities are underway or planned in Indonesia, Sri Lanka, and Nepal.

(3) Augumentation of fuelwood supplies:

Major projects are planned in India and Nepal, while fuelwood and village-woodlot components are underway or planned in Sri Lanka and Thailand.

(4) Energy sector planning and training:

Projects are underway in Indonesia and regionally through the East-West Center and ASEAN/AIT.

Appendix F contains a list of core projects in each of these areas. The estimated total funding involved in these activities is \$187.8 million. The projected obligations for Asia in FY 81 are as follows:

Tentative FY 81 Operating Year Budget
for Energy

498-0262 - Regional: Energy Development	\$ 1,815
498-0272 - Regional: ASEAN Energy Cooperation	1,000
497-0267 - Indonesia: Rural Electrification I	5,000
497-0300 - Indonesia: Energy Manpower and Training	500
388-0054 - Bangladesh: Rural Electrification II	20,000
492-0352 - Philippines: Reforestation/Rural Energy	1,700
498-0275 - South Pacific: Alternative Energy	150
	<hr/>
Total.....	\$30,165

VIII. Energy Assistance Programs of Other Donors

According to the most recent report of the OECD Development Assistance Committee, DAC members provided \$1.4 billion in ODA commitments for energy in 1978 to developing countries. Multilateral development lending institutions committed \$405 million in ODA for energy and \$1.5 billion in non-concessional flows.³⁰ No breakdown is given for Asia.

World Bank

As part of its expanded program of lending mentioned above, the World Bank is providing assistance to Asian governments in virtually all areas of energy. Lending in the power sector continues to dominate, with commitments totalling \$614.5 million for South Asia in FY 1980 and \$588.5 million for East Asia and the Pacific. Included was the largest loan ever made to Indonesia -- \$253 million for the first stage of the Suralaya Power Station in West Java. The World Bank is also financing an off-shore gas pipeline in Thailand, petroleum field development in Pakistan, a gas utilization project in Bangladesh, coal and lignite projects in Indonesia and Thailand, hydro projects in Nepal, Sri Lanka, Burma, Philippines, and Fiji, and an energy conservation activity in Thailand. It is managing a UNDP solar pumping project in the Philippines. Energy sector studies are nearing completion for Thailand and the Philippines and one is planned for Indonesia. Social forestry and watershed management projects are being financed in India, Nepal, Bangladesh and the Philippines.

Asian Development Bank

The ADB is currently considering the direction of its future lending in energy. A regional energy policy study is nearing completion. Most ADB lending in the past has gone to the power sector and in 1978 the ADB provided \$249 million in eight loans for seven power projects. Activities include generation and transmission projects in Malaysia, Pakistan, Fiji and Vietnam; a lignite development project in Thailand, a rural electrification project in Sri Lanka and a master energy plan in Thailand.

Japan

Japanese assistance has focused on power development (Malaysia, Philippines, India), oil and gas development (Indonesia and Burma) and forestry projects (Indonesia, Malaysia, Burma). Japanese involvement in new renewable technologies is in the early stages. Grants are apparently given for training in geothermal energy exploration and evaluation at the Japanese Geological Institute.

West Germany

The West German assistance program seems to be focusing on supporting the development of oil and gas and solar energy. The FRG has provided a grant to Bangladesh for gas field drilling and technical assistance in oil exploration has occurred in Malaysia and Burma. A major solar village project is underway in Indonesia and similar assistance is being provided to the Philippines.

France

France is active in both the nuclear and solar areas. France has agreed to provide a 125 MW nuclear reactor to Bangladesh. They are also providing small amounts of equipment and assistance in solar to the Philippines and to Thailand, i.e., Asian Institute of Technology.

Canada

Canada has a broad based program that includes assistance for hydro power development in Pakistan and Indonesia, oil and gas development in Pakistan, geothermal energy in Indonesia, and biogas and rural energy in Thailand and other countries. Canada is apparently planning to help Bangladesh update the 1975 ADB/UNDP energy sector study.

United Kingdom

The United Kingdom has a small program in Asia that includes a loan to Fiji for hydroelectric power, technical assistance to Bangladesh in natural gas exploration, research cooperation in methane generation with South Korea, and a small grant for the development of a solar-powered refrigerator in Thailand.

The Italians have recently completed a nuclear market assesment, plant feasibility study for Indonesia. They have also been assisting the Philippines in geothermal resource assessment for several years.

Other Donors

New Zealand is assisting Indonesia and the Philippines in geothermal. The project in Indonesia is the largest single project financed by New Zealand ODA and involves some \$24 million over 1974-81. The Philippines activity involves \$13.5 million for engineering service and drilling.

The Dutch are providing support for rural electrification in Sri Lanka and Indonesia as well as for research on solar dryers and biogas digestors in Indonesia and solar-ice units in Sri Lanka.

Norway is providing assistance to Vietnam and Sri Lanka in offshore oil surveying and to the Philippines and Papua New Guinea in hydro-power feasibility studies.

Australia is providing small amounts of assistance to Papua New Guinea and Fiji for renewable energy development and planning. Australia is seeking to increase energy cooperation with the ASEAN countries.

IX. The Future Asia Bureau Program in Energy

Consistent with its central resource and leadership position within the Agency, the Asia Bureau has made a firm commitment to helping Asian countries overcome the energy constraints to their development. Jack Sullivan, Assistant Administrator of the Asia Bureau, in his testimony to the Senate Foreign Relations Committee, stated:

"We are convinced that energy should become a central concern of the Asia Bureau. The expanded agricultural and industrial production necessary to meet basic human needs requires increasing supplies of energy. The increasing prices and decreasing availability of petroleum and firewood demand urgent actions by Asian countries to develop indigenous, alternative energy supplies."³¹

The resources the Bureau can devote to this sector are, of course, miniscule in relation to the problems of reducing oil imports and meeting the fuel needs of the poor. The Bureau's program must therefore be structured to play a catalytic role in this sector and a role that complements the major capital resources of the World Bank and the private sector.

The responses received from Asia Missions on the Draft Asia Bureau Policy Statement on Energy and the Draft PPC Energy Policy Paper indicate some divergence of opinion on the desirable direction for Asia Bureau activities in energy. The key issue is the role of the Bureau in funding activities in conventional energy. USAID/Pakistan commented: "We see no reason for the Bureau to be involved in the exploration and production of conventional energy, e.g., hydroelectric, petroleum, natural gas, and coal. AID neither has the massive capital and human resources nor the specialized expertise to make a meaningful contribution in this area." Other missions, e.g., Thailand and the Philippines, however, seem to support some Bureau involvement in technical assistance for conventional resource assessments.

Conventional energy resource identification is an area in which the Development Support Bureau has recently approved a major project. This project responds to the Congressional mandate that Section 106 funds be used "to facilitate geological and geophysical survey work to locate potential oil, natural gas, and coal reserves and to encourage exploration for potential oil, natural gas and coal reserves in developing countries, especially those which are not members of OPEC." The Asia Bureau position has been to encourage DSB to develop a balanced program in energy that is consistent with the overall thrust of Section 106. However, U.S. expertise in conventional energy exploration clearly resides in the private sector and the World Bank, OPIC, and the Export-Import Bank are in the best position to stimulate private sector investment and exports to developing countries. AID can, at best, give certain countries, through training and application of remote sensing technology and other assessment techniques, an informed basis from which to deal with the private companies and financial lending institutions.

On the other hand, considerable technology and expertise in renewable energy, conservation and forestry is directly supported by the public sector. DOE's solar RD & D program, at close to \$1 billion, is by far the largest in the world. With their abundant renewable resources, developing countries have great potential for designing long-term development strategies that avoid their becoming 'hooked' on oil in the way industrial countries are now. A number of renewable energy technologies currently exist that can be matched with important tasks in both the rural and industrial/commercial sectors. While many of these technologies have extremely high initial costs, their operating costs are generally assumed to be lower -- certainly their fuel costs are -- and they can be produced domestically with indigenous design or foreign-licensed technology. Their inherent decentralized nature is also well-suited to off-grid applications, where the cost of diesel or battery generation is extremely high. The prospect is for major reductions in the cost of many of these technologies during the 1980's. Thus, their costs are declining while those of petroleum and other non-renewable energy sources are rising. Adoption of these technologies will depend on the particular system, the application, the pricing and credit policies of governments, and the social and institutional acceptance and development in a particular country. President Carter has established 20% as the target for the contribution of renewable energy in total U.S. energy consumption by the year 2000. A study in Sweden concludes that Sweden could move from its current 70% dependence on oil to a position of 100% reliance on renewable energy by 2015, while still doubling productions.³³

Asia Bureau programs can play a critical role at this early stage in the transition by helping to demonstrate the technical, economic and social feasibility of renewable energy technologies and in fostering the application and dissemination of proven technologies. To accomplish this goal, projects must be designed so results can be meaningfully compared. In February 1980, AID and the Solar Energy Research Institute held an international workshop to discuss collaboration in developing common information on renewable energy systems.³⁴ In addition, the assessment and evaluation of renewable energy technologies must be done with respect to the full range of energy options, including nuclear power in certain cases. Such a comprehensive approach is

essential in order for the United States not to be viewed as pushing an apparently inappropriate technology on the developing countries while we use oil and conventional resources -- as inappropriate as these may actually be for long-term use.

