

Technical Assistance to the Government of
Bangladesh
In the Fossil Energy Sector

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Dacca, Bangladesh
12 June 1981

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1. Purpose and Scope

Since October 1980, there have been a number of contacts between USAID and various agencies of the Government of Bangladesh concerned with potential technical assistance in the fossil energy sector. Interest in assistance began with a visit to the United States by the President of Bangladesh, during which the subject of technical assistance in the fossil energy area was raised.

The author visited Dacca during the period of 5-14 June 1981 for the purpose of reviewing the results of the previous contacts and discussions and assisting in the development, in principle, of a technical assistance program satisfactory to the Government of Bangladesh and the USAID Mission in Dacca. This report contains the results of this visit.

The resources which can be devoted to a Bangladesh project in the fossil energy sector originate in two centrally-funded world-wide projects in the Development Support Bureau (Office of Energy) of the USAID / Washington organization. One, the Conventional Energy Technical Assistance Project, provides the following features:

- assistance and collaboration in activities relevant to the non-hardware aspects of exploration for, the production of, and the utilization of oil, natural gas, and coal resources,
- cooperation with Bangladesh counterpart organizations and personnel in all aspects of the activities to the extent that the counterparts are fully aware of the management, progress, evaluations, and follow-on needs involved in the accomplishment, and

- on-the-job training of counterpart personnel in the technical aspects of the work as the need is identified.

The other, the Conventional Energy Training Project, provides the following features:

- the placing of qualified candidates in degree programs in universities in the United States having substantive content in fossil energy, and
- the placing of qualified candidates in shorter term specialized fossil energy programs appearing to satisfy particular local needs.

The rationale for the conventional energy technical assistance project is the production of results that serve either directly, indirectly, potentially, or by implication to reduce the import of petroleum while, at the same time, providing the energy supplies needed for economic development. This rationale, then, is the basis for assessing priorities on the selection of project activities.

The rationale for the conventional energy training project is the building of skills and capability, at least, to maintain the momentum of progress in achieving reductions in petroleum imports produced by the results of the technical assistance project.

2. Sources Investigated

Two categories of sources were investigated during the course of the author's visit. The first was a review of documents relevant to current activities in the energy sector of Bangladesh. The other was the discussions with a number of Bangladesh Government agencies in Dacca. Both of these sources are listed in Table 1.

3. Summary of Findings

A. Assistance Needs as Perceived by the Government of Bangladesh

On 4 May 1981, the Government of Bangladesh (Petrobangla) informally submitted to USAID/Dacca its preliminary views on potential technical assistance in three areas. A copy of this submission is included in this report as Annex 1. The three areas are

- (1) Oil and Gas Sector Studies
- (2) Production of Gas
- (3) Utilisation of Hydrocarbons

A fourth area is being prepared, which involves Petrobangla's master plan for staffing, in which training needs may be identified. This plan should be available during the week of 14 June 1981. A fifth area was submitted which comprised a list of equipment items believed necessary for effective prosecution of Petrobangla's current activities.

Analysis of the submission shows the following.

(1) Oil and Gas Sector Studies

The eight tasks outlined for this area conform to, and are consistent with, the rationale and the activities encompassed by the USAID central conventional energy technical assistance project. Comments below on certain of these tasks are relevant to this finding. The apparent objective to be reached by accomplishing these tasks is to strengthen significantly Petrobangla's capability to manage, to staff, to establish funding needs, and to plan for effective and efficient exploration activities for oil and natural gas and production of natural gas and by-products from existing fields. The objective stated in Annex 1 for this area is relevant to the aforementioned broader objective.

With respect to Task A-2, the collection of exploration data outside of the country, Petrobangla would retain the responsibility to making the contacts and obtaining agreements to permit collection of data outside of Bangladesh.

With respect to Task A-5, only the review of a requirement for processing and interpreting existing data is stated. Actual processing and interpreting activities could be included in the scope of this task.

With respect to Task A-6, only the analysis of existing data for the formulation of an extensive exploration program is stated. Actual formulation of the program and the cost estimate for its accomplishment could be included in the scope of this task.

