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AID Energy Assistance
to Bangladesh

Asia Bureau
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Summary

President Zia ur Rahman recently requested increased energy assistance from the United States, particularly in petroleum exploration. This request comes in the context of the new Second Five-Year Plan's emphasis on (1) expanded exploration for oil and gas, particularly in the Western Zone; (2) increased production and use of natural gas and other indigenous energy sources to reduce dependence on imported oil and coal (which account for nearly 50% of Bangladesh's foreign exchange earnings) and to mitigate pressures on scarce firewood and traditional energy resources (which supply roughly three-quarters of total energy); (3) the building of a 125-MW nuclear reactor (to be provided by the French).

In the energy resource development sector, the Second Five-Year Plan targets investments in seven major areas:

- (1) Development of the Geological Survey of Bangladesh
- (2) Hydrocarbon Exploration
- (3) Production of Gas and Gas Field Development
- (4) Gas Transmission and Distribution
- (5) Petroleum Production and Distribution
- (6) Development of Non-Conventional Energy
- (7) Research, Studies, Training, Energy Institute (Planning and Institutional Development)

The Plan also emphasizes the development of community forests.

Previous AID assistance has been directed to the electric power sector i.e., (1) construction of a 50-MW hydro unit at Karnafuli and (2) the construction of approximately 4,000 miles of electricity distribution lines to 13 rural cooperatives.

AID's energy-assistance strategy in the future, in order to respond to President Zia's request and to meet directly the dual crisis of rising costs of imported oil and dwindling traditional energy sources should move to a more balanced approach including support for areas (1), (2), (6), and (7) of the energy investment plan.

In the near-term, AID should respond to President Zia's specific request for assistance in petroleum by supporting oil, gas, and coal resource assessments and surveys. Initial design of this activity would be funded by the bureau/mission and the full assessments or surveys from recently approved DS/EY projects in conventional resource identification and training.

Over the longer-term, the mission should pursue the development of an energy program that also includes:

- testing, demonstration and application of renewable and non-conventional energy technologies;
- augmenting supplies of fuelwood and improving the efficiency of wood use;
- training and technical assistance to enhance the technical, managerial, and planning capabilities of Bangladesh institutions in both conventional and renewable/traditional energy areas.

A mission staff position should be established to develop and manage this energy program. A long-term arrangement between an institution in the U.S. (e.g., the Solar Energy Research Institute) and the Bangladesh mission/government could also be established to provide continuous technical support.

I. Background

A. Bangladesh Energy Study and First-Five-Year Plan

A major energy-sector analysis, supported by the Asian Development Bank and the UNDP, was completed during 1975-76. The report recommended a core investment program covering 1976-85 with an estimated cost of \$930 million (in 1975 dollars). It included the following projects:

Electric Power Sector

1. the rehabilitation of existing plants;
2. an electric interconnection across the Jamuna River;
3. a small gas-turbine generating station in the West Zone;
4. a larger gas-turbine station in the East Zone;
5. several additions to the main transmission system.

Gas Sector

6. additional distribution in the area served by the Titas-Dacca system, supported by some additions to the production facilities and a new pipeline to Ashuganj;
7. a pipeline to Chittagong and distribution of gas within Chittagong supported by further development of the Bakhrabad gas field;
8. construction of three large urea plants, with the first in Chittagong;

Oil Sector

9. rehabilitation of the Chittagong refinery;
10. expansion of the refinery to include a bitumen plant and an LPG unit.

The study also highlighted the importance of traditional fuels in overall energy use. While suggesting that measures should be taken to augment traditional supplies and increase the efficiency of their use, no specific investment projects were recommended.

On petroleum exploration, the report considered that additional drilling was needed to ascertain more accurately the size of Bangladesh's gas reserves.

The report was completed during the middle of the First Five-Year Plan (1973-78). Its recommendations reinforced the basic emphasis of the Plan on power-sector development and natural-gas resources exploration, production, transmission, and utilization. In general, however, actual performance during the period of the Plan was well below Plan targets.