The experience of the Atoms for Peace Program contains important lessons with respect to pushing a particular technology without concern for the total development context. Consistent with AID's emphasis on rural development and meeting the basic energy needs of the poor, activities to expand fuelwood supplies should also be a central focus of the Asia Bureau's energy program. This emphasis would build on current and planned projects of Asia Missions and complement efforts to develop new and renewable energy technologies for use in rural areas. It responds to the President's Directive to AID on tropical deforestation and to a central challenge identified in the Global 2000 study.

While stressing the need for the development of fuelwood and other renewable energy supplies, Asia Bureau programs should also be concerned with increasing the efficiency of energy use, i.e., increasing output per unit of energy input. While perhaps not as great as in industrial countries, considerable scope exists for improving the efficiency of energy use in both rural and urban sectors of developing countries.³⁵ AID can provide valuable assistance in identifying potential savings and the cost of measures to achieve increased efficiency. Such information is critical for the development of energy pricing, tax, and investment policies and, in most cases, detailed information and knowledge of conservation possibilities does not exist.

In summary, the future program of the Asia Bureau should emphasize increasing energy efficiency and developing fuelwood and renewable energy supplies for rural use within the context of support for overall national energy planning and institutional development in the energy sector.

X: Asia Bureau Five-Year Energy Program (FY 82-86)

IDCA and AID have assigned high priority to energy assistance. In support of this policy, the Asia Bureau will proceed with a Five-Year Energy Program at a planning level of \$50-75 million per year.

Objective: The basic objective of the program is two-fold:

- To help overcome the energy constraints to rural development, with particular emphasis on increasing productivity in agriculture and rural industries.
- To help meet the basic energy needs of the poor for cooking and heating.

Main Program Elements: The program has five basic elements:

- (1) Technical assistance in energy planning;
- (2) Local and overseas training in energy technologies, resource and demand assessment techniques, and energy planning methodologies;
- (3) Technical and limited capital assistance in the demonstration of the technical, economic, and social feasibility of solar, wind, biomass, and hydro technologies for rural or market-town use;
- (4) Technical and capital assistance in the broader application of proven renewable energy technologies (e.g., small hydro) in rural areas, recognizing funding limitations;
- (5) Technical and limited capital assistance in the development of community forestry and village woodlot projects that increase supplies of fuelwood to rural consumers and improve the efficiency of wood conversion and use.

Mission Staffing:

To develop and carry out this program, energy positions will be established in Asia Missions with major programs. Missions should submit a statement of staffing needs in this area by the beginning of calendar year 1981.

Technical Support

The Asia Bureau looks to DSB, the Department of Energy and other public and private organizations to provide technical support to this program. DSB support is sought in:

- (1) Monitoring of R & D efforts of the Department of Energy, the national labs, universities, private industry and communicating key information on a regular basis to the Asia Bureau and missions;
- (2) Analyzing the relationships between energy and other major functional categories in AID's programs;
- (3) Conducting comparative analyses of the energy situation and options across regions;
- (4) Concluding and managing RSSA's with DOE, USGS, USDA and other agencies and working with the Asia Bureau and missions to provide specific experts to the missions for short and long-term assignments;
- (5) Maintaining and communicating to the Asia Bureau current data on individuals in the public and private sector who are available for project work in various energy fields;
- (6) Managing Agency energy IQC's.

In addition, the Asia Bureau turns to DS/EY for support in responding to specific requests for resource identification and training in conventional energy. Current DSB projects in these and other areas are contained in the Appendix G.

Additional Guidelines

-- The Asia Bureau should continue to support regional activities that help accelerate national energy programs and rationalize AID and other donor assistance. AID should specifically lend assistance to activities that further energy cooperation among the ASEAN countries. During FY 81, the Bureau should work with Asian countries in preparing for the UN Conference on New and Renewable Sources of Energy, scheduled for August 1981.

-- The Asia Bureau should begin to phase out capital-intensive rural electrification programs and encourage the multilateral development banks to take these over. Where

such programs are proposed, they should be carefully considered in terms of (a) implications of national rural electrification plans for energy supply (particularly as they relate to oil imports); (b) evidence of the benefits from previous rural electrification projects (e.g., industry generation, irrigation, lessening of urban migration, improved income distribution, etc.); (c) costs in comparison with conventional and non-conventional decentralized systems; (d) affordability of the electricity by the poor in the target area and the priority of electricity in meeting the basic needs of the poor for cooking fuel; and (e) their relative benefits compared to possible projects in energy planning, training, renewable energy, fuelwood production.

--The Bureau should consider carefully the energy implications of all proposed projects.

Appendix C contains a list of questions that may be appropriate to address in project design. Missions should seek to include renewable energy technologies in non-energy projects (either on a test or on actual use basis). ASIA/TR/STEP will take the lead in a Bureau study of the energy implications of current and planned Asia Bureau projects in all sectors.

-- The Asia Bureau should not be involved in pre-feasibility or feasibility studies for nuclear power plants but may help a country examine the social, economic, and environmental implications of pursuing a nuclear option as part of a general country energy sector assessment.

-- The Asia Bureau should seek to coordinate energy activities with other donors to the maximum extent possible. The Bureau looks to IDCA for regular information on the energy programs of the World Bank and other donors.

NOTES

- ¹Oil and Gas Journal, Annual Survey, 1980.
- ²Petroleum Economist, June 1980, p. 243.
- ³World Bank, Energy in Developing Countries, August 1980, Table 24, p. 50.
- ⁴Jochen Mahnfeld, "Changing Patterns of Trade." Petroleum Economist, August 1980, pp. 329, Table 2.
- ⁵E. P. Philhower, "The Current Energy Situation in the Asian Developing Countries," AID/Asia Bureau, August 1980. See Appendix B-I.
- ⁶Petroleum Economist, September 1980, p. 370.
- ⁷World Bank, op. cit., Table 2, p. 5.
- ⁸World Bank. A Program to Accelerate Petroleum Production in the Developing Countries, November 30, 1978. Annex Table I.
- ⁹See Robert Ichord, "Oil Exploration and Development in South and Southeast Asia: Prospects and Implications for U.S. Policy," June 27, 1980. Working Paper.
- ¹⁰See Appendix C-II for summary tables from studies in India, Pakistan, Thailand, and Bangladesh.
- ¹¹Bangladesh Institute of Development Studies, Phase II Interim Report, Rural Industries Study Project, March 1980.
- ¹²Proceedings of the USAID Asia Bureau Conference on Energy, Forestry, and Environment, Manila, November 12-16, 1979, p. 175.
- ¹³In Nepal, for example, "...fuel and fodder collection for one household may require the fuel time labor of one person, while in other areas, women and children must spend an average of 11 person days per month (between 4.7 and 19.9) gathering firewood and 15 days per month for fodder collection because of the

NOTES (Continued)

increased distances covered to obtain adequate supplies." Source: World Bank, Nepal Forestry Sector Review, Washington, D. C., 1978, p. 13.

- ¹⁴ World Bank, Energy in Developing Countries, op. cit., p. 5.
- ¹⁵ American Embassy, Jakarta, Industry Outlook Report: Indonesia's Petroleum Sector, 1980, p. 4.
- ¹⁶ Sheilah Ocampo, "Fighting the Philippines' Costly Energy Crunch," Far Eastern Economic Review, August 15, 1980, p. 39.
- ¹⁷ Indonesia plans exploration expenditures of \$118 million by Pertamina this year.
- ¹⁸ India plans to boost its coal production from 104 million tons per year to 260 million tons per year by 1990 and has established a \$4.4 billion fund.
- ¹⁹ Philippines Ministry of Energy, Ten-Year Energy Program 1980-89, Manila, January 1980.
- ²⁰ See Ichord, op. cit., for an analysis of policies toward foreign investment and aid in petroleum.
- ²¹ U.S. Department of Agriculture, Forest Products Laboratory, Forestry Activities and Deforestation Problems in Developing Countries, June 1980, p. 67.
- ²² Devres, The Socio-Economic Context of Fuelwood Use in Small Rural Communities, AID Evaluation Special Study, No. 1, August 1980, p. 106.
- ²³ USDA, loc. cit., p. 60.
- ²⁴ Kenneth M. Kauffman, The Energy Crisis in a Developing Country: The Case of Sri Lanka, Department of State, Executive Seminar in National and International Affairs, 1979-80, p. 11.