With respect to Task A-7, in addition to the identification of areas for investment in the exploration facilities stated, the scope could also include the preparation of cost estimates to establish and manage these facilities.

Task A-8 should be considered in two parts. Part 1 would be the "logistics" type of planning for the items as stated, while part 2 would involve establishing the qualifications of personnel and evaluating staff experiences. Training needs and programs may also be identified as one result.

(2) Production of Gas

The 17 tasks outlined for this area conform to, and are substantially consistent with, the rationale and the activities encompassed by the USAID. The comments below on the organization and management of this area are relevant to this finding. As stated, the objective of the work in this

area responds to apparent Government of Bangladesh energy policy in the energy sector, which is

- to utilize indigenous natural gas in a manner that effectively reduces the importation of petroleum, and
- to realize exports of indigenous gas to provide foreign exchange to pay for imported petroleum.

The 17 tasks should be allocated in three groups, two of which would be undertaken one at a time in a sequential manner. At the conclusion of the first group, a decision point would be reached requiring decisions regarding the substantive content of the activities in the second group. The third group appears to be anomalous.

The first group would contain the tasks B-1 through B-5 inclusive. The activities encompassed by this group may be summarized as: characterizes how present demand (1981-82) is being supplied from present producing fields; projecting demands through 1985 and through 1990 by reviewing the work of others in this respect and by establishing new inputs (export potential would be included here); analyzes the capability of presently known fields to produce to meet expected demand (including reservoir analyses to ascertain the require reserves); and establishes a development plan in steps, including timing of activities, to meet the projected demands for 1985 and for 1990.

Government of Bangladesh approval of the results and recommendations would be required before producing with the activities in the second group.

The second group would contain the tasks B-6 through B-12 inclusive. The activities encompassed by this group may be summarized as developing the details (bills of materials, equipment, and costs) for the immediate program to meet the 1985 demands, assesses the capabilities and deficiencies in the Petrobangla organization to implement the immediate plan, provides for efficient use of available equipment and remedying present well deficiencies, looks toward optimizing the present pipeline network to assure reliable supply to consumers, and, overall, studies the management of the national gas sector and recommends improvements.

The third group would contain the tasks B-13 to B-17 inclusive. The activities encompassed relate to the identification and assessment of investment opportunities to promote natural gas demand either domestically or for export. In this context, the tasks in this group appear to mesh better with those in utilization of hydrocarbon area.

(3) Utilization of Hydrocarbons

The 13 tasks in this area appear to be dependent for their accomplishment on the results of the tasks discussed above for the oil and gas sector and the production of gas areas. Also, the third group tasks in the production of gas sector should be added. Therefore, activity in the utilization of hydrocarbon area should be deferred until it can be judged that adequate results are available from the work in the first two areas, as discussed above, to permit effective and efficient study of the utilization of hydrocarbons in Bangladesh.

(4) Staffing and Training

The rapid growth of activity in the oil and gas sector has stretched thin the availability of experienced personnel and has generated the dilemma of inability to spare qualified personnel from regular duties during the time required for them to acquire needed and beneficial education and/or training. Petrobangla's staffing and training plan when issued is likely to reflect this dilemma.

Potential approaches to resolve the dilemma appear to be the following:

- Select promising entry level personnels for the education offered by the conventional energy training project before they have incurred organizational responsibilities. As these personnel return they can help release more senior personnel for appropriate educations.
- Provide local opportunities for in-depth short duration work/seminars on specialized topics useful in supporting the work activities of the technical personnel.
- Attempt to find one or two personnel who can benefit from highly-specialized short-term (e.g. about 6 months) overseas training.

B. Features Involved in Responsive Project Design

The design of an oil and gas, exploration and production, technical assistance project should incorporate a number of features that ensure that the project results will be responsive to the needs as presented in the previous section.

(1) Acquisition of Available Inputs

A number of donors are currently assisting in the development of Bangladesh's oil and gas sector. The results of their efforts are likely to be critical to the project design. They may serve either to avoid duplication of work, to eliminate unproductive directions of activities, to corroborate results achieved by the project, or in other ways not at present obvious. The design should provide for identifying and evaluating the efforts of other donors.