B. Planning Commission Proposal to AID

In 1977, the Bangladesh Planning Commission, interested in filling the major gaps in analysis of rural energy supply/demand, submitted a proposal to USAID for technical assistance in rural energy surveys and studies of firewood production. AID did not support this request.

C. Karnafuli Hydro Project (388-0018)

AID has had a long involvement with the Karnafuli Dam project in the Eastern Zone. The latest contribution to this project was the provision of \$9.5 million to the Ministry of Power, Water Resources, and Flood Control for a 50 mw hydro generator.

D. Rural Electrification I (388-0021)

Since 1975, the Bangladesh government has pursued a program of "total electrification" of the country. The Constitution obligates the government to rural electrification. In FY78, AID approved a project to assist the Rural Electrification Board of the Ministry of Power, Water Resources, and Flood Control in the construction of approximately 4,000 miles of electricity distribution lines and in the establishment of 13 rural electrification societies in a area encompassing 45 thanas and 1.6 million households. The total revised project costs of RE-I are estimated at \$97.3 million, of which AID will provide \$69.3 million. AID has already obligated the full \$69.3 million. A Rural Electrification II project is proposed for FY 81.

E. Alternative Energy PID

During 1979, the mission began discussions with Bangladesh officials on an alternative energy project. A PID was submitted that proposed the creation of an Energy and Fuel Institute (EFI) within the Ministry of Science and Technology. This institute, which had not yet been approved within the Bangladesh government, would have broad responsibilities in energy planning and R&D. The major focus of the project was to train Ph.D.s for the Institute. As a result of AID/W concerns over the feasibility of this Institute and the problems of Ph.D. training in the Bangladesh context, the mission was asked in the APAC cable to revise the PID. The evacuation and work load of the mission staff has prevented this revision, and the mission has undertaken no further work on this project.

F. Renewed Proposal from Planning Commission

On June 11, 1980, the Bangladesh Embassy in Washington presented to AID Washington a proposal from the Planning Commission for a study of rural energy use in Bangladesh. The proposed scope for the study is essentially the same as the previous proposal from the Planning Commission in 1977. The mission is currently discussing the proposal with the Planning Commission.

II. Current Energy Situation and Plans

A. Structure of Energy Demand/Supply

Bangladesh is a poor, predominantly rural country with over 70% of total energy use accounted for by traditional energy sources.

Traditional Fuels.

The breakdown of traditional fuel sources in 1973-74 is shown in Table I of the Appendix. Studies since then suggest a more significant share for firewood. Growing population and rural industries are placing severe pressures on firewood and other traditional energy resources. A recent survey of rural industries by the Bangladesh Institute of Development Studies revealed the widespread use of firewood in such major industries as gur making, lungi, baking, pottery, bricks and tiles. Table II indicates the ten rural industries with the highest energy intensities and the fuels they use.

Conventional Fuels.

Oil and gas supply about 90% of total consumption with coal and hydro accounting for the remainder. (See Table III.) Bangladesh, of course, imports all its oil and coal. Oil import costs have risen from \$183 million in 1975-76 to \$268 million in 1978-79, or over 45% of the country's export earnings. The pattern of petroleum consumption (See Table IV) is fairly evenly split among the electricity sector, the transportation sector, and the household sector. Demand for diesel fuels for irrigation and kerosene for rural lighting and cooking in urban areas is growing rapidly. The Government is encouraging the substitution of natural gas for fuel oil in the power sector. Currently, 56% of total gas production is being used for power generation. (See Table V)

B. Resource Potential and Supply Development

Bangladesh has sizeable natural gas deposits, conservatively estimated at 9.36 trillion cubic feet. No systematic and thorough appraisal of the country's gas resources has been completed, however.

Nine major gas fields have been discovered, of which only four are currently on stream. Production is about 145 million cubic ft/day. The prospects are good for confirming additional reserves and the success rate of drilling in Bangladesh has been one of the highest in the world (one in every three wells drilled onshore).