NOTES (Continued)

- ²⁵OECD, Report by the Working Party of the Council to Develop a Co-ordinated Effort to help Developing Countries Bring into Use Technologies Related to Renewable Energy, May 7, 1979.
- ²⁶World Bank, Petroleum Production, see Appendix E-II.
- ²⁷World Bank, Energy in Developing Countries, see Appendix E-III.
- ²⁸North-South: A Program for Survival, The Report of the Independent Commission on International Development Issues under the Chairmanship of Willy Brandt, (Cambridge, Ma.: MIT Press, 1980), p. 279. Also, see Appendix E-IV.
- ²⁹U.S. Department of State, Statement by the Honorable Edmund S. Muskie, Secretary of State, before the 11th Special Assembly of the United Nations General Assembly, New York, New York, August 25, 1980. Press Release No. 2300.
- ³⁰OECD, Development Assistance Committee, Financial and Technical Assistance for Energy Development in Developing Countries, Paris, April 11, 1980. DAC (80) 14.
- ³¹Witness Statement by Honorable John H. Sullivan, Bureau for Asia of the Agency for International Development Before the Senate Foreign Relations Committee, March 19, 1980.
- ³²See John Ashworth and Jean Neuendorffer, Matching Renewable Energy Systems to Village -Level Energy Needs, Solar Energy Research Institute, June 1980.
- ³³Thomas Johansson and Peter Steem, Solar Sweden--An Outline to a Renewable Energy System, Stockholm, Secretariat for Future Studies, 1977.
- ³⁴Solar Energy Research Institute, Developing Common Information Elements for Renewable Energy Systems: Summary and Proceedings of SERI/AID WORKSHOP, June 1980, SERI/TP-744-661.
- ³⁵Patricia Kashel et al. Opportunities for Energy Conservation in the Developing Countries, Draft Report to AID, June 1980.

APPENDICES

- A: I -- World Oil Prices
 - II -- Oil Imports of Oil-Importing Developing Countries

- B: I -- Petroleum Imports of Net-Oil Importing AID Asia Countries
 - II -- Oil Production in AID Asia Countries
 - III -- Size of Potential Petroleum Resources, Exploration Activity and Actions Needed in 70 Developing Countries
 - IV -- Growth of Commercial Energy Consumption in Asia Countries

- C: I -- Firewood and Charcoal Use in Asia
 - II -- Estimated Use of Traditional Fuels in Pakistan, Bangladesh, Thailand and India

- D: I -- Petroleum Imports as a % of AID Asia Countries Imports and Exports
 - II -- External Public Debt of AID Asia Countries

- E: I -- OECD Report on Renewable Energy
 - II -- 1978 World Bank Expanded Energy Program
 - III -- 1980 World Bank Proposed \$25 Billion Energy Program
 - IV -- Brandt Commission Findings on Energy

- F: I -- Section 106 of Foreign Assistance Act
 - II -- AID Energy Assistance Program in FY 80
 - III -- Core Asia Bureau Energy and Related Forestry Projects FY 78-80

- G: I -- Energy Projects of the Development Support Bureau
 - II -- Agency IQC's in Energy
 - III -- Possible Energy Questions to Address in Project Design

APPENDIX A

TABLE A-I: World Oil Prices 1971-1980

(U.S. \$ per Barrel)

<u>Country</u>	<u>1/71</u>	<u>1/73</u>	<u>1/75</u>	<u>1/77</u>	<u>1/79</u>	<u>7/79</u>	<u>1/80</u>	<u>4/80</u>	<u>6/80</u>
Saudi Arabia	1.800	2.742	11.251	12.09	13.339	18.00	24.00	28.00	28.00
Kuwait	2.085	2.626	11.145	12.37	12.83	19.49	25.50	27.50	29.50
Iran	1.790	2.729	11.475	12.81	13.45	22.00	30.00	35.37	35.37
Iraq	1.720	2.711	11.272	12.67	13.29	19.96	25.96	28.18	30.18
Libya	2.140	4.024	15.768	13.92	14.69	23.45	34.50	34.67	36.67
Nigeria	2.170	3.787	14.691	14.22	14.82	23.49	29.97	34.71	36.71
Abu Dhabi	1.860	2.796	11.686	12.28	13.78	21.36	27.56	29.56	31.56
Indonesia	1.700	3.730	12.60	13.55	13.90	21.12	27.50	29.50	34.25
Venezuela	2.339	3.937	11.2156	13.99	14.69	22.45	25.46	30.75	34.25

Source: Petroleum Economist, various issues.

APPENDIX A

TABLE A-II: Oil Imports of Oil-Importing Developing -- Volume and Cost
1970 - 1990 (Projected)

	<u>1970</u>	<u>1975</u>	<u>1980</u>	<u>1985</u>1990.....	
					<u>Case 1*</u>	<u>Case 2</u>
Volume (Million Barrels per Day)	1.8	4.4	4.5	6.0	7.6	6.4
Cost (Billion 1980 U.S. Dollars)	5.4	31.5	49.3	76.6	111.0	93.4

*Assumes average annual percentage growth in imports of 5.4% and 3% per year increase in real prices.

Source: World Bank. Energy in Developing Countries, August 1980, Table 24, p. 50.

APPENDIX B

TABLE B-I: Petroleum Imports of Net Importing

AID Asia Countries -- 1979

<u>Country</u>	Petroleum Imports: <u>Volume</u> (MB/D)	Petroleum Imports: <u>Cost</u> (Million)	Petroleum Imports as % <u>of Oil Consumed</u>	Oil as % of <u>Total Energy Consumption</u>
Nepal	2	17	100%	4%
Philippines	220	1,370	92%	57%
Thailand	202	2,000	100%	44%
Sri Lanka	28	156	100%	36%
Bangladesh	45	190	100%	13%
Pakistan	70	540	90%	38%
India	<u>377</u>	<u>3,500</u>	65%	14%
	944	\$7,773		

Source: E. P. Philhower, "The Current Energy Situation in the Asian Developing Countries", AID/ASIA Bureau, August 1980.

APPENDIX B

TABLE B-II: Oil Production in
AID Asia Countries -- Past and Projected
(Thousand Barrels per Day)

<u>Country</u>	<u>1970</u> ^a	<u>1974</u> ^b	<u>1978</u> ^b	<u>1980 (First Half)</u> ^d	<u>1982</u> ^b
Pakistan	10	8	12	10	40
India	136	156	248	250	360
Burma	16	18 ^a	27 ^c	32	40 ^e
Philippines	-	-	-	40	60
Indonesia	853	1,393	1,700	1,598	1,400

Sources: a= U.N. Statistical Office, An Extract of Global Energy Statistics,
March 1976.

b= CIA, The World Oil Market in the Years Ahead, August 1979.

c= Petroleum Economist, April 1980, p. 178.

d= Petroleum Economist, September 1980, p. 370.

e= Estimate of author.

APPENDIX B-III

ANNEX TABLE I

SIZE OF POTENTIAL PETROLEUM RESOURCES, EXPLORATION ACTIVITY AND ACTIONS NEEDED IN 23 DEVELOPING COUNTRIES

Country	Size of Potential Resources				Exploration Activity			Actions Needed						
	VH	H	F	L	Adequate	Moderate	Inadequate	1	2	3	4	5	6	7
<u>Latin American/Caribbean</u>														
Argentina		H					I	S	T	U				Z
Brazil	VH				A		I	S	T	U		X		Z
Chile	VH		F		A		I	S	T	U		X		Z
Colombia	VH					M		S	T	U		X		Z
Cuba	VH					M		S	T	U		X		Z
Venezuela	VH		F	L		M		S	T	U			Y	Z
Sub-Total	5	1	1	1	2	4	1	8	3	11	1	0	1	10
<u>North America</u>														
Canada	VH						I	S	T	U				Z
Sub-Total	1						1	1	1	1				1
<u>Western Hemisphere</u>														
Benin			F				I	S						Y
Cameroon		H			A									
Chad	VH				A			S	T	U				Y
Gabon		H				M		S	T	U				Y
Ivory Coast			F		A			S						Y
Nigeria	VH			L		M		S		U	V	W		Y
Sub-Total	1	2	1	1	1	1	1	3	2	3	1	1	1	2
<u>Asia/Australia</u>														
Barbados				L			I			U		W		
Cuba				L	A									Z
Costa Rica				L			I	S	T	U				Y
Cyprus			F				I	S	T	U				Y
Dominican Rep.				L			I	S	T	U				Y
El Salvador				L			I	S	T	U		W		Y
Equ. Guinea				L			I	S	T	U				Y
Ethiopia				L			I	S	T	U				Y
Guatemala			F				I	S	T	U		X		Y
Ghana		H			A			S		U				Y
Guinea			F				I	S	T	U	V			Y
Guinea Bissau			F				I	S	T	U				Y
Guinea Rep.				L			I	S	T	U				Y
Kenya				L		M		S	T	U				Y
Madagascar				L		M		S	T	U		X		Y
Malawi				L		M		S	T	U		X		Y
Maldives			F				I	S	T	U		W		Y
Mali				L			I	S	T	U	V			Y
Mauritania			F				I	S	T	U		W		Y
Mauritius				L		M		S	T	U				Y
Mozambique				L			I	S	T	U				Y
Niger			F			M		S	T	U		W		Y
Nigeria	VH				A			S	T	U	V	W		Y
Paraguay				L		M		S	T	U				Y
Rwanda				L	A			S	T	U				Y
Senegal			F				I	S	T	U	V			Y
Sierra Leone				L			I	S	T	U				Y
Somalia				L		M		S	T	U				Y
Tanzania				L			I	S	T	U				Z
Togo				L		M		S	T	U				Y
Upper Volta				L			I	S	T	U				Y
Yemen				L		M		S	T	U				Y
Yemen P.D.R.				L		M		S	T	U				Y
Sub-Total	1	14	10	10	4	11	2	28	20	32	14	1	1	14
<u>Non-OPEC/Oceania</u>														
Comoros	VH							S	T	U				Y
Syria	VH					M		S	T	U				Z
Zaire		H				M		S	T	U		X		Y
Sub-Total	1	1	10	10	10	1	1	11	1	11	1	1	1	1
TOTAL	11	10	15	22	10	22	38	61	41	61	18	2	13	25