The following donors and activities were identified by the author.

World Bank. The Bank is the major lender in a pipeline construction and natural gas production project to bring gas from the Bakhrabad field to Chittagong, which also includes the distribution of this gas to the major consumers. The project is expected to be completed by June 1982 to June 1983 depending on whether a monsoon season interferes with the construction schedule. The justification for the loan depends on growth of consumption to a schedule by the year 2000, namely: in new steel manufacturing capacity by 1993; in new electric power generation by 1995; in new fertilizer production by 1985; in carbon black production by 1990; in sponge iron production by 1990; and in the growth in the other consumers.

One potential gas consumption project not considered is the provision of attractively-priced natural gas for electricity production to support an aluminum smelter. The project depends on two assumptions which need to be verified, and if so would represent a sale of 50-100 million cfd of natural gas for foreign exchange at no appreciable

investment to the country. The assumptions are (a) that Petrobangla can be credible in contracting for a reliable long-term 20-30 year, supply and (b) that the world primary aluminum picture is that of demand looking for additional supply. The Government of Bangladesh would provide a free trade zone to which it would bring the metered gas line. An aluminum producer would build a smelter, bring in alumina and take out aluminum. A demand for local labor and satellite industry support could be generated. The gas may need to be marginally priced in order to attract a recognized aluminum producer.

The pipeline project also provides \$1.8 million for studies for a compressed natural gas (CNG) project which would aim at replacing gasoline demand by CNG, and possibly also diesel oil demand.

Asian Development Bank -1.

A \$45.9 million loan is on the verge of becoming effective for a project whose objective is to increase and stabilize gas production at the Titas and Sylhet gas fields by drilling additional wells and repairing several currently producing wells. Three new wells are to be drilled at the Titas field, two gas wells repaired, and ancillary facilities and training provided. Gas production should increase by 105 million SCFD. At Sylhet, two wells will be repaired, a 40 km pipeline constructed, and ancillary facilities provided. Production should stabilize at 160 million SCFD.

Asian Development Bank -2. A \$6.2 million loan has been negotiated to strengthen the Geological Survey of Bangladesh. The activities to be undertaken include the provision of physical facilities; machining equipment, and technical documents, the use of consultants; and the training of personnel. Although the scope covers all the geological activities, much of the activity is likely to be oil and gas related. The Geological Survey of Bangladesh is currently in the process of selecting its consultant.

Federal Republic of Germany. The FRG has provided about \$50 million equivalent in a grant for the drilling of 5 wells over a 2-1/2 year period. The purpose is to determine whether oil exists in the structures below Bangladesh. One well has been completed at Benni Bazar. The well was spudded in November 1980. Gas was found in two sands. The work was given to the Sunmark Exploration Company, a division of Sun Oil Company.

United Nations Development Programme. Interest has existed in the establishment of a Petroleum Institute. The status of this project and the functions of the institute were not determined during the visit.

Roy M. Huffington, Inc. Huffington of Houston, Texas has been involved in discussions concerning the liquifaction and export of Bangladesh natural gas. It appears that such a project could be viable if reserves of at least 3 trillion cubic feet were found at a location suited to an export operation. The status or prospects for this project are not clear. Apparently, Huffington would undertake the entire investment beginning with exploration, if they received an acceptable concessional agreement.

Centre for Policy Analysis. This Centre, associated with the University of Dacca, plans to begin a USAID-assisted study of the oil and gas sector in July 1981. The study covers the entire scope of the factors influencing this sector and is directed toward the identification and delineation of policy issues. It is likely that much of the activity in this project can be corroborative.

(2) Phasing

It appears clear from the discussion in the previous section, that the work activities to be specified in the project design should be phased. Tasks should be identified and grouped from the oil and gas sector and gas production studies that logically relate to each other, and that may represent parallel independent tracks of investigation. Completion of these tasks should represent the achievement of an intermediate objective related to the ultimate objective, and should include recommendations affecting the work in the following phase. At some point, the tasks in the utilization of hydrocarbon study can be brought in a logical manner.