Besides seeking to reduce petroleum imports through substitution of natural gas (directly as fuel for domestic and commercial use and as a substitute for fuel oil in power plants, and indirectly through substitution of gas-generated electricity for kerosene and diesel in irrigation and lighting), the government is considering the export of gas both as LNG and via pipeline to India. A U.K.-based firm, International Management and Engineering Group, is conducting a feasibility study for a 3.5-trillion cubic ft. LNG export project and a high-level Indian team recently began negotiation on the proposed sale of 1 trillion cubic ft. over 20 years to the Indian state of West Bengal.

Drilling for gas is increasing rapidly in Bangladesh. The West Germans recently concluded a grant agreement to finance part of a 20-well drilling program. Sunmark Technical Services, a subsidiary of the U.S. independent Sun Oil, is providing the technical management services to Petro Bangla under the FRG Grant Agreement. In general, the climate for investment by foreign oil companies is not favorable. Phillips and Union have complained that the Bangladesh government has not made adequate geological data available to permit a proper assessment of the investment potential in oil and gas. However, it appears that Ray Huffington, a U.S. company involved in Indonesian LNG, may undertake gas exploration in Bangladesh, nevertheless.

Bangladesh also has substantial renewable energy resource potential. The Bangladesh Energy Study emphasized biogas digestors and President Zia has called for the installation of a digester in each Thana. Opportunities exist to increase production of wood for rural household and industry use. Selected solar technologies might also be appropriate, e.g., solar pumps in remote areas. Bangladesh also has some coal and peat resources that have not been adequately defined.

C. Institutional Structure in the Energy Sector.

Like many developing countries, extreme fragmentation exists in energy policy and administration. In Bangladesh, the principal actors are shown below by functions:

- (1) Oil and Gas Development,
Processing, and Marketing:

Ministry for Petroleum and
Mineral Resources
- Petro Bangla

- (2) Power Generation, Transmission, and Distribution:

Ministry of Power, Water Resources, and
Flood Control

- (3) Energy Research and Development: Ministry of Science and Technology
 - Center for Scientific and Industrial Research
 - Atomic Energy Commission
- (4) Community Forestry: Ministry of Forests
- (5) Energy Policy and Analysis: Planning Commission
 - Energy Study & Planning Cell

Dr. Nural Islam, a leading energy expert from Bangladesh, has proposed that "a separate national institution should be established for the efficient management of rural energy programs as a whole rather than separate institutions for the management of different energy technologies in the rural areas, e.g., Rural Electrification Board, Biogas Directorate, etc." Furthermore, he advocates that "the various administrative agencies presently engaged in the management of different commercial energy sectors (Power, Oil, and Gas, etc.) and the proposed Rural Energy Administration should be brought under a single National Energy Administration. This will enable the development of a balanced energy policy with proper attention to both traditional and commercial energy sources." The Bangladesh government is considering such a reorganization during the second five-year plan (see below.)

D. Objectives of Second Five-Year Plan

The Second Five-Year Plan continues the First Five-Year Plan's emphasis on natural gas development and the expansion of capacity in power generation, transmission, and distribution. However, the plan also realizes the need to improve the efficiency of primary energy resource use and to develop alternative, renewable energy sources. It states: "to increase the rural energy base, development of efficient technology for biogas, solar energy, and wind will be emphasized along with the development of community forests." The plan targets about \$500 million for investment in seven major categories:

- (1) Development of the Geological Survey
- (2) Hydrocarbon Exploration
- (3) Production of Gas and Gas Field Development
- (4) Gas Transmission and Distribution
- (5) Petroleum Production and Distribution
- (6) Development of Non-Conventional Energy
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As shown in Table VI of the Appendix, the bulk of the projected investment remains in the conventional energy area. Special emphasis is given to expanding petroleum exploration in the Western Zone of Bangladesh, where no oil or gas has yet been found.

The need for institutional development and consolidation is recognized in the Plan. An institute of energy is recommended to carry out research in both conventional and non-conventional energy and the possibility of establishing a Ministry of Energy is indicated.