CODES:

Size of Potential Resources

VH = Very High -- over 1,500 million barrels
H = High -- 750-1,500 " "
F = Fair -- 100-750 " "
L = Low -- under 100 " "

Exploration Activity Code:

A = Adequate
M = Moderate
I = Inadequate

Actions Needed Code:

S = Possibility of increased exploration.
T = Increased cooperation with foreign interests.
U = Reappraisal of past exploration data.
V = Additional geophysical surveys.
W = Drill stratigraphic test well.
X = Negotiate new contracts; positive action to be taken by Bank.
Y = Assistance to government.
Z = Assistance to State Oil Company.

APPENDIX B

TABLE B-IV: Growth of Commercial Energy Consumption
in Asia Countries -- 1974 - 1978 (Average Annual %)

<u>Country</u>	<u>1960-74</u>	<u>1974-78</u>
Bangladesh	-	16.5
India	4.9	5.1
Indonesia	4.2	21.4
Nepal	12.3	0.9
Pakistan	5.9	1.0
Philippines	9.6	6.3
Sri Lanka	6.2	0.8
Burma	3.6	4.9
Thailand	16.9	7.6

Source: World Bank, World Development Report 1980, p. 122.

APPENDIX C

TABLE C-I: Fuelwood and Charcoal Use in Asia - 1976

<u>Country</u>	<u>Consumption (Million GJ)</u>	<u>Per Capita</u>
Nepal	94.61	7.3
Pakistan	92.09	1.22
India	1,285.19	2.07
Sri Lanka	45.95	3.3
Bangladesh	152.38	1.89
Burma	206.62	6.45
Indonesia	1,207.12	8.9
Philippines	249.69	5.76
Thailand	174.99	4.07

Source: FAO.

APPENDIX C

TABLE C-II: Estimated Use of Traditional Fuels
in Pakistan, Bangladesh, Thailand and India
(% by Source)

	<u>Pakistan</u> ^a	<u>Bangladesh</u> ^b	<u>Thailand</u> ^c	<u>India</u> ^d
Dung	15.5%	25.0%	-	26.0%
Firewood	54.2	3.5	} 90.7	48.0
Charcoal	0.2	-		-
Bagasse	16.5	5.5	7.4	-
Cotton Sticks	6.4	Jute Sticks 6.0	-	-
Saw Dust	1.3	-	-	-
Shrubs	5.6	} 9.0	-	-
Weeds	0.3		-	-
Tobacco Sticks	<u>0.0</u>	-	-	-
	100.0%	Rice Straw 18.0	-	Vegetable Waste 15.0
		Rice Hulls 24.0	<u>1.9</u>	Other <u>11.0</u>
		Other <u>9.0</u>	100.0%	100.0%
		100.0%		

Sources: a= Energy Resources Cell, Gov. of Pakistan, Survey of Non-Commercial Fuels in Pakistan, Table 6.1.1, 1976.

b= META Systems Estimates for Bangladesh Energy Study, Asian Development/UNDP, November 1976.

c= Estimates of META Systems energy project design team for AID, April 1979.

d= Government of India, Fuel Policy Committee.

APPENDIX D

TABLE D-I: Petroleum Imports as a % of AID Asia Countries Imports and Exports

<u>Country</u>	<u>% of Imports</u>		<u>% of Exports</u>	
	<u>1972-73</u>	<u>1978</u>	<u>1972-73</u>	<u>1978</u>
Bangladesh	2.7	11.2	5.8	31.8
India	8.2	25.7	7.9	29.7
Indonesia	1.6	8.7	1.3	5.2
Nepal	13.2	9.3	44.8	25.9
Pakistan	6.6	14.9	5.8	26.9
Philippines	10.4	20.0	7.6	21.8
Sri Lanka	8.8	15.2	8.9	14.6
Thailand	11.0	21.0	10.7	22.4

Source: Roger Revelle, "Energy Dilemmas in Asia: The Needs for Research and Development," Science, Vol. 209, July 4, 1980, Tables 4& 5, p. 167.

APPENDIX D

TABLE D-II: External Public Debt of AID Asia Countries
(Includes Undisbursed)

<u>Country</u>	<u>1970</u>	<u>1977</u>	<u>1978</u>
Bangladesh	-	3,491	4,278
India	7,935	18,760	20,562
Nepal	3	299	382
Thailand	323	2,263	3,680
Philippines	635	5,627	7,563
Pakistan	3,060	8,764	9,868
Burma	102	1,187	1,478
Sri Lanka	311	1,230	1,543
Indonesia	<u>2,505</u>	<u>15,904</u>	<u>18,887</u>
	14,874	57,525	68,241

Source: World Bank, Annual Reports.

Paris, 7th May, 1979

REPORT
by the
WORKING PARTY OF THE COUNCIL TO DEVELOP A
CO-ORDINATED EFFORT TO HELP DEVELOPING
COUNTRIES BRING INTO USE TECHNOLOGIES
RELATED TO RENEWABLE ENERGY

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT
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75775 PARIS CEDEX 16

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APPENDIX E-I (Continued)

B. Policy Options

11. The greater application of renewable energy forms in developing countries will thus involve a variety of participants and actions. Agreement in principle to the pursuit of an effort of this kind would, of course, need to be reached with developing countries themselves and specific actions involving them would be undertaken at their request. The following policy options provide the basis for a contribution by OECD Member countries to this co-ordinated effort.

I. General

Give greater emphasis to the utilisation of renewable energy sources in co-operation with developing countries and provide additional resources (financial and otherwise) as warranted by the general evolution of the development situation and the energy situation of developing countries.

II. Assessment of Renewable Energy Potential and Resources

(i) Encourage and assist in the survey and evaluation of the renewable energy resource base needs and uses in individual developing countries.

(ii) Encourage surveys to determine what R & D activities on renewable energy, including improvements in existing technologies, are taking place in developing countries.

III. R & D

(i) Include, in OECD Member country renewable energy R & D programmes, where institutionally possible, activities aimed specifically at meeting the needs of developing countries, such activities to be carried out wherever possible on a co-operative basis between developed and developing countries.

(ii) Include in developing and developed country co-operation the possibility of building up the indigenous capability of the developing country in local production installation and maintenance of renewable energy systems, especially but not exclusively in small-scale applications.

(iii) Support the adaptation of high potential renewable energy technologies in developing countries.

(iv) Promote the research, field testing and demonstration of projects appropriate for the development of renewable energy in developing countries in collaboration with these countries, concentrating on low-risk projects so as to lessen the possible adverse effects on development and on the confidence of developing countries in new technologies.

(v) Encourage international organisations in which OECD countries are members to seek to include developing countries, on appropriate terms, to participate in the R & D programmes of such organisations.

IV. Training, Infrastructural and Institutional Support

(i) Complement renewable technology projects financed by OECD Member countries in developing countries with infrastructural support, institution building and training programmes to ensure a viable and lasting contribution of these renewable technologies to developing energy needs.

(ii) Encourage and assist programmes to develop and improve an energy planning capacity in developing countries in the framework of their overall developmental planning programmes in order to assist such countries to assess the possible role of renewable energy in their energy plans.

(iii) Encourage and assist technical training programmes aimed at developing and improving a technical capability in developing countries, at appropriate levels and without undue specialisation, to select, manage and further develop renewable energy technologies.

APPENDIX E-I (Continued)

V. Project Formulation and Evaluation

(i) Encourage developing countries, when planning projects that have energy requirements, to consider the possible use of renewable energy systems in such projects depending not only upon initial cost outlays but also on life-of-project cost projections of renewable and conventional energy, and taking into account the social and environmental impacts of the alternative projects.

(ii) Assure that all renewable energy projects contain an evaluation component to increase understanding of applications of these technologies.

(iii) Avoid unnecessary duplication of projects in certain renewable energy areas without narrowing unduly a possible base for comparison between projects.

VI. Information

(i) Encourage (a) the exchange between developed and developing countries and among developing countries themselves of information on technologies and their social impacts and of positive and negative experience in the deployment of proven technologies, and (b) the development of widely available data reference systems on renewable energy technologies.