(3) Duration

It appears that a phased multiyear project will develop, whose ultimate duration will depend on how effectively and efficiently each phase can be accomplished.

(4) Counterparts

The design should incorporate the role of counterparts both as personnel involved in the work activities and as the Bangladeshi Government organizations which will be supported. The role should be defined

to assure specific benefits to be achieved by the project, namely: (a) counterparts will receive appropriate on-the-job training; (b) counterparts whose motivation and experience /education background offer promise given an opportunity for advanced education in the United States will be identified; and (c) the availability of personnel familiar with and competent in the project activities will constitute a momentum toward assuring that the project benefits are in fact ultimately achieved.

(5) Level of Responsibility

The level in the Government of Bangladesh at which the project fits in terms of receiving direction and discharging its responsibilities should be established. An appropriate level seems to be represented by the following organization of activities.

The guiding body could be a steering or monitoring committee comprising high-level, policy making executives from Petrobangla, the Geological Survey of Bangladesh, and the Planning Commission. The projects manager would report to this committee and receive direction from it. In turn, this manager would organize and direct the work activities giving primary emphasis to the needs of Petrobangla, and addressing as appropriate specific needs that may be identified with respect to the Geological Survey of Bangladesh and to the Planning Commission.

(6) Design Focus

The project design should focus solely on the "what" of the tasks that need to be incorporated. The "how" should be left to the organization which will have the responsibility to implement the project. The design should also include policy matters which will guide the implementation organization in his determination of the method of accomplishing the tasks

determined. It is likely that some inputs from the implementation organization will be needed to ensure that the tasks specified in the design are feasible to complement. The project design should clearly state the immediate objectives to be achieved, their relationships to the ultimate goals, and the type of recommendations anticipated for decision making upon the conclusion of the activities.

(7) Title

The title for the project team that seems to fit best the nature of the tasks to be undertaken as the result of the project design is "advisory and assistance group".

C. Other Energy Resources

Bangladesh possesses two energy resources upon which interest so far has been at a low level relative to that placed on natural gas and on the search for oil. They are coal and peat. Project activities could involve a maintenance type of effort to facilitate exposure to current developments in underground coal gasification in the case of coal, and on mining and drying in the case of peat.

(1) Coal

Bangladesh coal deposits exceed in terms of energy value the natural gas resources so far proven. They are deep deposits 2800-3800 feet below the surface, covered by unconsolidated sediments which may require freezing in order to penetrate by shafts. Several independent investigations agree that mining is technically feasible, but disagree on the extent of the reserves. The deposits occur in the north-western part of the country, and probably are an extension of the coal deposits of eastern India.

The coal is sub-bituminous, highly volatile, and non-coking. The permeability of the seams appears conducive to underground gasification techniques.

(2) Peat

Peat occurrences permeate the country, but the largest appear to be in the south-western part of the country in the Faridpur and Khulna districts. Average thickness is about 6 feet under an overburden of 5 feet. Moisture content exceeds 80%, and solar drying techniques are probably appropriate. Reserves have been estimated as 125 million tons.

Considerable activity in utilizing peat as a domestic fuel exists worldwide, for example, the USAID project in Burundi. Such utilization appears appropriate for Bangladesh.

4. Conclusions

The allotment of about an additional week would have been helpful to permit additional interviews in Dacca, and perhaps also to cross check information. Nevertheless, it is clear that a definitive project of technical assistance has emerged, which addresses the needs in the fossil energy sector of the Government of Bangladesh, and in particular its oil and gas exploration and production agency, Petrobangla.

The accomplishment of such a project in an efficient and effective manner requires an expansion in greater depth of the details presented in this report, through conducting a definitive project design activity.

Petrobangla's dilemma of finding a means of providing further education and training for its apparently overburdened technical staff could be addressed by undertaking a separated effort in this respect. This effort

would be aimed at providing local training opportunities for a broad participation and overseas educational opportunities for a highly selective participation.

5. Recommendations

(a) Proceed with a project such as has been identified by Petrobangla's informal submission (Annex 1), as discussed and commented upon in this report.