III. Recommendation -- A Proposed AID Energy Assistance Strategy in Bangladesh

AID energy assistance to Bangladesh should focus on expanding and developing indigenous renewable and non-renewable energy supplies for meeting both short- and longer-term energy needs. The strategy proposed here would specifically support four of the seven energy investment areas in the Second Five-Year Plan (numbers 1, 2, 6, 7 above).

In the near term, AID should respond to President Zia's specific request for assistance in petroleum by supporting oil, gas, and coal resource assessments and surveys. Initial design of this activity would be funded by the Bureau/Mission and the full assessments or surveys from recently approved DS/EY projects in conventional resource identification and training.

Over the longer-term, the mission should pursue the development of an energy program that also includes:

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A mission position would be created to develop and manage this energy program. A long-term arrangement between an institution in the United States (e.g., the Solar Energy Research Institute) and the Bangladesh mission/government could also be established to provide continuous technical support.

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APPENDIX

TABLE I: Traditional Energy
Use in Bangladesh -- 1973-74

<u>Source</u>	<u>Percent of Total</u>
Cowdung	25.0
Jute Sticks	6.0
Rice Straw	18.0
Rice Hulls	24.0
Bagasse	5.5
Firewood	3.5
Twigs & Leave	9.0
Other Crop Residues	<u>9.0</u>
	100.0

Source: ADB/UNDP, Bangladesh Energy Study

TABLE II: Energy Intensity and Fuel
Mix of Ten Rural Industries in
Bangladesh 1979-80

<u>Industry</u>	<u>Energy Intensity*</u>	<u>% of Total Value Added by Rural Ind.</u>	<u>Fuels</u>
1. Gur Making	.55	5.8	Firewood
2. Pottery	.45	1.7	Firewood, Cowdung
3. Bricks and Tile	.43	1.7	Firewood
4. Dairy	.25	1.5	Firewood/Kerosene
5. Blacksmith	.23	1.7	Coal
6. Dhahi Products	.21	0.6	Firewood, Kerosene, Coal
7. Bakery Products	.17	1.5	Firewood, Kerosene, Electrical
8. Than Cloth	.15	1.8	Firewood, Kerosene
9. Paper Bags	.14	1.6	Firewood
10. Grain Milling	.13	7.9	Tush, Diesel, Electricity

*Energy input Cost/value added

TABLE III
Conventional Energy Consumption
Mix in 1977-78

<u>Source</u>	<u>% of Conventional Total Energy</u>	<u>Electric Sector</u>
Petroleum Products	54.9%	25.2
Natural Gas	35.2%	48.4
Coal	8.2%	-
Hydro	1.9%	26.4%

TABLE IV
Structure of Petroleum
Product Demand
1977-78

<u>Product</u>	<u>%</u>
Fuel Oil	32.4%
Kerosene	29.3% (3.4% for electricity)
Diesel	25.7% (6% for irrigation)
Gasoline	4.3%
Jute Batching Oil	2.6%

TABLE V
Structure of Natural Gas
Consumption 1978-79

<u>Consumer</u>	<u>Volume</u>	<u>%</u>
Power Stations	12,506	36.5
Fertilizer Plants	14,860	43.3
Tea Estates	5,189	15.1
Commercial	548	1.6
Domestic	1,199	3.5

**Million Cubic Feet

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APPENDIX (Continued)

TABLE VI

Energy Investment in Second Plan (Crores Taka*)

<u>Area</u>	<u>Total Allocation</u>	<u>Foreign Exchange</u>	<u>%of Total</u>
1. Geological Survey Dev.	25	10	3.3
2. Hydrocarbon Expl.	160	100	21.1
3. Prod. of Gas & Gas Field Dev.	115	85.42	15.1
4. Gas Transmission & Distribution	340	218.25	44.7
5. Petroleum Production & Distribution	90	61.00	11.9
6. Dev. of Non-Conven- tional Energy	20	10.00	2.6
7. Research, Studies, Training, Energy Institute	10	6.00	1.3
	<u>760</u>	<u>484.67</u>	<u>100</u>

*Crore = 10 million
15 Taka = \$1