(ii) Increase the awareness of the general public, universities, industry and other appropriate circles about the possible role of renewable energy so as to ensure that government policies in this field acquire a wide understanding and to ensure that the renewable energy potential is adequately taken into account in planning for the future.

WORLD BANK OIL AND GAS PROGRAM^{/a}Tentative Estimate of Sector Work, Lending
Programs and Staffing Requirements

	Fiscal Years				
	1979	1980	1981	1982	1983
	(Amounts in 1978 dollars)				
A. <u>Professional Staff</u>	16	25	35	45	54
B. <u>Oil and Gas Sub-Sector Studies</u>	11	16	25	25	25
C. <u>Geological and Geophysical Surveys</u>					
No. of countries	1	4	8	10	10
Amount (\$ m.)	3	10	20	25	25
D. <u>Exploratory Drilling</u>					
No. of loans	-	3	5	7	9
Amount (\$ m.)	-	60	100	130	160
E. <u>Appraisal Drilling</u>					
No. of loans	-	3	6	9	10
Amount (\$ m.)	-	45	90	135	190
F. <u>Production</u>					
No. of Projects	6 ^{/b}	9	9	10	11
Loan amounts (\$ m.)	138	432	450	500	550
G. <u>SUMMARY OF PROPOSED PROGRAM</u> ^{/c}					
<u>No. of Activities</u>					
Surveys (countries)	1	4	8	10	10
Exp. Drilling	-	3	5	7	9
Appraisal Drilling	-	3	6	9	10
Production	6	9	9	10	11
Total Bank	7	19	28	36	40
<u>Amounts</u>					
Bank loans/credits (\$ m.)	141	547	660	790	925
Current dollars ^{/d}	150	615	785	995	1230 ^{/e}

^{/a} To be revised annually based on the Bank's evolving experience in the Sector.

^{/b} Includes 2 engineering loans.

^{/c} IFC activities will be in addition to this program.

^{/d} Based on World Bank commitment deflator.

^{/e} Deducting operations in OPEC countries in FY83, say \$230 m., leaves \$1,000 m. of financing in non-OPEC countries. Assuming Bank share of financing is 1/5 in production and 2/3 in pre-development, the activities and projects supported by the Bank cost about \$4,200 m. (in current dollars). This represents one third to two fifths of the investment requirement of the NODCs, depending on the extent to which Bank assistance raises the level of oil and gas investment in these countries above that assumed in Table 4.1

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ANNEX TABLE 3

WORLD BANK COAL AND LIGNITE PROGRAM

	Fiscal Years				
	1979	1980	1981	1982	1983
A. <u>Professional Staff</u> ^{1/}	16	16	17	17	18
B. <u>Sub-sectoral Studies</u>	4	5	2	4	5
C. <u>Engineering Loans</u>					
No. of Loans	1	0	1	2	1
Amount	5	0	5	10	5
D. <u>Production Projects</u>					
No. of Loans	0	3	3	4	3
Amount	0	155	110	233	335
E. <u>SUMMARY OF PROPOSED PROGRAM</u>					
Sub-sectoral Studies	4	5	2	4	5
Engineering Loans	1	0	1	2	1
Production Loans	0	3	3	4	3
Total Activities	5	8	6	10	9
Total Bank Loans/Credits (\$m.)	5	155	115	243	340

^{1/} Entire professional staff of the Mining and Non-Ferrous Metals Division of the Industrial Projects Department.

11/17/78

Table 30: CURRENT AND DESIRABLE WORLD BANK ENERGY LENDING PROGRAMS,
FY 1981-85

(Million current US dollars)

	Current		Desirable	
	Lending Program	Total Project Cost	Lending Program	Total Project Cost
<u>Coal and Lignite</u> /a	840	4,270	2,000	7,350
<u>Oil and Gas</u>				
Predevelopment	1,020	2,610	2,410	5,850
Oil Development /b	1,755	5,900	3,320	12,150
Gas Development /c	1,210	3,250	2,270	5,875
	<u>3,985</u>	<u>11,760</u>	<u>8,000</u>	<u>23,875</u>
<u>Refineries</u>	150	400	1,000	3,100
<u>Renewables</u>				
Fuelwood	425	850	1,100	2,200
Alcohol	200	2,100	650	4,550
	<u>625</u>	<u>2,950</u>	<u>1,750</u>	<u>6,750</u>
<u>Electric Power</u>	7,590	37,950	11,000	47,450
<u>Industrial Retro-</u> <u>fitting</u>	<u>0</u>	<u>0</u>	<u>1,250</u>	<u>3,825</u>
TOTAL	<u>13,190</u> /d	<u>57,330</u>	<u>25,000</u> /d	<u>92,350</u>
Bank Share of Total Project Cost (percent)		23		27

/a Includes coal gasification projects.

/b Includes heavy oil projects.

/c Includes methanol.

/d Does not provide for any lending to China.

Note: On completion, the projects included in the Current Lending Program are estimated to produce (or in the case of electric power and industrial retrofitting projects, to save) energy equivalent to 1.62 million barrels of oil per day (mbdoe) or 5.3 percent of the developing countries' projected energy consumption in 1990. The corresponding estimates for the Desirable Lending Program are 2.9 mbdoe and 9.5%, respectively. Refineries, which add substantially to the value of petroleum products but not to energy output or savings, are excluded from the calculation.

10 Energy

APPENDIX E-IV

In the course of the 1970s the cost and availability of energy, and particularly of oil, has become a worldwide concern. All countries have become dependent on petroleum products to maintain their transportation systems, industrial and agricultural production, national defence and other vital functions. Most of them depend on imports of oil and natural gas from other countries. The mere threat of a disruption in international supply lines sends shock waves through national societies and the world economy. At the same time, the depletion of the world's oil resources is proceeding so rapidly that the transition to other sources will be necessary in a foreseeable future.

Energy shortages take many forms. Sudden rises in petroleum prices affect all countries; but while pleasure motoring continues on a large scale, fishermen in poor island communities like the Maldives may not get oil at all to operate their boats, or farmers in India and Pakistan to work their irrigation pumps. The energy crisis in much of Africa and Asia means the shortage of firewood: poor families have to search further and further to find wood to cook their rice or wheat, while more and more of the land is denuded of trees. Many developing countries are experiencing balance of payments difficulties or economic stringency as higher expenditures on fuel force cuts elsewhere. The long-term solutions lie in the development of alternative and renewable energy sources; but the short-term difficulties are acute. Both require nothing less than a global strategy for energy.

Energy problems are closely linked to many of the issues we have discussed in previous chapters and will raise later. Oil is the leading commodity in world trade, making up as much as one-eighth of it. It has been subject in the past to control by a few multinational corporations. The scale of its use and of the monetary flows by

which it is paid for are so great as to affect the prosperity of every country and the balance of the world's financial and monetary system, which is now seriously threatened by world economic conditions in general. The fair distribution of oil and the development of substitutes are likely to call for exceptional measures of international collaboration in the future.

Implications of the Energy Transition

The supply of energy, particularly of oil, has become a prominent North-South issue. Yet there are significant areas of agreement about oil. It is now widely accepted that during the 1960s when the industrial societies and a few developing countries were rapidly expanding their use of cheap oil, the price failed to reflect the depletion of resources. Oil was 25 per cent cheaper in 1970 in relation to the prices of other goods than in 1955. A higher price was essential to constrain consumption and to help ensure the consideration of long-term requirements and the development of alternative fuels to take the place of oil. Even at higher oil prices, there is much waste, especially in industrial societies, and frivolous use of a resource which is needed for world survival.

Ever since the first commercial strike of oil in Pennsylvania in 1857, its economics have been controversial. When oil supplies were controlled by cartels or groups of companies, prices reflected their market position at a particular time. There have since been significant changes in the control of supplies. In the 1960s a number of 'independent' companies began to challenge the monopoly power of the major oil companies; and in the 1970s producing countries increasingly took control, making long-term contracts with the 'oil majors'. In the 'spot market' where oil is sold outside long-term contracts, prices react sharply to sudden short-term surpluses or gluts. The spot market used to handle relatively marginal quantities, but in 1979 it acquired considerable importance. Experts are unsure whether this will continue to be the case, or whether it is a temporary phenomenon, resulting from the new supply patterns.

Any assessment of world oil prices must take into account both the need for conservation and long-term supplies, and the critical need for oil, at least for the next two decades, both in industrialized nations and in the Third World. In the immediate future oil will remain the lifeblood of industrial society. While the long-term aim of energy policy must be to reduce the dependence on this diminishing resource, the fact must be faced that during the

APPENDIX E-IV (Continued)

transition no country can escape serious disruption if its supplies of oil are drastically reduced. To navigate through these dangerous political narrows, achieving a fair distribution of oil while ensuring long-term alternatives, provides a major challenge to world statesmanship.