(b) Undertake the design of such a project in which the design features discussed above are addressed.

(c) As a separate effort, aimed at immediate benefits, undertake the design, conduct, and implementation of a workshop/seminar for selected participants from relevant GOB energy oriented agencies. Focus on at least two topics, which appear to have the greatest relevance to current needs: (a) the interpretation of seismic data, and (b) the analysis of gas well production tests. Select a Bangladesh organization to administer the seminar for effective and efficient presentation and discussion of the substantive content.

(d) Encourage energy-oriented agencies of the Government of Bangladesh (e.g. Petrobangla and the Bangladesh Petroleum Corporation) to take advantage of the petroleum management training opportunity described in Annex 2.

TABLE I

SOURCES OF INFORMATION

DOCUMENTS

Bakhrabad Gas Development Project, World Bank Staff Appraisal Report 2956-BD

Preliminary Version - Needs and Targets Study Bangladesh U.S. Geological Survey

Preliminary Version - Energy Issues and Prospects Energy Sector Assessment -- World Bank

Loan Agreement (Geological Survey Project) Asian Development Bank, 5 August 1980

Centre for Policy Research, University of Dacca, Scope of Study Topic, Natural Gas and Petroleum

Petroleum and Mineral Resources of Bangladesh, Proceeding of Seminar and Exhibition, 8-12 October 1980, Dacca

VISITS

Government of Bangladesh Agencies

Joint Secretary, Ministry of Petroleum

Chairman and staff, Petrobangla

Former Joint Secretary, Ministry of Petroleum

Planning Commission Member

Director General, Bangladesh Geological Survey

Others

Sunmark Exploration Company, Dacca

ANNEX I

INFORMAL SUBMISSION BY PETROBANGLA (4 MAY 1981) OF
SCOPES OF WORK IN CONVENTIONAL
ENERGY TECHNICAL ASSISTANCE

OBJECTIVES AND SCOPE OF THE STUDIES:

Long-Term Objectives:

The studies will consist of assessment of energy requirement in Bangladesh in order to optimize the utilisation of its energy resources within the frame-work of the overall economy. Apart from the requirement of meeting the future energy needs of the economy at least cost, this includes investigation of the possibilities of augmenting energy production for internal use, optimizing foreign exchange earnings by the export of energy resources (e.g. gas) and of accomplishing adequate diversification of the energy resource base of the economy. This will involve an assessment of the country's overall economic prospects, its total energy requirements for the next 5-10 years, and its existing and potential energy resources. It will result in the formulation of a long-term plan for the rational investigation, development and utilization of such energy resources to meet the projected and optimum energy requirements of the economy particularly keeping in view a larger measure of energy independence and foreign exchange earning through export of Gas.

Short-Term Objectives:

There are major projects in the energy sector for which investment funds must be made available in the immediate future. For this reason, within the frame-work of the long-term objectives, the studies will also include pre-feasibility type investigations of investment options for the period upto 1985 with a view to offering indication on specific investment projects. The prefeasibility type investigations will include adequate studies to determine the prima facie viability of an individual project. These investigations will provide bases on which further actions, whether for detailed examination of viability and/or for project investment, can then be undertaken.

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OIL AND GAS SECTOR STUDIES:

A. Exploration for Oil and Gas:

The objective of this sectoral study is the preparation of a detailed scope of work for investment options in hydrocarbon exploration during the period of second five year plan (1980-85).

The terms of reference of the study are as follows:

- A.1 collect, systematise and review all existing data relating to exploration for Oil and Gas in Bangladesh;
- A.2 examine possibilities of collecting exploration data that are scattered about in several locations, even outside the country;
- A.3 examine possibilities of setting up a centralized data bank relating to exploration, production and utilisation of hydrocarbon;
- A.4 review establishment of a computerised exploration data processing centre which would also cater for general purpose computation requirement of Oil and Gas exploration and exploitation. Assess investment costs for both A.3 and A.4;
- A.5 review the requirement for processing and interpretation of existing data and assess cost estimate for this;
- A.6 analyze existing data for formulation of an extensive exploration programme which should cover seismic surveys and exploration drillings in onshore and offshore areas;
- A.7 identify areas of investments covering seismic survey, exploration drilling, inventory requirement, storage systems, communication systems, etc;
- A.8 recommend technical aspects of personnel requirement for each separate operation, prepare check lists of materials and equipment required for exploration drilling, with worked out examples, recommend specifications for these and recommend inventory of spares and accessories requirement and recommend all tests and logging methods necessary;

- A.9 develop management and technical reporting systems and recommend communication system necessary for efficient operation, information and management control;
- A.10 develop financial reporting system for management information and control.

B. STUDY ON PRODUCTION OF GAS:

The objectives of this study are the preparation of the scope of work for future gas production and utilisation opportunities of natural gas with a view to reducing outflow of F.E. on account of imported fuels and enhancing inflow of cash Foreign Exchange through setting up export oriented gas based industries.

The terms of reference of this study are as follows:

- B.1 obtain and review information on the level and pattern of present gas demand from the producing gas fields;
- B.2 examine various estimates of the projected gas demand from these fields and prepare most likely projections of demand for the period up to 1985 and up to 1990.
- B.3 examine the capacity and the operating conditions of the present production facilities at these gas fields and determine the timing and magnitude of capacity additions that would be necessary to increase production and/or security of supply with the view to ensuring that the projected demand up to 1985 is satisfactorily met. The alternatives to be examined in this regard would comprise:
 - (i) development of new production wells,
 - (ii) increasing capacity of the existing production wells,
 - (iii) repair, rehabilitation and development of the existing production wells, and
 - (iv) possible development of the existing test well at Kailashtilla into a production well;

- B.4 examine and interpret, for each of the relevant reservoirs, available data pertaining to:
- (i) initial and present reservoir pressures,
 - (ii) initial and present reserves,
 - (iii) subsurface profile of the structure,
 - (iv) net thickness and depths of horizons,
 - (v) porosity, permeability and gas saturation characteristics,
 - (vi) proven, probable and possible reserves and the estimated ultimate recovery;
- B.5 in consideration of B.1 through B.4 above, outline a broad plan of production well development at these gas fields and indicate the field location of such possible wells on the profile with the suggested timing for their development;
- B.6 for the well development to be accomplished before 1985, the following will be prepared:
- (i) general outline of the well programme,
 - (ii) operational procedures for drilling,
 - (iii) detailed drilling programme including casing, cementation, directional drilling, well logging, well completion and testing programme and procedures, and
 - (iv) sketch of deviated holes (if any), schematic downhole equipment and method of installation.
- B.7 provide the list of equipment, material and services, together with the estimated local and foreign currency costs for the programme recommended in B.6 above. In estimating the above, availability of suitable equipment and personnel within Bangladesh will be carefully examined;
- B.8 examine the feasibility of carrying out drilling operations by Petrobangla staff with expatriate advisers and in the light of these recommend appropriate contracting and supervision arrangements for the drilling programme with estimates of costs. The drilling programme in respect of each well will include logistics plan and the rig movements;

- B.9 for the wells requiring workover and/or repair work, items described in B.6 and B.7 should be prepared where relevant;
- B.10 examine the feasibility of utilising rigs available with Petrobangla (Oil-Well-96') for the purpose of developmental and/or production well drilling. If the use is considered advisable, ascertain the requirement of a new rig;
- B.11 determine the feasibility of connecting the producing gas fields to the existing and proposed pipeline systems, if such a link line is considered justified, provide estimated requirement of the equipment, services and materials for the same, together with its local and foreign currency costs;
- B.12 with the view to identifying areas of improvement and/or to strengthen the present arrangements regarding the overall management of the sector, various aspects of sector operations will be studied and appropriate recommendations will be made;
- B.13 identify major investment options during the period 1980-1985 in the gas production sector;
- B.14 assess investment opportunities for LPG/Ethane/Gasoline recovery from the natural gas;
- B.15 assess possibilities of investment in the development of Kutubdia Gas Field for export oriented industries;
- B.16 review production of Gasoline/Diesel from gas as a source to meet internal consumption and to export for resource generation;
- B.17 recommend other investment opportunities in the production and utilisation of natural gas.