Disparities in Use

The use of energy in the world is grossly unbalanced. The consumption of energy per head in industrialized countries compared to middle-income and low-income countries is in the proportion of 100:10:1. One American uses as much commercial energy as two Germans or Australians, three Swiss or Japanese, six Yugoslavs, nine Mexicans or Cubans, 16 Chinese, 19 Malaysians, 53 Indians or Indonesians, 109 Sri Lankans, 438 Malians, or 1072 Nepalese. All the fuel used by the Third World for all purposes is only slightly more than the amount of gasoline the North burns to move its automobiles.

The oil-importing developing countries obtain about two-thirds of their commercial energy from oil, an even higher proportion than the OECD countries (half) or Eastern Europe (a third). The North has greater scope for conserving energy by relatively painless adjustments or by introducing less energy-intensive technologies. Most countries of the South have only a modest consumption of oil but, as they provide for their industries and rural communities and move away from traditional fuels, they will inevitably have to increase their use of oil and other commercial forms of energy very considerably. In recent years, however, a number of developing countries have had difficulty in obtaining even the relatively small quantities of oil they need currently.

While the North's consumption of commercial energy doubled between 1960 and 1976, that of the developing countries tripled; but it was still only one-fifteenth of the consumption in the West, or one-twelfth of that in Eastern Europe. The developing countries import only about 10 per cent of all traded oil. There is rightly a great interest now in alternative sources, such as solar energy, which may in the end be particularly suited to developing countries; but they should not be obliged to adopt expensive new technologies prematurely. They have a legitimate need for an expanding share of oil in the years to come.

Scope for Conservation

The industrial countries will have to alter lifestyles which they have

based on abundant energy. This need not have severe economic consequences. The relationship between growth in GNP and the consumption of energy has been found not to be immutably fixed; indeed, figures for the OECD countries show a modest decline in energy use per unit of GNP in the last few years. Consumption grew rapidly in recent decades because people bought more cars, appliances, heaters or air conditioners, and because cheap oil stimulated energy-intensive technology. Over time, there is major scope for conservation and adjustment to higher energy costs. Recent studies of many industrial countries have shown that with only moderate changes in attitudes and practices the *per capita* consumption of energy can be substantially reduced without great sacrifice of economic growth.

At the Tokyo Summit of 1979 leaders of western industrialized countries made an undertaking to limit their oil imports up to 1985 to the levels prevailing in 1977-8. We believe it is time for the major oil consumers - today 85 per cent of the world's oil consumption takes place in the industrialized world - to set themselves ambitious targets for energy conservation. Developing countries also must make such efforts whenever possible. This can be done in various ways including overall consumption targets and standards for consumption in various uses such as vehicle mileage and building insulation. Ultimately such standards should themselves become the subject of international agreement and surveillance.

Oil Production and the Problems of the 1980s

About one-quarter of the world's commercial energy today is oil produced by OPEC members. As far as concerns any major increase in production in the near future from known and guaranteed oil reserves, the Middle East is the main source. In the short run, any expansion in world energy consumption has to be met chiefly by oil.

A number of factors bear on the planning of Middle East production. In the first place, the producers view the management of oil as something which affects all countries, and for which all countries have a responsibility. They are keenly aware of the depletable nature of oil, and that until very recently consumers acted as if supplies were unlimited. They express the view that future generations will hold them to blame for failure to manage this precious resource. There are also more technical reasons why higher output may be resisted. It is likely that the faster the off-take from a given oil-well, the smaller the volume of oil the well will

APPENDIX E-IV (Continued)

ultimately yield. As the oil is pumped out, gas is released which may have to be flared off and wasted. And of course there are economic considerations. Burning oil in combustion engines is one of its lowest-value uses; conversion to petrochemicals is more important and more profitable and indeed is a growing tendency among Middle East producers.

For capital-surplus oil exporters, one of the biggest questions is what they receive in return for their oil; as long as oil is priced and paid for mainly in US dollars, the health of the dollar is a critical factor. And if the exporters exchange their dollars for long-term financial assets, the permanence of the value of those assets is equally critical. If a producing country does not need oil revenues for immediate payments for imports, there is a real question about the good sense of exchanging a depletable and increasingly valuable resource, which can easily be kept in the ground, for anything whose long-term value may be less certain.

New Sources of Oil

For all these reasons, significant increases in Middle East oil production are problematic. And further, any such increases will require major investments in billions of dollars. If new capacity is to become available in any near future, decisions on those investments must be taken relatively soon. But in the current world situation the decisions are very difficult to make. All these considerations underline the urgency of an accommodation between producers and consumers. They also underline the importance of conservation, which weighs heavily in the minds of producers.

There are other sources of oil supply in the industrialized countries and in the Third World. Recent major finds in Mexico show that there are still new reserves to be discovered, particularly in the Third World where, as with minerals, there is now far less exploration than in the industrialized countries which have already been intensively explored. The drilling density in prospective oil areas in industrialized countries is about forty times that in those of the oil-importing developing countries. Here the need for better North-South relations is fundamental. The mutual distrust between the major oil companies and many developing countries is a serious obstacle to exploration. The methods of finance and the safeguards and framework for fair negotiation and security which we propose in later chapters are specially urgent in the case of oil. The exploration and development of energy resources commonly

involve the expertise and finance commanded by the big international companies, though there are increasing numbers of national oil companies and smaller private operators.

Need for Diverse Agencies

There is a need for a variety of agencies. The multinational companies are increasingly content to cooperate with multilateral agencies, but we do not believe that exploration should be confined to the major oil companies. In their new role in the overall supply structure the oil majors are making very considerable profits, which have attracted comment. Because of worldwide interest in these companies, special care must be taken to consider the reciprocal obligations of multinationals and host and home countries referred to in Chapter 12. At the very least these companies should increase their investment in oil development in the Third World. But the developing countries must obviously control the exploration of their own resources.

Production can be increased in some industrialized countries as well. Once again, it creates problems for surplus producers if industrial countries urge them to step up their production while they themselves go slowly and try to maintain their own resources.

An 'Emergency Programme'

In our final chapter we put forward an Emergency Programme for international negotiation, a crucial part of which covers the energy problem. It is no exaggeration to describe this as an emergency. Virtually all expert projections indicate a very tight oil situation in the 1980s, with increasing demand and great uncertainty about the state of supply. There is no need to dwell on the dangers that lie ahead: the vulnerability of supplies to political upheaval in any producing country; the threat of major hardships for developing countries; the dangers to the world economy - not to speak of the even greater dangers of possible recourse to military intervention by major powers who see their vital interests at stake in any serious disruption of supplies. The level of production is already a highly political matter, both in the national and international context, not least because the market incentives and supply patterns for current oil production do not create an orderly framework for equilibrating supply and demand. We therefore have no hesitation in putting forward a global energy strategy as a matter of the utmost urgency.

APPENDIX E-IV (Continued)

Alternative Energy Sources

The transition away from oil is made difficult by the fact that oil is an unusually versatile energy source which can be applied to many different uses and serve all the demands for highly concentrated energy which accompany urbanization and industrialization. And even if much new oil is discovered, the transition to other sources of energy will have to take place in an uncomfortably near future. Ultimately the human community must rely on inexhaustible sources of energy; solar in the broadest sense, which includes biomass, wind and tides; new forms of nuclear energy, supplementing hydro-electric and geothermal sources. But for the rest of this century oil, natural gas and other exhaustible sources of energy - particularly coal - have to meet most of the additional needs.

Most alternative energy sources are surrounded by problems - of technology, of risk to the environment and of costs. There are of course 'new' sources of oil such as tar sands and oil shales, from which synthetic oils can be produced. They present some of the same problems as coal, particularly in their large-volume mining methods, their needs for water, and requirements for cost-reducing research. Several industrial countries have enough coal to meet all their energy needs for decades or in some cases for centuries; but the human and environmental hazards of coal production and use were among the causes of the shift to other fuels. Accelerated research can and undoubtedly will diminish some of these hazards; it can also reduce the costs of converting coal to gas or liquid fuel. A greatly expanded role for coal seems inevitable in the next decades.

Nuclear Problems

Nuclear energy is another major alternative. For the immediate future it gives rise to legitimate concern. There is a risk both of accidents - as was underlined in the Three Mile Island incident in 1979 - and of long-term low level exposure, which make nuclear energy particularly alarming to the public. This option must be evaluated rationally and soberly. In view of the widespread apprehensions, safety precautions and regulations have to be more rigorous than for other energy sources. To rely on nuclear energy may ultimately require a resort to breeder reactors; but here the control of the fuel cycle is crucial. As we move further into the twenty-first century, nuclear fusion may also become available,

promising virtually inexhaustible energy from a fairly benign process. But for the present stage of nuclear energy, the problems of radiation risk in power production and in the storage and transport of nuclear wastes are unsolved; the large demands on water and land made by nuclear installations are a matter of concern; in many countries public opposition to new nuclear stations is highly vocal. The nuclear alternative is thus problematic, and in most countries cannot be expected to make more than a partial contribution to overall energy use in this century.