C. STUDY FOR UTILISATION OF HYDROCARBON:

The objectives of this study are the preparation of a detailed scope of work and identification and formation of investment options in the field of utilisation of natural resources in place of imported fuels.

The terms of reference of this study are as follows:

- C.1 obtain and review the level and pattern of present energy demands, both commercial and conventional, in Bangladesh;
- C.2 examine present transmission and distribution systems of energy, particularly commercial energy in Bangladesh
- C.3 analyze and review various assumptions and bases for forecasting different commercial energy demands in Bangladesh upto 1985 and upto 1990;
- C.4 forecast various commercial energy demands upto 1985 and 1990;
- C.5 examine all prospects for new developments in the field of energy with a view to gaining a larger measure of energy independence in Bangladesh;
- C.6 identify areas/projects for utilisation natural resources for energy optimisation, independence, and economic uses;
- C.7 assess investments necessary for the identified projects and indicate economic and social benefit arising out of these projects;
- C.8 examine transmission and distribution of natural gas to the western region crossing the Jamuna River;
- C.9 assess the investment level of recommended gas transmission and distribution projects;
- C.10 examine alternative uses of gas and its by-products;
- C.11 examine gas based petro-chemical and other export oriented industries for inflow of foreign exchange;
- C.12 review the possibility of investment in the natural gas grid;
- C.13 review of the impact of natural gas on the economy of Bangladesh.

ANNEX 2

POTENTIAL OPPORTUNITY FOR IMMEDIATE TRAINING IN PETROLEUM MANAGEMENT

The following extracts the substantive content of a cable received by USAID/Dacca, dated 8 June 1981, concerned with an opportunity for the Government of Bangladesh to participate in a course on Petroleum Management conducted by Arthur D. Little and available under the USAID (DS/EY) Conventional Energy Training Program.

1. DS/EY wishes to advise that while in general we are only placing candidates in university degree programs during this first round. Our recent discussions with A.D. Little have made it possible to include ADL's Petroleum Management course among our current offerings. A five-month course which begins August 20, 1981, the ADL program is intended to provide oil professionals (especially engineers, geologists and economists) with both classroom and field exposure to all aspects of petroleum exploration, production and distribution. Course modules and sample topics include:

- (1) Industry environment (history and structure)
- (2) Technical (from concession to marketing and distribution)
- (3) Operational (supply economics, product valuation, oil brokerage and trading)
- (4) Financial (Government fiscal regulations, capital requirements, pricing, project finance)
- (5) Planning and management (forecasting supply and demand, risk analysis)
- (6) Management in developing countries (joint ventures, technology transfer, infrastructure requirements)
- (7) Related hydrocarbon activities (natural gas, LNG, LPG, petrochemicals)
- (8) Integrated case studies.

Two weeks of travel and site visits in the Houston and new Orleans areas are also included. (Classroom portion of course takes place at ADL in Cambridge, Mass.).

2. ADL advises us that as of 1 June between seven and twelve openings remain in the class, which is limited to 40 participants. Prerequisites for the ADL course include a university degree, competence in the English language, at least five years' working experience in a petroleum company or related Government agency, and an endorsement

from candidate's company or agency indicating that he/she has been designated as a prospective senior executive or official. FYI, the average age of participants in the 1980 course was 39.

3. As with other programs offered under the Conventional Energy Training Project (936-9997), DS/EY will cover all costs of the program except international travel. AID will assist in screening candidates, arranging for visas, etc. Brochures, application forms and endorsement forms are being pouched on 5 June.

4. DS/EY requests that USAID/Dacca discuss this program with appropriate Government officials and determine whether there are qualified and available candidates. If so, please cable soonest the name, DOB, academic credentials, employment history and prospects, and English language skill level (as per Ailign Scores) for each candidate. Given the short time until August, ADL will offer provisional acceptance to qualified candidates immediately on basis of cabled information, to be confirmed later on receipt of written applications and recommendations.