Hydro and Solar Energy

Hydro-electric development is a well-known and feasible technology which must attract major new investment in the near future particularly in developing countries; high priority should be given to this at national and international levels. Solar energy, however, seems so far economical only in limited fields such as space heating, or generating electricity in remote locations. Great progress is reported in photovoltaic cells and thermal conversion, but a breakthrough in the storage of electricity is urgently needed. Given their solar exposure, it is possible that developing countries may at some point become relatively well off in energy terms, provided that really low cost technology is available. But research on a major scale is necessary to develop this technology. For some countries, especially poor landlocked countries with no indigenous fossil fuels, for whom even oil is made additionally expensive by heavy transport costs, solar technology is already competitive with other energy sources, and can become more so with further developments. We believe there is a strong case, in view of the mutual interest in assured world energy supplies, for the fruits of research on solar energy in the North to be made available on specially favourable terms to the poorer countries of the South. The oil-exporting countries themselves are anxious to use some of their funds for developing alternative sources of energy for the post-oil era.

Planning for the Future

During the rest of this century, most additional energy will almost certainly have to come from technologies which are already known. Some difficulties, like the higher costs and major investments in technologies, will be foreseeable; others will be less predictable, like nuclear accidents, oil spills or political upheavals

APPENDIX E-IV (Continued)

in producer countries. But while the energy transition is inevitable, catastrophe is not; and it should be possible to mitigate the difficulties of the transition through proper planning and cooperation. The time lags will be long, and both the future supply of energy and the demand for it will depend on decisions taken by governments, investors and consumers today.

An International Energy Strategy

The greatest dangers facing the world in the short and medium term are supply disruptions, consequential price surges, and incompatible national policies.

The need to seek an international accommodation has been recognized since the oil crisis of 1973. Before the Conference on International Economic Cooperation (CIEC) in 1975-7, industrial countries wanted to concentrate first on oil and energy while the OPEC nations insisted on giving equal emphasis to the totality of the North-South dialogue, both because they saw themselves as part of the South, and because they had a special interest as oil producers in discussing other aspects of the world economy. They were naturally concerned about world inflation, which was diminishing the value of the currencies, particularly the dollar, for which they were exchanging their diminishing oil deposits; they were concerned about maintaining the value of their growing financial investments in the industrialized countries; they were anxious to have greater access to technology, to build industries which would survive after their oil ran out; they had a lively interest in the regulation of the multinational corporations, with which so much of their history had been interlocked; and the increasing importance of oil in world trade and payments gave them a growing concern in the functioning of the international monetary and financial systems. All this led them to insist that the problem of energy supplies was only part of the broader problem of restructuring the world economy; and at the same time, along with other nations of the South, they pressed for fairer terms for other commodities, and for a more equitable distribution of the world's resources. These problems are still on the agenda today.

The differences in perception should not conceal the important areas of common interest and potential agreement between producers and consumers, and the need for continuing dialogue. All parties have an interest in the creation of an international framework and a political climate which can provide a confident and trusting collaboration of all countries to ensure long-term

exploration and development of energy, and an orderly transition from a world economy and industry based on oil, to one that can be sustained through renewable sources of energy. They have a shared interest in conservation and in avoiding abrupt price changes. And all must be aware of the special need to protect the poorer oil-importing countries. OPEC members find it difficult to meet the needs of these countries due to the lack of downstream facilities in their oil sector. It is suggested in some OPEC quarters, however, that special refinery facilities be established for groups of developing countries on a joint-venture basis between these countries and oil producers, which will guarantee the flow of crude from the producers to meet their needs and give them greater security.

A Global Research Centre

All countries must obviously formulate energy policies appropriate to their needs and resources. They must be able to make their plans on the basis of the most accurate available information, and coordinate their strategies as far as possible with other nations. Twenty of the West's oil-importing countries already belong to the International Energy Agency in Paris, in which recently there have been efforts to set targets for oil imports and make arrangements for monitoring them. We would recommend the setting-up of a global energy research centre under UN auspices which could in the first place provide a focus for information, research and projections. Such a centre could support in particular research in the field of renewable sources of energy. The UN conference in 1981 on New and Renewable Sources of Energy will offer an important opportunity to make progress in this field.

Protecting Poorer Oil Importers

Developing countries have found it difficult in times of serious shortages to obtain fuel required for their needs. The smaller ones in particular have tended to be left out of the system by the major oil corporations owing to their marginal importance as customers. In addition the oil-importing developing countries have been seriously affected by the sharp increases in the cost of their oil imports, which for many of them have in recent years absorbed a rapidly rising share of their foreign exchange earnings. There is an immediate need for arrangements to meet the financial requirements which such increases generate, over and above the

APPENDIX E-IV (Continued)

general measures to strengthen their balance of payments through programme loans and other means. The financing of exploration for fossil fuels and the development of new energy supplies in the Third World, including natural gas, hydro-electric and geothermal energy, is also in the mutual interest and should receive international support.

Occasional disruptions in supplies will occur in the future as they have in the past, and contingency planning is essential. The oil-importing developing nations, which are in most need of protection, have so far been left out of international agreements. The Energy Commission of CIEC recommended that, in periods of reduced oil supplies, the most vulnerable developing countries should be given priority to allow them to meet essential requirements, and similar proposals have been raised elsewhere. There should be contingency plans to protect these countries in the event of acute scarcity.

Rejecting the Use of Force

The political dangers arising from the energy situation are underlined by fears expressed in the media and elsewhere that force might in some circumstances be used by powerful countries to ensure the security of future oil supplies. Such interventions would put world peace in jeopardy; even talk of them increases political tensions and makes solutions more difficult - we need hardly stress how essential it is that such notions be utterly rejected, and that the world's energy problems be solved by peaceful means.

Producer-Consumer Understanding

We believe it is both necessary and urgent to seek an understanding between producers and consumers on all internationally traded energy supplies. Such an understanding would comprehend the assurance of regular supplies of oil, more vigorous conservation, more predictable changes in oil prices, and the development of alternative energy sources. Several of these objectives require longer-term measures. But a start must be made with all of them. To this end we propose a major global agreement in our last chapter, which would include an international energy strategy, action on finance to accommodate developing countries' general borrowing needs and to ensure the recycling of surplus OPEC funds, and other measures of international economic reform, all of which taken together might begin to resolve North-South problems and lead the way to a more rational and equitable world order.

An arrangement between producers and consumers should include all countries. The Soviet Union produces more oil than any other country and is the second largest exporter after Saudi Arabia. It also earns half its hard currency from oil. It has the world's largest reserves of natural gas, of which it is the second largest producer (after the US) and the third largest exporter. Other countries of Eastern Europe have so far obtained 90 per cent of their oil imports from the Soviet Union, but they have in recent years begun to turn to Third World sources. And China is thought to have at least double the oil reserves of the US, with oil already accounting for 15 per cent of US imports from China. China is also the third largest coal producer in the world.

Energy must become the shared responsibility of the whole world community, and to reach an understanding will clearly require a serious attack on these and the other issues to which we address ourselves. All our futures could depend on the success which attends such global efforts.

Recommendations

An orderly transition is required from high dependence on increasingly scarce non-renewable energy sources.

Immediate steps towards an international strategy on energy should be taken as part of the Emergency Programme recommended in the final chapter of the Report.

Prices which reflect long-term scarcities will play an important role in this transition; orderly and predictable price changes are important to facilitate a smooth development of the world economy.

Special arrangements including financial assistance should be made to ensure supplies to the poorer developing countries.

International and regional financial agencies must increase substantially their financing of exploration and development of energy sources including the development of renewable energy resources.

A global energy research centre should be created under UN auspices to coordinate information and projections and to support research on new energy resources.

Sec. 106. Energy and Selected Development Activities.-

(a) (1) (A) The Congress finds that energy development and production are vital elements in the development process, that energy shortages in developing countries severely limit the development process in such countries, that two-thirds of the developing countries which import oil depend on it for at least 90 percent of the energy which their economies require, and that the dramatic increase in world oil prices since 1973 has resulted in considerable economic hardship for many developing countries. The Congress is concerned that the value and purpose of much of the assistance provided to developing countries under sections 103, 104, and 105 are undermined by the inability of many developing countries to satisfy their energy requirements. Unless the energy deficit of the developing countries can be narrowed by more fully exploiting indigenous sources of energy such as oil, natural gas and coal, scarce foreign exchange will increasingly have to be diverted to oil imports, primarily to the detriment of long-term development and economic growth.

(B) The Congress recognizes that many developing countries lack access to the financial resources and technology necessary to locate, explore, and develop indigenous energy resources.

(C) The Congress declares that there is potential for at least a moderate increase by 1990 in the production of energy for commercial use in the developing countries which are not members of the Organization of Petroleum Exporting Countries. In addition, there is a compelling need for vigorous efforts to improve the available data on the location, scale, and commercial exploitability of potential oil, natural gas, and coal reserves in developing countries, especially those which are not members of the Organization of Petroleum Exporting Countries. The Congress further declares that there are many benefits to be gained by the developing countries and by the United States and other developed countries through expanded efforts to expedite the location, exploration, and development of potential sources of energy in developing countries. These benefits include, but are not limited to, the following:

(i) The world's energy supply would be increased and the fear of abrupt depletion would be lessened with new energy production. This could have a positive impact upon energy prices in international markets as well as a positive effect upon the balance of payments problems of many developing countries.

(ii) Diversification of the world's supplies of energy from fossil fuels would make all countries, developing and developed, less susceptible to supply interruptions and arbitrary production and pricing policies.

APPENDIX F-I (Continued)

(iii) Even a moderate increase in energy production in the developing countries would improve their ability to expand commercial trade, foreign investment, and technology transfer possibilities with the United States and other developed countries.

(D) Assistance for the production of energy from indigenous resources, as authorized by subsection (b) (1) of this section, would be of direct benefit to the poor in developing countries because of the overwhelming impact of imported energy costs upon the lives of the poor and their ability to participate in development.

(2) The Congress also finds that energy production from renewable, decentralized sources and energy conservation are vital elements in the development process. Inadequate access by the poor to energy sources as well as the prospect of depleted fossil fuel reserves and higher energy prices require an enhanced effort to expand the energy resources of developing countries through greater emphasis on renewable sources. Renewable and decentralized energy technologies have particular applicability for the poor, especially in rural areas.

(b)(1)(A) In order to help developing countries alleviate their energy problems by improving their ability to use indigenous energy resources to produce the energy needed by their economies, the President is authorized to furnish assistance, on such terms and conditions as he may determine, to enable such countries to prepare for and undertake development of their energy resources. Such assistance may include data collection and analysis, the training of skilled personnel, research on and development of suitable energy sources, and pilot projects to test new methods of energy production.

(B) Of the funds made available to carry out this section, up to \$7,000,000 for the fiscal year 1981 shall be used for purposes of sub paragraph (A) to facilitate geological and geophysical survey work to locate potential oil, natural gas, and coal reserves and to encourage exploration for potential oil, natural gas, and coal reserves in developing countries which are not members of the Organization of Petroleum Exporting Countries.

(2) The President is authorized to furnish assistance under this chapter for cooperative programs with developing countries in energy production and conservation through research on and development and use of small-scale, decentralized, renewable energy sources for rural areas carried out as integral parts of rural development efforts in accordance with section 103 of this Act. Such programs shall also be directed toward the earliest practicable development and use of energy technologies which are environmentally acceptable,

require minimum capital investment, are most acceptable to and affordable by the people using them, are simple and inexpensive to use and maintain, and are transferable from one region of the world to another. Such programs may include research on, and the development, demonstration, and application of suitable energy technologies (including use of wood); analysis of energy uses, needs, and resources; training and institutional development; and scientific interchange.

(c) The agency primarily responsible for administering this part shall coordinate with the Department of Energy, to the maximum extent possible, and planning and implementation of energy programs authorized under this chapter and shall consult with the Department of Energy on such planning and implementation.

(d) The President is authorized to furnish assistance, on such terms and conditions as he may determine, for the following activities, to the extent that such activities are not authorized by section 103, 104, and 105 of this Act:

(1) programs of technical cooperation and development, particularly the development efforts of United States private and voluntary agencies and regional and international development organizations;

(2) programs of research into, and evaluation of, the process of economic development in less developed countries and areas, into the factors affecting the relative success and costs of development activities, and into the means, techniques, and such other aspects of development assistance as the President may determine in order to render such assistance of increasing value and benefit;

(3) programs of reconstruction following natural or manmade disasters;

(4) programs designed to help solve special development problems in the poorest countries and to make possible proper utilization of infrastructure and related projects funded with earlier United States assistance; and

(5) programs of urban development, with particular emphasis on small, labor intensive enterprises, marketing systems for small producers, and financial and other institutions which enable the urban poor to participate in the economic and social development of their country.

(e)(1) There are authorized to be appropriated to the President for purposes of this section, in addition to funds otherwise available for such purposes, \$160,632,000 for the fiscal year 1981.

(2) Amounts appropriated under this section are authorized to remain available until expended.

3/24/80

APPENDIX F

TABLE F-II: AID Energy Assistance Program in FY 80
(Estimated \$ Million)

PPC	160	160
Near East	600	600
Asia	7,982	27,282
Latin America	2,829	3,009
Africa	7,997	7,997
DSB	<u>8,371</u>	<u>8,559</u>
	\$27,939 (Excluding rural electrification and Economic Support)	\$47,607 (Includes rural electrification and excludes Economic Support)

APPENDIX F

TABLE F-III: Core Asia Bureau Energy and
Related Forestry Projects FY 78-80

<u>Rural Electrification</u>		<u>Obligation (000's)</u>
India	386-0462	\$ 58,000
Bangladesh	388-0021	69,300
Indonesia	497-0267	<u>36,000</u>
	Subtotal	\$163,300
<u>Demonstration and Application of Renewable and Non-Conventional Energy Technologies</u>		
Philippines	492-0294	\$ 8,650
Thailand	493-0304	5,000
India	386-0465	2,000
Indonesia	497-0266	800*
Nepal	367-0132	<u>100*</u>
	Subtotal	\$16,550
<u>Augumentation of Fuelwood Supplies</u>		
Nepal	367-0132	\$1,000*
Sri Lanka	383-0055	<u>4,350</u>
	Subtotal	\$5,350

TABLE F-III .(Continued)

Energy Sector Planning and Training

Indonesia:	498-0249 (Energy Planning)	\$ 600
Indonesia:	497-0300 (Energy Training)	1,000
Regional:	498-0262 (Energy Development)	500
Regional:	498-0258 (ASEAN)	<u>500</u>
	Subtotal	\$2,600
	Total	<u>\$187,800</u>

*Energy or Forestry Component Only (Estimated)

TABLE G-I: Energy Projects of the Development Support Bureau

1. 936-5701: Cooperative agreement with Volunteers in Technical Assistance (VITA) for information dissemination and small projects. \$1,250K (FY 80)
2. 936-5702: Support agreement with the Department of Energy, \$500K (FY 80)
3. 936-5703: Cooperative agreement with Resources for the Future for policy studies on rural electrification (India), conservation, and biomass. \$1,000K (FY 80)
4. 936-5709: Agreement with USDA for studies, workshops, and feasibility work in biomass conversion. \$450K (FY 80)
5. 936-5710: Agreement with NASA for the development and testing of photovoltaic systems for health applications (focus in Africa and Latin America). \$1,000K (FY 81 Request).
6. 936-5711: Agreement with the Peace Corps for surveys of rural energy uses and technologies. \$600K (FY 80)
7. 936-5715: Agreement with NRECA to provide expertise to support regional workshops, country resource and feasibility studies in small, decentralized hydroelectric power. \$1,500K (FY 80)
8. 936-5716: Training in energy technologies at University of Florida.

TABLE G-I (Continued)

9. 936-5724: Contract to be awarded for program of technical assistance in conventional energy resource assessment and surveys.
\$3,500K (FY 81 Request)
10. 936-9997: Agreement with Association of Engineering Universities for program of degree training in energy disciplines, particularly those related to conventional energy development. \$700K (FY 80)

APPENDIX G-II

<u>Company Name</u>	<u>Type of Business</u>	<u>Location</u>	(A) <u>Assessment, Plan ning, Policy</u>	(B) <u>Engineering Technology</u>	<u>Contract Number</u>
Applied Solar Technology, Inc.	Small Business	Gaithersburg, Md		X	A10/SOB/POC-C-0311
Automated Management Systems, Inc.	Small, Minority	Lanham, Md	X		0309
Burns & Roe, Inc.	Corp	Woodbury, NY	X	X	0304
Chas. T. Main, Inc.	Corp	Boston, MA	X	X	0309
Development Science, Inc.	Small Business	Sagamore, MA	X		0306
Georgia Inst. of Technology	Non-Profit	Atlanta, GA	X	X	0303
Gordian Assoc/Louis Berger Int'l	Corp	Washington, D.C.	X	X	0301
Int'l Energy Associates Ltd	Small Business	Washington, D.C.	X	X	0307
Poly Tech Consulting Engineers	Minority	Cleveland, Ohio		X	0312
PRC Energy Analysis Co.	Corp	McLean, Va.	X	X	0302
The EC Corp	Small, Minority	Knoxville, TN	X		0310
United Engineers	Corp	Philadelphia, Pa.	X	X	0305

G-III. Possible Energy Questions to Address in Project Design

1. What is the effect of the project's activities on the demand for specific types of energy?
2. Can this demand be met from indigenous sources and at what cost?
3. Can the local community afford to pay for the energy?
4. What are the options for meeting these demands, especially options based on renewable energy?
5. Is the application or demonstration of a renewable energy system, e.g., solar pump, merited as part of the project?
6. What is the efficiency of the energy conversion and end-use devices being used in the project and are they the most efficient systems available for the price?
7. What impact would large future energy price increases or supply disruptions have on the viability of the project?